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THE NEW INTERNATIONAL ENCYCLOPÆDIA

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KEY TO PRONUNCIATION.

ā	as in ale, fate. Also see ĕ, below.
ā̇	“ “ senate, chaotic. Also see ĕ, below.
â	“ “ glare, care.
ă	“ “ am, at.
ä	“ “ arm, father.
ȧ	“ “ ant, and final *a* in America, armada, etc. In rapid speech this vowel readily becomes more or less obscured and like the neutral vowel or a short u (ŭ).
a	“ “ final, regal, where it is of a neutral or obscure quality.
a̤	“ “ all, fall.
ē	“ “ eve.
ē̇	“ “ elate, evade.
ĕ	“ “ end, pet. The characters *ĕ*, *ā*, and *ā̇* are used for *ä* in German, as in Gärtner, Gräfe, Hähnel, to the values of which they are the nearest English vowel sounds. The sound of Swedish *ä* is also indicated by *ĕ*.
ẽ	“ “ fern, her, and as *i* in sir. Also for *ö*, *oe*, in German, as in Göthe, Goethe, Ortel, Oertel, and for *eu* and *oeu* in French, as in Neufchâtel, Crèvecœur; to which it is the nearest English vowel sound.
e	“ “ agency, judgment, where it is of a neutral or obscure quality.
ī	“ “ ice, quiet.
ī̇	“ “ quiescent.
ĭ	“ “ ill, fit.
ō	“ “ old, sober.
ō̇	“ “ obey, sobriety.
ô	“ “ orb, nor.
ŏ	“ “ odd, forest, not.
o	“ “ atom, carol, where it has a neutral or obscure quality.
oi	“ “ oil, boil, and for *eu* in German, as in Feuerbach.
o͞o	“ “ food, fool, and as *u* in rude, rule.
ou	“ “ house, mouse.
ū	“ “ use, mule.
ū̇	“ “ unite.
ŭ	“ “ cut, but.
ụ	“ “ full, put, or as *oo* in foot, book. Also for *ü* in German, as in München, Müller, and *u* in French, as in Buchez, Budé; to which it is the nearest English vowel sound.
û	“ “ urn, burn.
y	“ “ yet, yield.
ʙ	“ “ the Spanish Habana, Cordoba, where it is like a *v* made with the lips alone, instead of with the teeth and lips.
ch	“ “ chair, cheese.
ᴅ	as in the Spanish Almodovar, pulgada, where it is nearly like *th* in English then, this.
g	“ “ go, get.
ɢ	“ “ the German Landtag, and *ch* in Feuerbach, buch; where it is a guttural sound made with the back part of the tongue raised toward the soft palate, as in the sound made in clearing the throat.
ʜ	as *j* in the Spanish Jijona, *g* in the Spanish gila; where it is a fricative somewhat resembling the sound of *h* in English hue or *y* in yet, but stronger.
hw	“ *wh* in which.
ᴋ	“ *ch* in the German ich, Albrecht, and *g* in the German Arensberg, Mecklenburg; where it is a fricative sound made between the tongue and the hard palate toward which the tongue is raised. It resembles the sound of *h* in hue, or *y* in yet; or the sound made by beginning to pronounce a *k*, but not completing the stoppage of the breath. The character ᴋ is also used to indicate the rough aspirates or fricatives of some of the Oriental languages, as of kh in the word Khan.
n̲	as in sinker, longer.
ng	“ “ sing, long.
ɴ	“ “ the French bon, Bourbon, and *m* in the French Etampes; where it is equivalent to a nasalizing of the preceding vowel. This effect is approximately produced by attempting to pronounce ‘onion’ without touching the tip of the tongue to the roof of the mouth. The corresponding nasal of Portuguese is also indicated by ɴ, as in the case of São Antão.
sh	“ “ shine, shut.
th	“ “ thrust, thin.
ᴛʜ	“ “ then, this.
zh	as *z* in azure, and *s* in pleasure.

An apostrophe ['] is sometimes used to denote a glide or neutral connecting vowel, as in tā'b'l (table), kăz''m (chasm).

Otherwise than as noted above, the letters used in the respellings for pronunciation are to receive their ordinary English sounds.

When the pronunciation is sufficiently shown by indicating the accented syllables, this is done without respelling; as in the case of very common English words, and words which are so spelled as to insure their correct pronunciation if they are correctly accented. See the article on Pronunciation.

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THE NEW INTERNATIONAL ENCYCLOPÆDIA

MAX'IMIL'IAN I. (1459-1519). Holy Roman Emperor from 1493 to 1519. He was the son and successor of Frederick III., and was born at Wiener-Neustadt, near Vienna, March 22, 1459. His first wife, whom he married in 1477, was Mary of Burgundy, daughter and sole heiress of Charles the Bold (q.v.), Duke of Burgundy and sovereign of the Netherlands. Maximilian became at once involved in war with Louis XI. of France, who laid claim to Burgundy and other parts of Mary's inheritance. Maximilian won the battle of Guinegate in 1479, but was finally compelled in 1482 to conclude the Treaty of Arras with Louis, who retained Burgundy, Artois, and Franche-Comté. The bulk of the Netherlands, the most opulent realm in Europe, remained with the Hapsburgs. In 1486 Maximilian was elected King of the Romans. In 1488 the Flemings rose against Maximilian, who was for a time held a prisoner at Bruges. In 1490 he made a successful incursion into Hungary and soon after became master of the Austrian crownlands. He again took up arms against France, whose King, Charles VIII., had married Anne of Brittany, in order to acquire that great duchy, after a matrimonial alliance had been concluded between that princess and Maximilian. By the Treaty of Senlis, in 1493, Maximilian recovered Artois and Franche-Comté. In the same year he succeeded his father on the imperial throne of Germany. Soon afterwards, Mary of Burgundy having died in 1482, he married Bianca, a daughter of the late Duke of Milan, Galeazzo Sforza, and thus was involved subsequently in the Italian wars. He joined the League of Cambrai against Venice in 1508 and the Holy League against France in 1513, and after Francis I.'s victory at Melegnano (1515) was forced to cede Milan to the French. Nor was Maximilian more successful against the Swiss, who in 1499 completely separated themselves from the German Empire. By the marriage of Philip, the son of Maximilian, with the Infanta Joan, daughter of Ferdinand and Isabella, the House of Hapsburg, in 1516, ascended the throne of Spain in the person of Charles I. (Maximilian's successor in the Empire as Charles V.). The marriage of two of Maximilian's grandchildren with the son and daughter of Ladislas, King of Hungary and Bohemia, ultimately brought both these kingdoms to the Austrian monarchy. Maximilian died at Wels, in Upper Austria, January 12, 1519. As an administrator Maximilian sought to strengthen the organization of the Empire. The evil of private warfare was partially remedied by the declaration of a perpetual peace for the Empire at Worms in 1495, and for the better maintenance of the peace a division of the Empire was made into circles. Reforms in the administration were introduced by the establishment of the Imperial Chamber and the Aulic Council (qq.v.). In general, however, Maximilian placed his dynastic interests above the welfare of the Empire. He was an ardent humanist and a zealous patron of art and learning. He wrote various works on the art of war, hunting, gardening, etc., and sketched the *Weisskunig*, an autobiographic poem. His frank and generous nature, his love for outdoor sports, and his many accomplishments gained him the title of 'Last of the Knights.' Consult: Heyck, *Kaiser Maximilian I.* (Bielefeld, 1898); Ulmann, *Kaiser Maximilian I.* (Stuttgart, 1884-91); Adler, *Die Organisation der Zentralverwaltung unter Kaiser Maximilian I.* (1886).

MAXIMILIAN II. (1527-76). Holy Roman Emperor from 1564 to 1576. He was the eldest son of the Emperor Ferdinand I., and was born in Vienna, July 31, 1527. He was educated in Spain with his cousin, Philip II. He took part in the war with France (1544), and in that of the League of Schmalkald (1547). In 1548 he married his cousin Maria, daughter of Charles V. He was Viceroy of Spain from that year until 1550. Notwithstanding the surroundings in which he had been educated, his attitude toward the Reformation was so liberal that he was even considered by those about him to be at heart a heretic. The Protestants of Germany expected much from his accession, even hoping that they might have a Protestant Emperor of the House of Hapsburg. These hopes remained unfulfilled. Lack of decision, dynastic policy, his personal ambitions, all united to keep Maximilian in his allegiance to the Church. He was crowned King of Bohemia and elected King of the Romans in 1562, and was elected King of Hungary in 1563. In 1564 he succeeded his father on the Imperial throne of Germany, in Bohemia, and in the portion of Hungary not under the sway of the Turks or the Transylvanian princes. In 1566 Solyman the Magnificent determined to make a fresh onslaught upon the power of Austria. His vast army was arrested by the heroic defenders of Sziget, and the great Sultan died in his camp before the stronghold fell. Maximilian displayed great inactivity in the face of the impending danger, and concluded a disadvantageous treaty with Solyman's successor. The marriage of Maximilian's daughter Anne with Philip II., and the hope held out to him by the Pope that he might acquire the Polish Kingdom, acted to repress the Emperor's interest in the Protestant cause. He interceded with Philip in behalf of the Protestants of the Low Countries, but without much success. Under his tolerant rule Germany enjoyed a period of comparative tranquillity, which was followed by one of religious strife under his successor, Rudolph II. Consult: Koch, *Quellen zur Geschichte Maximilians II.* (2 vols., Leipzig, 1857-61); Hopfen, *Kaiser Maximilian II. und der Compromisskatholizismus* (Munich, 1895). See AUSTRIA-HUNGARY.

MAXIMILIAN, FERDINAND JOSEPH (1832-67). Archduke of Austria and Emperor of Mexico. He was the second son of the Austrian Archduke Francis Charles, and a brother to the Emperor Francis Joseph of Austria. He was liberally educated, became commander of the Austrian Navy in 1854, and later served with success as Governor of Lombardy and Venetia. In 1862-63 the French troops of Napoleon III. occupied the principal parts of Mexico. (See MEXICO; JUAREZ.) An assembly of notables, named by the French commanders, was convened, and on July 10, 1863, this body offered the crown to Maximilian, who as a Hapsburg represented the dynasty which had preceded the Bourbons upon the throne of Spain. Maximilian announced that he would accept only on condition that "the vote of the assembly of notables could be ratified by the Mexican people in a general election, and that the European nations would give sufficient guarantees that the throne would be protected from dangers which might threaten it." The Mexican popular vote was easily secured by Marshal Bazaine, and Napoleon signed the Treaty of Miramar, by which he bound himself to maintain the French army in Mexico until the army of the Empire should be thoroughly organized. On May 29 Maximilian, with the Empress Carlotta, daughter of King Leopold of Belgium, landed at Vera Cruz. The new ruler announced that his mission was "the rejuvenation of Mexico." Unfortunately, he knew nothing of the characteristics of the country or of the people over whom he had come to rule. Anxious to conciliate all parties, he soon found himself without the cordial support of any. His desire to rule without the French led him to neglect their representatives, until he suddenly realized that the foreign army, hated equally by all divisions of his subjects, was the only power really behind his throne. In despair of accomplishing anything by conciliation, the Emperor was persuaded to issue a decree, October 3, 1865, declaring that all persons bearing arms against his empire were bandits, and if caught would be tried by court-martial and shot. Before the end of the month four highly esteemed Republican officers had been executed in accordance with this decree, and the last hope of popular support for Maximilian's rule had been destroyed. Meantime, the United States Government, relieved of its embarrassments by the fall of the Confederacy, succeeded in convincing the French Emperor that his intervention in Mexico would not be tolerated. In consequence, on May 31, 1866, Maximilian received dispatches announcing that all French troops would be withdrawn from Mexico. Maximilian would probably have resigned at once had not the Empress Carlotta dissuaded him, undertaking to go to Europe and use her influence with Napoleon III. She proceeded to Paris, where the Emperor at first refused to see her, and finally brutally asked her to leave France. The Pope gave her little better consolation, and she became hopelessly insane. (See CARLOTTA.) Maximilian determined to abdicate, but the French commissioners sent by Napoleon III. were unable to agree to the terms which he stipulated, and eventually he decided to accept the offer of Generals Miramon and Marquez (qq.v.), who promised to raise a force sufficient to replace the French troops and maintain his empire. The Church Party urged the Emperor to remain, promising its support, and Maximilian established his headquarters at Querétaro. There he was surrounded by the Republican army in the early part of March, 1867. On May 14th plans were made for a sortie by which the Emperor might escape to Mexico City or to the coast. Before such plans could be carried out, Colonel Miguel Lopez, a constant favorite of the Emperor and Empress, and one who had received many proofs of their generosity, informed the enemy of the plan and arranged to admit them into the Imperial camp. Maximilian and his generals were forced to surrender, and after a short confinement were tried by a military court. The Emperor was accused of treason, usurpation of public power, filibustering, trying to prolong the civil war, and of signing the decree of October 3, 1865. He was declared guilty and condemned to be shot, together with Generals Miramon and Mejia. The execution took place on the morning of June 19, 1867. The Emperor's body was eventually surrendered to the Austrian Government, and now rests in the Imperial vault in Vienna. Maximilian was a prolific writer, and seven volumes of his prose and verse were published in Vienna in 1867. Among the best accounts of the Emperor are: Chynoweth, *The Fall of Maximilian* (London, 1872), and Prince Salm-Salm, *My Diary in Mexico in 1867* (Eng. trans., London, 1868). Hall's *Life of Maximilian I.* (New York, 1868) is especially valuable for its account of the legal aspects of the trial and execution.

MAXIMILIAN I. (1573-1651). A Duke of Bavaria, prominent in the Thirty Years' War, born in Munich. He was educated at the Jesuit University of Ingolstadt, and in the internal administration of his realm displayed much statecraft. He improved the judicial and executive departments, organized a militia effective for defense, maintained a well-disciplined standing army under the famous Count of Tilly (q.v.), and placed the treasury upon a secure basis. In the affairs of the Empire he was an active opponent of the Protestant cause. When in 1607 the ban of the Empire was pronounced against the free city of Donauwörth (q.v.), he was appointed to occupy the town, which he forthwith proceeded to make Roman Catholic. As a result of his methods, the Protestant Union was organized in 1608. He in turn established the Catholic League (1609), with himself at its head. After the disturbances in the Austrian estates (1618-19), he sided with the Emperor Ferdinand II. (q.v.), and arrangements were made (1619) by which he was to receive the Upper Palatinate and the electoral dignity of Frederick V. (q.v.). His army, commanded by Tilly, defeated that of Frederick under Christian of Anhalt at the battle of the White Mountain (November 8, 1620), and occupied the Palatinate. It was he who, in opposition to any extension of the Imperial power through Wallenstein's army, effected Wallenstein's dismissal at the Diet of Ratisbon (1623). During the Swedish period of the war he was driven from Munich by the entrance of Gustavus Adolphus into Bavaria in 1632. In 1637-38 he fought against the Swedes and French on the Upper Rhine, but in 1647 independently concluded the truce of Ulm. He has been considered the most important German statesman of the time. Consult: Wolf, *Geschichte Maximilians I. und seiner Zeit* (continued by Breyer, 4 vols., Munich, 1807-11), and Von Aretin, *Geschichte des bairischen Herzogs und Kurfürsten Maximilian I.* (vol. i., Passau, 1842). See also Thirty Years' War, The.

MAXIMILIAN II., EMANUEL (1662-1726). An Elector of Bavaria, grandson of Maximilian the Great. He succeeded his father, Ferdinand Maria, in 1679; fought on the side of Austria in the great struggle against the Turks which began in 1683 and in 1685 married Maria Antonia, daughter of the Emperor Leopold I. Appointed Governor of the Spanish Netherlands in 1692, he resigned this thankless post after the death of his son, who had been named heir to the Spanish throne. He sided with France in the War of the Spanish Succession, Louis XIV. having promised him the Spanish Netherlands. But the defeat of Höchstädt (1704) more than outweighed his previous victories; the Elector was forced to take refuge in the Netherlands, and was not restored until the Peace of Baden in 1714. Consult Ruith, *Kurfürst Max Emanuel von Bayern und die Donaustädte* (Ingolstadt, 1889).

MAXIMILIAN I. (Maximilian Joseph) (1756-1825). First King (originally Elector) of Bavaria. He succeeded Charles Theodore as Elector of Bavaria in 1799. His domestic policy was excellent, aiming at general reform. He aimed at dynastic aggrandizement, and, as a reward for his support of Napoleon, received the title of King, which he assumed in 1806, and important accession of territory in Swabia and Franconia, together with Tyrol, and later Salzburg, both of which he had afterwards to relinquish. In the War of Liberation he reluctantly sided with the Allies. His liberal policy at home was shown by his grant of the Constitution of 1818, which unified his scattered domains.

MAXIMILIAN II. (Maximilian Joseph) (1811-64). King of Bavaria. He was the son of Louis I., studied at Göttingen and Berlin, traveled abroad, and gave himself, while prince, to a quiet life surrounded by men famous in art and literature. On his father's abdication in 1848, Maximilian ascended the throne, and made concessions to the liberal spirit of the time; but though he favored German unity, he looked with hostility upon Prussia, and turned rather to Austria as the leader in the movement of unification.

MAXIMILIAN, Order of. A royal Bavarian order, with but one class, founded by Maximilian II. in 1853 for distinction in science and art. It is intended especially for German scholars and artists, and its membership is limited to 100. The King is the grand master.

MAX'IMIL'IA'NA. See Inaja Palm.

MAX'IMI'NUS, Gaius Julius Verus. A Roman Emperor (A.D. 235-238). He was originally a Thracian shepherd. Attracting the attention of the Emperor Septimius Severus by his immense size and wonderful feats of strength and agility, he was admitted to the army; was rapidly advanced for his bravery, put in command of a new legion raised in Pannonia, and obtained great influence over the soldiers. At the head of this legion he followed Alexander Severus in his campaign against the Germans. When the army was encamped on the banks of the Rhine, he conspired against Alexander, and caused him to be put to death in his tent, with his mother Mammæa (A.D. 235). Being proclaimed Emperor, he named his son Maximus Cæsar, and made him colleague in the Empire. He continued the war against the Germans, and devastated a large territory beyond the Rhine. But his cruelty and rapacity aroused the indignation of the people. For alleged conspiracy against him he put to death Magnus, a Senator, with 4000 other persons, and for the Imperial treasury confiscated the municipal property. He opposed Christianity, and persecuted the bishops who had been favored by Alexander. The provinces of Africa revolted and proclaimed Gordianus, who was soon after acknowledged by the Senate and people (March, 238), but died after a brief reign of twenty-two days. Fearing the vengeance of Maximinus, the Senate then proclaimed Emperors Pupienus Maximus and Balbinus, and with them was associated, by order of the people, the third Gordianus. Maximinus, having crossed the Isonzo, laid siege to Aquileia in Italy, but met with strong resistance from the garrison and people. The soldiers mutinied and killed both him and his son, June 17, 238.

MAXIMINUS DA'ZA, Galerius Valerius. A Roman Emperor (A.D. 308-313). When Diocletian and Maximian abdicated (A.D. 305), Galerius and Constantius Chlorus were made Augusti, and Flavius Severus and Maximinus Daza became Cæsars, and Daza received the Government of Syria and Egypt. Early in 308 he proclaimed himself Augustus. A bitter pagan, he persecuted the Christians relentlessly. In 313 war broke out between Daza and Licinius, the successor of Flavius Severus, and was terminated by the defeat and death of the former in August of the same year.

MAXIMITE (named in honor of its inventor, Hiram Maxim). An explosive which has been used in the bursting charge of shells with very good results. It is practically impossible to explode it by shock, but it is easily detonated by a suitable fuze. It melts at a temperature of 174° when heated in air. When detonated the products of combustion are almost wholly gaseous. In an unconfined state it burns slowly without explosion; and if heated it melts and then evaporates rapidly but not explosively. Its composition is a trade secret, but it is said to be a picric acid mixture composed chiefly of picrates. See EXPLOSIVES.

MAXIMS (Fr. *maxime*, from ML. *maxima*, maxim, abbreviation of *maxima propositio*, chief premise, fem. sg. of Lat. *maximus*, greatest, superlative of *magnus*, great; connected with Gk. *μέγας*, *megas*, Goth. *mikils*, OHG. *michil*, *mihhil*, AS. *micel*, *mycel*, Eng. *mickle*), LEGAL. A term used by members of the legal profession and writers on jurisprudence to denote those brief and pithy utterances which by general consent have been accepted as stating in condensed though necessarily imperfect form the general principles which are the foundation of both law and equity. As the ultimate foundation of these general principles is the natural law of justice, safety, and public policy, the basis of the common or customary law is the same in all countries, and its general principles remain substantially unchanged by statute or local enactment. Hence it follows that many of the utterances of ancient Roman magistrates and authors of legal treatises remain to this day of as much force and truth as when first promulgated.

In very few instances can the maxims be traced to their original sources. Many are derived from the Roman law; many are from Continental jurists of the Middle Ages; while a very large number were enunciated by early English judges and writers, and still others are of quite modern origin. Like other expressions of the common law, maxims derive their force and authority in the first place through the truth and justice of the principles which they enunciate, and, secondly, through the universality of their acceptance and application by courts in the past. They are not, therefore, of absolutely equal and binding authority, and it is impossible to draw a line strictly dividing accepted maxims from mere expressions of opinion. The number of those universally accepted as having some authority in law is very large indeed. Works devoted entirely to the consideration of the meaning and application of this form of law have been published by several authors.

Examples are: *caveat emptor*—let the buyer be on his guard—an important principle of the law of sales, but not to be construed too strictly; *Qui facit per alium, facit per se*—he who acts by another, acts himself—in which may be seen the main principle of the law of agency; *Æquitas sequitur legem*—equity follows the law; *Ex nihilo nihil fit*—from nothing comes nothing; *Fraus est celare fraudem*—to conceal a fraud is itself a fraud; *A l'impossible nul n'est tenu*—no one is bound to do what is impossible, the language being what is called 'law French'; *Ubi jus, ibi remedium*—where there is a right there is a remedy; *Ignorantia legis neminem excusat*—ignorance of the law excuses no one; *Prior tempore, potior jure*—first in time, first in right; *Id certum est, quod certum reddi potest*—that is certain which may be rendered so. Among those commonly given in English may be mentioned: Acts indicate the intention; When the equities are equal the law shall prevail; Once a fraud, always a fraud.

The difficulty in practically employing maxims is twofold; first, in correctly amplifying and expounding the extended meaning sought to be conveyed in the condensed form; and, secondly, in properly applying it to the adjudication of the particular facts of the case in question; and it is the work more especially of the writer of treatises on the various branches of law and equity to perform the first duty, while to the active practitioners and to the judges emergencies are constantly presented calling for the exercise of the latter function. It may safely be said that legal maxims play a much less important part in the law than formerly. Generally they have lost whatever character they may have possessed in early times as precise governing rules determining the rights of parties to a litigation. They are now regarded only as convenient forms of expression denoting important legal principles which have many variations or modifications, and consequently are not capable of any complete statement or exposition which at the same time has the convenience of brevity. Consult Broom, *Legal Maxims* (6th ed., London, 1884).

MAX'IMUS. The name of four Roman emperors.—MARCUS CLODIUS PUPIENUS MAXIMUS, elected by the Senate as the colleague of Balbinus (q.v.) in A.D. 238, but soon afterwards murdered by the prætorian guards.—MAGNUS CLEMENS MAXIMUS, born of obscure parentage in Spain; from 368 held high military rank in Britain; was proclaimed Emperor by his soldiers, as a result of their disaffection toward Gratian, whom he defeated and slew (383). Theodosius and Valentinianus II. were induced to recognize him as their colleague and as Augustus of Gaul, Spain, Britain, etc.; but when he sought to extend his sway over Italy also, he was defeated by Theodosius, taken prisoner, and executed (388).—MAXIMUS TYRANNUS, proclaimed Emperor in Spain (408) when Gerontius rebelled against the usurper Constantine III.; was deposed on the defeat of Gerontius (411); again rebelled (418), and was defeated and slain (422).—PETRONIUS MAXIMUS, the intimate friend of Valentinianus III., against whom he turned (455), succeeding him after his murder in the same year; but at the end of three months Maximus was slain as he was fleeing from an invasion of the Vandals, invited by Eudoxia, the widow of Valentinianus.

MAXIMUS, SAINT, called CONFESSOR (c.580-662). An advocate of orthodoxy against the Monothelite heresy. He was born in Constantinople, and served the Emperor Heraclius, 610-630, at which latter date he entered the monastery of Chrysopolis (Scutari). He urged Pope Martin I., at the first Lateran Synod, 649, to anathematize the Monothelite doctrine, in which condemnation Heraclius and Constans II. were implicated. By command of the latter, Maximus was banished to Thrace, 655; being recalled to Constantinople in 662, he was commanded to accept the Monothelite heresy. Refusing to do so, his tongue was cut out, his right hand cut off, and he was banished to Lazika, Colchis, where he died August 13, 662. He is called among the Greeks Theologos, and is venerated as a saint by the Western and Eastern Churches. He was a voluminous author; his works are in Migne, *Patrol. Græca*, xc.-xci.

MAX'WELL, JAMES CLERK (1831-79). One of the greatest of modern physicists. He was born in Edinburgh, the only son of John Clerk-Maxwell of Middlebie, Scotland, receiving his early education at the Edinburgh Academy, and his first published scientific paper, *On the Description of Oval Curves,* was read for him by Professor Forbes before the Royal Society of Edinburgh before he was fifteen. He spent three years at the University of Edinburgh, where he pursued most zealously the study of mathematics, physics, chemistry, and philosophy, devoting considerable time to experimental research. During this period he wrote two valuable papers, *On the Theory of Rolling Curves* and *On the Equilibrium of Elastic Solids.* He went to Cambridge University in the autumn of 1850 and there made a brilliant record as a student, graduating in 1854 with the position of second wrangler, and being equal with the senior wrangler in the competition for Smith's prize. In 1856 he became professor of natural philosophy in Marischal College, Aberdeen; in 1860 professor of natural philosophy in King's College, London. He was successively scholar and fellow of Trinity, and became, in 1871, the first professor of experimental physics in the University of Cambridge, a post for which he was in every way preëminently qualified. The Cavendish laboratory was erected and furnished under his supervision. The great work of his life is his treatise on *Electricity and Magnetism* (2 vols., 1873). He had previously, from 1856 onward, published various papers on these subjects, following very closely the experimental procedure of Faraday. Using the discoveries of this great experimenter, Maxwell so connected and arranged them as to make the material available for mathematical discussion and treatment. He early advanced the view that electric or magnetic forces result from changes in the distribution of the energy which is stored up in the ether and are not produced by the attractions of electric or magnetic matter which is distributed over the surfaces of conductors or magnetic substances. He then demonstrated that electromagnetic action traveled through space in the form of transverse waves similar to those of light and having the same velocity. Maxwell's theory was corroborated by Hertz, who not only produced these waves, but showed that they were propagated just as waves of light are, and experience reflection, refraction, and polarization, and also measured their velocity. Subsequent experiments amply confirmed Maxwell's hypothesis that electricity and light are the same in their ultimate nature. After Maxwell's researches on electricity and magnetism comes his work on color, the well-known Maxwell disks and color-box being his inventions. He showed that any given color could be produced by the combination of three colors selected from different parts of the spectrum. These three fundamental colors would correspond to three different sets of nerves or sensations in the eye, each excited proportionately to the amount of its appropriate color in the compound color. The absence of any one set of sensations would occasion color-blindness.

A paper on the *Stability of Motion of Saturn's Rings* gained for Maxwell the Adam's prize from the University of Cambridge, 1857, and led to the conclusion that the ring must either be fluid or else consist of a large number of small particles. The kinetic theory of gases was also investigated by Maxwell, and the results of his study are given in a number of papers in the *Philosophical Transactions, Philosophical Magazine,* and the reports of the British Association. Maxwell was a member of the electrical standards committee appointed by the British Association in 1862, and served on a subcommittee to construct the standard of resistance, which was produced from experiments made in his laboratory at King's College. Among his many papers and works, a small treatise on dynamics, *Matter and Motion,* will be found of great interest to the general reader, as it contains a clear and comprehensive statement of the principles underlying this science. A memorial edition of Maxwell's scientific papers published by the Cambridge University Press was published in 1890. Consult: Campbell and Garnett, *Life of James Clerk Maxwell* (London, 1882); Glazebrook, *James Clerk Maxwell and Modern Physics* (ib., 1896).

MAXWELL, William Hamilton (1792-1850). An Irish novelist, born at Newry, County Down, Ireland, in 1792; graduated B.A. at Trinity College, Dublin, in 1812; served in the Peninsular campaigns and at Waterloo; took orders in the Church of England and was given the rectory of Ballagh, in Connemara, in the extreme west of Ireland. As there was no other Protestant in the parish, he devoted himself to sport and to novel-writing. He retired from his living in 1844 and settled near Edinburgh, where he died December 29, 1850. Maxwell has a place in the development of English fiction as the founder of the military novel. From him Charles Lever learned his art. His best work is represented by *Wild Sports of the West, with Legendary Tales and Local Sketches* (1832); *Stories of Waterloo* (1834); *My Life,* afterwards called *Adventures of Captain Blake* (1835); and *The Bivouac, or Stories of the Peninsular War* (1837). He wrote an autobiography under the title *Rambling Recollections of a Soldier of Fortune* (1842), and a popular life of Wellington (1839-41).

MAXWELL, William Henry (1852—). An American educator, born in the north of Ireland and educated at Queen's College, Galway. He came to America in 1874, was a teacher in the Brooklyn night schools, became assistant superintendent of the Brooklyn public schools in 1882, and superintendent in 1887, and in 1898 was appointed to a like position in Greater New York. He was especially interested in the teaching of English, and wrote English grammars. He urged a State requirement of college education for public school teachers, and raised the requirements of teachers' examinations.

MAXWELL, Sir William Stirling. See Stirling, Maxwell.

MAY. See May-Day; Calendar.

MAY, Cape. See Cape May.

MAY, Edward Harrison (1824-87). An American painter, born in London. He was brought to America when a child, and first studied under Daniel Huntington. Afterwards he studied with Couture in Paris and made his home there. His pictures include: "The Dying Brigand" (1855), in the Philadelphia Academy of Fine Arts; and "Mary Magdalen at the Sepulchre" (1873), in the Metropolitan Museum of Fine Arts, New York City. His portraits include those of Laboulaye (1866), and of Anson Burlingame (1869).

MAY, John Wilder (1819-83). An American lawyer, born at Attleboro, Mass. He graduated at the University of Vermont in 1846, was admitted to the Massachusetts bar in 1851, and practiced in Roxbury and Boston. In 1867 he was elected to the Legislature and became district attorney of Suffolk County. May was judge of the Boston municipal court (1873); editor of Angell's *Limitations* (1876), Greenleaf's *Evidence* (1876), and Stephens's *Digest of Evidence* (1877); and author of *The Law of Insurance* (1874-82, and often) and *The Law of Crimes* (1881).

MAY, Phil (1864—). An English illustrator, born in Leeds. He left Leeds for London as a mere lad, and spent several years with a company of wandering actors. Afterwards he attracted attention by his drawings in *Saint Stephen's Review,* and in 1884 went to Australia, where he worked on the *Sydney Bulletin* until 1889. In 1891 he published *The Parson and the Painter,* a series of remarkable sketches. Later his work was produced in the *Daily Graphic; Black and White;* the *Graphic,* for which he traveled in America; and the *Sketch;* and in 1895 he took Du Maurier's place on the staff of *Punch.* By the elimination of every unnecessary line, by a felicitous composition, a high technical excellence in the use of light and shade, and the keenest observation and unflagging humor, May holds a place among celebrated English caricaturists. His specialty is East London, and the types he has made famous are the frequenters of the race-course, the prize-ring, and the stage, and the 'gutter-snipes,' the children of the slums. *Phil May's Gutter-Snipes* (1896), a collection of drawings, contains much of his best work. In these his talent is at its ripest, and the quality of sympathy and kindliness, never lacking in his conception, is especially prominent. Other publications by him are *Phil May's Annual* from 1892, and *Phil May's Sketch Book* (1897, 50 cartoons).

MAY, Samuel Joseph (1797-1871). An American reformer, prominent as an abolitionist in the anti-slavery struggle. He was born in Boston; graduated at Harvard in 1817; studied for the ministry in the Harvard Divinity School under Dr. Ware; was ordained in 1822; and soon afterwards became pastor of the Unitarian Church in Brooklyn, Conn. In 1830 he became a disciple of William Lloyd Garrison, and in 1832 joined the first New England anti-slavery society. When Prudence Crandall (q.v.) was persecuted for opening her school at Canterbury, Conn., to girls of negro blood, he became her friend and champion, and later gave her advice and assistance when she was arrested and imprisoned. In the same year, 1833, he was a delegate to the convention at Philadelphia which founded the first American anti-slavery society, and was made one of the vice-presidents. In 1834 he resigned his pastorate and became general agent of the Massachusetts Anti-Slavery Society. In October, 1835, while giving a series of lectures in Vermont, May was five times mobbed, once while addressing an audience in the hall of the House of Representatives at Montpelier. The next year he became pastor of the Unitarian Church in South Scituate, Mass., and remained there until 1842, when he took charge for three years of the Girls' Normal School at Lexington, Mass. In 1845 he became pastor of a Unitarian society at Syracuse, N. Y., and continued to hold that position until three years before his death. In 1851 he assisted in the famous rescue of the slave 'Jerry,' and for this offense against the Fugitive Slave Law he and seventeen others were arrested on warrants issued by the United States District Court at Auburn. Anxious to test the question before the courts, May and two other participants in the rescue issued a public declaration to the effect that they had assisted in the rescue of Jerry, that they were ready to stand trial, but would base their defense upon the "unconstitutionality and extreme wickedness of the Fugitive Slave Law." They were, however, never brought to trial. By temperament May was averse to strife and possessed a sunny temper and a gentle disposition, but, being, in his own words, "a Unitarian, a non-resistant, a woman's rights man, an anti-capital punishment man, and a Garrison abolitionist," it fell to his lot to be engaged in many controversies. He published an interesting volume entitled *Some Recollections of Our Anti-Slavery Conflict* (1869). Consult Mulford (ed.), *Memoir of Samuel Joseph May* (Boston, 1873; new ed. 1882).

MAY, Thomas (1595-1650). An English historian and poet. He was born at Mayfield, Sussex, England, of an ancient family; graduated B.A. from Sidney Sussex College, Cambridge, in 1612; became a member of Gray's Inn, London, and was admitted to the bar, but, owing to a defect in his speech, did not practice law. He devoted himself to literature and published the tragedies of *Antigone* and *Agrippina,* a comedy entitled *The Heir,* and other works. By special command of Charles I., with whom he was a favorite, he published two poems on the reigns of Henry II. and Edward III. He translated into English verse *Selected Epigrams of Martial,* Vergil's *Georgics,* and Lucan's *Pharsalia,* to the last of which he wrote a continuation in English and Latin. During the Parliamentary troubles he became a Republican. He was secretary to Cromwell during the Civil War and was employed to write its history. Published originally in Latin, and translated into English in 1650, his *History of the English Parliament,* begun November, 1640, was edited by Baron Masères, and translated into French by Guizot (1812; new ed. 1853). May died November 13, 1650, and was buried in Westminster Abbey, but soon after the Restoration his body was disinterred and thrown into a pit in the adjoining Saint Margaret's churchyard.

MAY, Thomas Erskine, Lord Farnborough (1815-86). An English constitutional jurist. He was born in London, February 8, 1815, was educated at Bedford School, became assistant librarian of the House of Commons in 1831, and entered the bar in 1838. In 1844 he published a treatise on the *Law, Privileges, Proceedings, and Usages of Parliament* (10th ed. 1893), which has become a standard authority on parliamentary law and has been translated into French, German, Hungarian, Italian, Spanish, and Japanese. In 1846 he was made examiner of petitions for private bills, and the next year he was appointed taxing master to the House of Commons, of which he became clerk in 1871. In 1861-63 he published *The Constitutional History of England Since the Accession of George III., 1760-1860.*

This learned and impartial work is supplementary to Hallam's. He also published *Democracy in European History* (1877), and contributed to the *Edinburgh Review*, to the *Law Magazine*, and to other periodicals. He was president of the Statute Law Revision Committee, 1866-84. He resigned the clerkship of the House of Commons in April, 1886, was created Baron Farnborough, and died at Westminster Palace, May 17, 1886.

MAYA, mä'yȧ (Skt., artifice, illusion, unreality). In the Puranic mythology of the Hindus, the personified will or energy of the supreme being, who thereby created the universe. As, in this later doctrine, the world is unreal or illusory, Maya assumes the character of illusion personified. Maya is the cause of all the phenomena of the world; it makes the unreal universe seem as if it really existed or was distinct from the one Supreme Spirit. In this sense, Maya also occurs in the later Vedanta philosophy and in some of the sectarian philosophies of India. According to the modern Hindu view Maya represents the limitations of time, space, and causation by which the absolute becomes the universe. It is then almost a synonym for the phenomenal world. The modern Hindu views on the subject will be found in Tripathi, *Sketch of the Vedanta Philosophy* (Bombay, 1901), and Vivekananda, *Lectures on Vedanta Philosophy* (New York, 1902).

MAYA. The civilized native race of the peninsula of Yucatan, Mexico, the most important of the cognate peoples constituting the Mayan stock (q.v.). In 1511 the first landing was effected by the Spaniards on the coast of Yucatan, at the sacred island of Cozumel. In 1526, Mexico having already fallen, the first attempt was made upon the peninsula. In 1539 the Spanish commander, Montejo, entered Chichén-Itzá, and a year or two later the Spanish Government was declared established, the capital being fixed at the new city of Mérida in 1542. The country was mapped out into tribute districts; missionaries began to Christianize the natives, and in their zeal destroyed as heathen abominations the native temples and records wherever found. Resistance was crushed out by wholesale massacres and the Maya sovereignty was at an end. The warlike Itzá (q.v.), who had previously retired beyond the Guatemala border, maintained their independence until 1697. In 1848 occurred a general rising throughout the peninsula, the Indians seizing the opportunity afforded by internal troubles in Mexico. Massing their forces in thousands, they took one city after another, burning and destroying everything and consigning to indiscriminate massacre whole garrisons and populations. The entire strength of the Mexican Government was invoked to put down the rebellion. The Maya of the northern and central area were finally subdued, while the more determined warriors retired to the difficult region along the southern coast, where they continued to defy the Mexican armies for more than half a century, while maintaining friendly relations with the English of Belize, from whom they obtained their firearms and ammunition. The end came in May, 1901, when by means of a combined land and naval approach the Mexican army drove the independent Maya, about 15,000 in number, from their last citadel of Chan-Santa Cruz, opening up to the new civilization a region never before traversed by white men. The present number of those speaking the Maya language is about 300,000, about one-third of whom are mixed bloods, or persons of European descent who have adopted the language as their own. For general characteristics, see MAYAN STOCK.

MAYÁGUEZ, mȧ-yä'gwȧs. The capital of the Department of Mayáguez, and the third largest city in Porto Rico, situated near the western coast on the Mayáguez River, which is crossed by several bridges (Map: Porto Rico, A 2). Its harbor consists of an extensive and well-sheltered, but shallow roadstead, in which heavier vessels have to anchor a mile from shore. The industries of the city are insignificant, but it is an important centre of the coffee trade of the island, and it exports, besides coffee, considerable quantities of sugar and oranges, chiefly to the United States. Population, in 1899, 15,187.

MAYAN (mä'*yan*) **STOCK**. A group of cognate tribes or nations occupying the States of Vera Cruz, Yucatan, Campeche, Tabasco, and Chiapas, in Mexico, with the greater part of Guatemala and a small portion of Salvador, and exhibiting in their ancient native culture the highest aboriginal development found upon the American continent. The stock includes six languages, with nearly thirty dialects, the principal nations being the Huastec of northern Vera Cruz; the Maya proper of Yucatan peninsula, with the Itzá and Lacandon, speaking the same language, across the Guatemala frontier; the Tzental, in Tabasco and Chiapas; the Pokom, in the Vera Pas district, central Guatemala; the Mam, on the Chiapas-Guatemala frontier; and the Quiché and Cakchiquel, speaking dialects of one language, in southern and western Guatemala and northern Salvador. Their combined population is probably not far short of two million.

According to all historical and traditional evidence, the Mayan tribes emigrated from the far north at a very early period, probably not far from the beginning of the Christian Era. As they advanced along the shore of the Mexican Gulf they left the Huastec as a detached colony at the north of the Pánuco River on the northern frontier of the present State of Vera Cruz, while the rest proceeded southward into Chiapas and Yucatan, and thence still southward into Guatemala. The date of their arrival in Yucatan seems to have been as early as the middle of the fifth century. Guatemala was probably occupied not long afterwards, as the Quiché chronicles are said to go back more than eight hundred years before the Conquest, or to about 700 A.D. The great ruined cities of Uxmal and Chichén-Itzá date back from twelve to fourteen centuries, while Palenque antedates all American historical records.

Physically the Mayan peoples are dark, short, broad-headed, and muscular. In pre-Columbian times they had attempted a high grade of civilization. Agriculture was their main dependence, corn being the principal crop, to which were added beans, peppers, and cacao, the last, together with pieces of copper, being used among the Maya proper as the ordinary standard of value. Bees were domesticated for their honey and wax. Cotton was spun for clothing and dyed and woven into fabrics which rivaled silk in delicacy. The lands were held in common by each village and were parceled out by the chiefs on a basis of a certain corn production per year to each family. Gold, silver, and copper were used for ornamental purposes, but ordinary metal tools were unknown. The Maya of the coast region had large seagoing canoes, with which they carried on regular trade with Cuba and voyaged north and south along the Gulf coast and the Caribbean shore. Descent was generally in the male line, and each village community was governed by a chief who derived his authority from the hereditary ruler of the tribe or province. A century before the coming of the Spaniards the whole peninsula of Yucatan was under one compact governmental authority, while the greater part of Guatemala was divided between the sovereignties of the Quiché and the Cakchiquel.

The Mayan peoples were remarkable above all other cultured American nations for their architecture, their calendar, and their hieroglyphic system. Of their architecture, as exemplified in the great ruins of Palenque, Uxmal, Mayapan, and Chichén-Itzá, with hundreds of lesser cities and isolated temples scattered through the tangled tropical forests, it is unnecessary to speak at length here. The material was usually a hard limestone, imbedded in firm mortar, well cut and exactly fitted, and lavishly carved on every part with mythical and historical figures and hieroglyphic inscriptions. Their hieroglyphic records and rituals were carved or painted upon the walls of their temples and palaces or written in books of folded sheets of maguey paper. The explanation of these hieroglyphs is one of the most important problems in American archæology. From the rounded outlines of the characters, somewhat resembling pebbles or skulls in shape, they have been described as calculiform. In spite of wholesale destruction by the Spanish missionaries and authorities, a few of these ancient sacred books still remain for study and interpretation, notably the Codex Troano, the Codex Peresianus, and the Dresden Codex, besides a number of others in the Maya language, but in Latin characters, compiled by natives of the Yucatan peninsula later than the Conquest, and usually grouped under the title of "Books of Chilan Balam." From these books our knowledge of the Maya past is chiefly derived. The Guiché of Guatemala have also their sacred book, the Popol Vuh, of which a translation has been made by the Abbé Brasseur de Bourbourg. The calendar system of the Maya, which was practically the same among the neighboring tribes of the same stock, was more elaborate and exact than that of the Aztec tribes. The year, beginning on July 16th, when the sun crossed the zenith, consisted of 365 days, divided into eighteen months of twenty days each, the days being grouped into weeks of five days each. At the end of the year there was an interval of five 'nameless days' before the beginning of the new year. The years were grouped into *katuns* of twenty years each, the completion of each successive *katun* being signalized by the placing of a commemorative inscribed stone in the wall of the principal temple of the city. Thirteen *katuns* made up an *ahau katun*, or great cycle of 260 years. There was also a lesser cycle of fifty-two years, similar to that of the Aztec and Tarasco.

Much attention has been given to the Maya languages, owing to the literary tendency, cultural superiority, and numerical strength of the people using them. Compared with other Indian languages they are comparatively simple in structure. The Maya itself forms one of the few American languages which have enough vitality not only to hold their own, but even to force themselves on European settlers and supplant their own speech. In Yucatan whole families of pure white blood are found who know no Spanish, using the Maya exclusively. The earliest Maya grammar is that of Father Villalpando, published about 1555. The first dictionary is also by him, published in 1571. There is also the Maya-Spanish Dictionary of Perez, 1877, with about 20,000 words, and the manuscript Dictionary of the Convent of Motúl, in three large quarto volumes, in the Carter Brown Library of Providence. The best synopses of Mayan culture and chronology are: Brinton, *Chronicles of the Mayas; id., Annals of the Cakchiquels;* id., *Essays of an Americanist.* See CHICHÉN-ITZÁ, CHILAN BALAM; KATUN; POPOL VUH.

MAY APPLE. A North American perennial herb. See MANDRAKE; PODOPHYLLUM.

MAYBACH, mī'bäG, ALBERT VON (1822—). A Prussian administrator, born in Werne, Westphalia. He early entered the governmental employ in the department of railroads, of which he became head in 1874, when he urged the control of all railroads by the Empire. The success of this measure and the defeat of the movement for private control in the early 80's was due largely to him. From 1882 to 1893 he was a member of the Prussian House of Deputies, and in 1891, after twelve years' service, resigned from the supervision of the railways of Alsace and Lorraine.

MAY BEETLE. See JUNE BUG.

MAY BIRD, or MAY COCK. The name of several birds which appear in May; especially, among American sportsmen, the knot (q.v.). In New England the black-bellied plover (q.v.) is locally called 'May cock,' but in Great Britain and the Southern United States a curlew is meant by this term.

MAY DANCE. The dance performed throughout England upon the first of May. The celebration of May Day with a dance is an old custom, being possibly of Swedish or Gothic origin, but more probably from Roman (its prototype being the Floralia) or Egyptian and Indian sources. In England the dance was a composite one, in which the morris dance (q.v.) played an important part. There was also a milkmaids' dance, and the characters of Robin Hood, Maid Marian, Scarlet, Little John, Tom the Piper, the Hobby Horse, the Lord and Lady of the May, all joined in the various dances which centred around the May pole. See MAY DAY.

MAY DAY (OF., Fr. *mai*, from Lat. *Maius;* connected with OLat. *majus*, great, Lat. *magnus*, Gk. *μέγας*, *megas*, Goth. *mikils*, great, Skt. *mah*, to be great). The name popularly given to the first day of May, which among the Germanic and Latin people has been associated from an early period with festal ceremonies religious in origin. It was the custom on this day to start before dawn, make excursions to the woods and fields, and return laden with green flowering boughs. It is plain that this festival, which was celebrated by all classes alike, represented the continuance of an ancient pagan ceremony; and there seems to be good reason for regarding it as a survival of rites originally offered to the Roman goddess Maia, who was evidently worshiped as the principle and cause of fertility. Although recorded testimony does not enable us to reconstruct the details of her ceremony, it is probable that one essential feature was a ritual marriage to a partner who represented the male element of growth, whence arose habitual acts of license, in no way repugnant to early moral sentiment, but which under a stricter ethical code gave occasion for scandal. Songs and dances, which were usual on similar occasions, and are reminiscent of the same spirit, have continued in popular use to our own day, as the familiar English game of children, "Here oats, peas, beans, and barley grows." The actual basis of May Day seems to have been the Roman Floralia, celebrated April 28, and instituted at Rome, in the year B.C. 241, on account of a bad harvest. Flora (q.v.), to whom the feast was consecrated, was likewise a fertility goddess, and it may be taken for granted that the elements of her rite were similar to customs which had previously been associated with Maia. Among observances of the Floralia are mentioned gay costumes, dramatic performances, and dances described as frequently indecent. In the mediæval May festival an important feature consisted in a nocturnal expedition to the forest, whence branches were brought and afterwards attached to doors. The bushes brought home were planted in the streets, and a lover might thus honor the residence of his mistress. Corresponding to this act of 'bringing in the May,' it was usual for the young men of the village to fetch from the wood a tree, the tallest and straightest which could be procured. This was stripped of its boughs, planted in the public green, decorated with garlands and ribands, painted with gay stripes, and became the centre of dances and games having for the most part an amatory character. The tree thus obtained, as well as the branches of individual celebrants, were called simply 'the May;' in England the white-flowering hawthorn, especially, received this title. A 'May-pole,' once introduced, might remain for many years, and annually be made the focus of popular amusements. With the season continued to be associated theatrical performances. These were frequently of a comic nature, and might be crowded with local jests and personal allusions often of a scurrilous sort, as may be seen from the pastoral of Adam de la Halle, *Le jeu de Robin et de Marion*, composed in the thirteenth century for use on such an occasion. In England the story of Robin Hood was connected with the May-games, and the personages of his cycle were introduced into the performances of costumed or masked actors, called 'Morris dancers.' In the Highlands of Scotland and Ireland the first of May received the name of Beltan (q.v.), and was originally, no doubt, an independent ceremony. Customs analogous to May Day are widespread. Among the Russians there is a spring festival, celebrated by the boys and girls with a choral dance called Khorovod. (See SLAVONIC MUSIC.) The European spring-tide feast seems to have come from the Orient, where orgiastic merriment was common in the spring. So in modern India the Holi festival is celebrated in March or April, with the singing of songs generally obscene, and with the sprinkling with red powder and water, or with filth. The naturalistic basis of the custom is joy at the creative impulses felt in the spring and manifested both in the vegetable and animal world. Hence comes the erotic character of the songs and dances, while the May-pole itself is probably phallic in origin. See PHALLICISM.

MAYEN, mī′en. A town in the Prussian Rhine Province, Germany, on the Nette, 15 miles west of Coblenz (Map: Prussia, B 3). It has a late Gothic church and a partly preserved castle of the Middle Ages. Cloth, tobacco, wool yarn, and leather are manufactured, and there is trade in millstones. Population, in 1900, 11,961.

MAYENCE. A town of Germany. See MAINZ.

MAYENNE, mȧ′ĕn′. A northwestern department of France, traversed by the River Mayenne, a tributary of the Loire (Map: France, F 3). It was formerly part of the Province of Maine. Area, 1996 square miles. Its surface is mostly level, becoming hilly toward the northeast. Its fertile soil produces grain, flax, hemp, and apples; there are deposits of coal, iron, marble, and slate. A large number of cattle and fine horses are reared. Population, in 1896, 321,187; in 1901, 313,103. Capital, Laval.

MAYENNE. The capital of an arrondissement in the Department of Mayenne, in the northwest of France (Map: France, F 3). It is pleasantly situated on the Mayenne, a tributary of the Loire. Its streets are steep, narrow, and winding. It has manufactures of iron, calico, and linen, and trades chiefly in horses and grain. Population, in 1901, 10,125.

MAYENNE, DUKE OF. See GUISE.

MAY′ER, ALFRED MARSHALL (1836-97). An American physicist. He was born at Baltimore and was educated at Saint Mary's College, Baltimore. In 1856 he was appointed professor of physics and chemistry in the University of Maryland, and subsequently held positions in the Westminster College in Missouri, in Pennsylvania State College, in Lehigh University, and in the Stevens Institute of Technology. In 1863 he went to Paris, where he spent two years in study and research, working under the famous physicist Regnault. He was for a time one of the editors of the *American Journal of Science*, and contributed a number of papers to its pages. In 1872 he was elected a member of the National Academy of Sciences. After assuming the professorship of physics at Stevens Institute (1871) he devoted himself to acoustics, in which field he performed many new and interesting experiments, and made some valuable discoveries. His most important work in acoustics, perhaps, was the determination of the law connecting the pitch of a sound with the duration of the residual sensation in the ear. To Professor Mayer is also due a method of determining the comparative intensity of sounds with the same pitch, and the location of the organs of hearing in the mosquito. He developed new methods for analyzing sound, and he made researches into the nature of electricity, besides being the first to give accurately the temperature correction for tuning-forks. An early paper on the *Thermodynamics of Waterfalls* (1869) aroused considerable interest, and one on the variation of the elasticity of metals with change of temperature showed the delicacy of Professor Mayer's experimental work. His last important research was an experimental investigation of the equilibrium of the forces acting in the flotation of disks and rings of metal and their application to measure surface tension. In addition to his scientific attainments, Professor Mayer was an enthusiastic sportsman and wrote *Sport with Gun and Rod in American Woods and Waters* (1883). Consult short biographical sketch in *Science*, August 20, 1897, by W. LeConte Stevens. Besides many contributions to scientific journals and encyclopædias, Professor Mayer was the author of *Lecture Notes on Physics* (1868); *The Earth a Great Magnet* (1872); *Light*, with Charles Barnard (1877); and *Sound* (1878).

MAYER, Brantz (1809-79). An American author, born in Baltimore, Md. After graduation at Saint Mary's College he traveled in the East, practiced law (1829-41), was secretary of the American Legation at Mexico (1843), and wrote his observations there in *Mexico as It Was and Is* (1844); *Mexico, Aztec, Spanish, and Republican* (1851); *Observations of Mexican History and Archæology* (1856); and *Mexican Antiquities* (1858); works that retain some value, especially for the period following the Spanish conquest. He wrote also *Captain Canot, or Twenty Years of an African Slaver* (1854), and other less important books. Mayer served as paymaster in the Civil War and was a founder of the Maryland Historical Society (1844). He died in Baltimore.

MAYER, Constant (1832—). An American painter, born at Besançon, France. He was a student at the Ecole des Beaux-Arts, and afterwards a pupil of Léon Cogniet. After 1857 he lived in New York City. His works include: "Love's Melancholy" (1867); "Maud Muller" (1867); "Street Melodies;" and the "Song of the Shirt." He also painted several portraits, including those of Generals Grant and Sheridan, the Empress Charlotte, and others.

MAYER, Frank Blackwell (1827—). An American portrait and genre painter, born in Baltimore. He studied under Alfred Miller in Baltimore and under Gleyre in Paris. Afterwards he settled in Annapolis, Md. His collection of drawings of the Dakota Indians has an archæological value. His works include: "Feast of Mondawmin" (1857); "Treaty of Traverse des Sioux, Minnesota" (1886); "The Continentals;" and "The Attic Philosopher," which won a medal at the Centennial Exhibition of 1876.

MAYER, mī′ẽr, Johann Tobias (1723-62). A German mathematician and astronomer, born at Marbach in Württemberg. He was self-educated and at first taught mathematics for a living. In 1746 he became connected with a cartographic establishment and gained fame for his improvements in map-making. In 1751 he was appointed to the chair of mathematics and astronomy in the University of Göttingen, and in 1754 director of the observatory, where for the remainder of his life he did much to advance the sciences of astronomy and navigation. His first published work was *A Treatise on Curves for the Construction of Geometrical Problems*, which was followed the same year (1745) by *A Mathematical Atlas*. At Göttingen he gave much labor to a *Zodiacal Catalogue*, which contains 998 stars and of which a newly computed edition was published by Auwers in 1894. His *Lunar Tables*, published in 1752-53, were so correct as to be adopted by the British Board of Admiralty. In 1760 he invented the repeating circle, which was afterwards used with so much success by Borda in measuring the arc of the meridian. His posthumous works include: *Theoria Lunar Juxta Systema Newtonianum* (1767); *Tabulæ Motuum Solis et Lunæ Novæ et Correctæ Quibus Accedit Methodus Longitudinum Promota* (1770); *Observations Astronomiæ Quadrante Murali Habitæ in Observatorio Gœttingensi* (2d ed. 1826). He left a large number of scientific memoirs, which were published by Lichtenberg in 1775.

MAYER, Julius Robert von (1814-78). A German physicist, born in Heilbronn, Württemberg. He attended the gymnasium at Heilbronn, studied medicine at Tübingen, and finished his university course at Munich and Paris. He made a voyage to Java in 1840, and while there made observations on the blood which led him to the investigation of the subject of animal heat, and finally to that of the conservation and correlation of forces. After his return to Heilbronn he practiced medicine there, but after a few years devoted himself almost exclusively to his scientific investigations. He published a preliminary notice of his work up to 1842, in Liebig's *Annalen der Chemie und Pharmacie*, under the title *Bemerkungen über die Kräfte der unbelebten Natur*, after it had been refused by Poggendorff's *Annalen* on account of its novel and revolutionary character. It was in this paper that the first announcement was made of the principle underlying the theory of the conservation of energy. In 1845 he made a fuller explanation of the subject in a memoir, under the title *Die organische Bewegung in ihrem Zusammenhange mit dem Stoffwechsel*. In 1848 he published *Beiträge zur Dynamik des Himmels*, and in 1851 the essay for which he is perhaps more generally known in popular science, that upon the mechanical equivalent of heat (*Bemerkungen über das mechanische Aequivalent der Wärme*), in which he developed and expanded the principles laid down in his former papers. To Mayer is due the first conception of the doctrine of the conservation of energy, though he was soon followed by Joule and Helmholtz (qq.v.) with investigations and papers on the same subjects. His collected works appeared under the title *Die Mechanik der Wärme*, 3d ed., by Weyrauch (1893). Consult: Weyrauch, *Robert Mayer* (Stuttgart, 1890); id., *Kleinere Schriften und Briefe von Robert Mayer* (ib., 1893); and Gross, *Robert Mayer und Hermann von Helmholtz* (Berlin, 1898).

MAY'ERS, William Frederick (1831-78). A Chinese scholar, born in Tasmania. Educated in Marseilles and proficient in modern languages, he was appointed at twenty-eight student-interpreter in China, and acted as Vice-Consul at Canton and Chefoo, becoming in 1872 Chinese secretary to the British Legation in Peking. He was a master of Chinese, Tibetan, and Korean. He published "The Lamaist Septem in Tibet," in the *Journal* of the Royal Asiatic Society (1869); *The Anglo-Chinese Calendar Manual* (1869); his masterpiece, *The Chinese Reader's Manual* (1874); *The Chinese Government, a Manual of Chinese Titles* (1878); and in collaboration with Dennys and King, *The Treaty Ports of*

China (1867). He procured for the British Museum one of the few extant copies of the great Imperial cyclopædia of Chinese literature in 5020 volumes.

MAYFAIR. One of the most fashionable sections of London. It lies east of Hyde Park, between Park Lane and Bond Street, and derives its name from a fair formerly held in the locality during May.

MAY′FIELD. A city and the county-seat of Graves County, Ky., 25 miles south of Paducah; on the Illinois Central Railroad (Map: Kentucky, C 4). It is the seat of West Kentucky College. It controls a large trade in tobacco, having large warehouses and a number of rehandling concerns; and there are flouring, planing, and woolen mills, tobacco and clothing factories, etc. Settled about 1820, Mayfield was incorporated some thirty years later. The government is administered under a charter of 1893, by a mayor, chosen every four years, and a unicameral council. Population, in 1890, 2909; in 1900, 4081.

MAYFISH. The most common of American killifish (*Fundulus majalis*). See KILLIFISH.

MAYFLOWER. See ARBUTUS, TRAILING.

MAYFLOWER, THE. A ship of 180 tons burden, hired to take the Pilgrims from Southampton, England, to the New World in 1620. Some had sailed from Delft Haven in the *Speedwell*, which started with the *Mayflower*, but put back after several days. The *Mayflower* arrived at Plymouth December 11th, or 21st, New Style (anniversary celebrated December 22d).

MAYFLOWER DESCENDANTS, SOCIETY OF. A patriotic hereditary society, organized in New York City on December 22, 1894. It admits to membership any lineal descendant of any passenger of the voyage of the *Mayflower* which terminated at Plymouth Rock, Mass., in December, 1620, including all signers of the Compact. The badge of the society is a round medallion of gold with a representation of the *Mayflower* in relief surrounded by a wreath composed of the blossoms of the mayflower connected at the bottom by a scroll on which is the legend "1620, Plymouth, 1897." There are many State societies, from which representatives meet triennially, usually in Plymouth, Mass., at the general society, which was organized on January 12, 1897. A general register was published in 1901, showing nearly 2000 members, and the various State societies have issued books containing historical information.

MAY FLY. An insect of the order Ephemerida, sometimes also called 'shad-fly' and 'day-fly,' the latter, like the scientific name, derived from the ephemeral life of the adult. They have short antennæ, very large fore wings, very small hind wings, absolutely trophied mouth-parts, and two or three long, slender filaments at the end of the abdomen. The transformations are complete, and the early stages are passed in the water. The larvæ are active, possess long and strong legs, and breathe by means of tracheal gills. They are found under stones in running streams or swimming among water plants in quiet waters, or they may live at the bottom, more or less covered with slime or mud; some forms also burrow into the sand banks of rivers. They both swim and crawl, and they feed largely upon vegetable matter. The pupa or nymph is also active and feeds. It has small wing-pads, and when ready to transform it floats at the surface of the water and the subimago issues through the skin of the thorax. The emergence is very rapid, and the subimago flies away almost immediately after the skin cracks. The existence of a subimago stage is peculiar to this order of insects, and there is a subsequent molt after the subimago reaches the shore, the true imago issuing from the skin of the subimago. The May flies differ from all other insects not only in this additional transformation, but also in possessing paired sexual organs which open to the exterior by separate orifices. The life of the adult insect is very short, but the popular idea that they live but a day is erroneous. Curtis kept one alive three weeks. Most species couple during flight, and egg-laying is usually performed in fresh water, where the egg clusters disintegrate and the eggs sink to the beds of the rivers and streams. The larval life lasts from one to three years, and the larvæ form a favorite food for many food-fishes. The adults are also eagerly sought for by fish, and many of the artificial flies, especially those forms known as 'duns,' 'drakes,' and 'spinners' (see FLY-CASTING), are imitations of May flies. About 300 species have been described—85 from temperate North America. They are strongly attracted to light and fly in enormous numbers, so that they sometimes half fill the globes of electric street lamps with their bodies in a single evening, and greatly trouble lighthouse keepers, especially along the Great Lakes, by swarming about the lantern in such crowds as to obscure the light.

MAYHEM (archaic form of *maim*, from OF. *mahaigner*, *mehaigner*, to maim). At common law, the offense of so maiming another, or doing such violence to his members, as to render him the less able in fighting either to defend himself or to annoy his adversary. It rendered the wrongdoer liable to a civil action for damages by the injured person and also to a criminal prosecution as "an atrocious breach of the King's peace, and as tending to deprive him of the aid and assistance of his subjects." Destroying or disabling an arm or leg, hand or foot, putting out an eye, or breaking a front tooth, was a mayhem.

MAYHEW, mā′hū, AUGUSTUS SEPTIMUS (1826-75). An English journalist and author, born in London. He wrote in collaboration with his brother Henry such works as *The Greatest Plague of Life, or the Adventures of a Lady in Search of a Good Servant* (1847, illustrated by George Cruikshank), and he joined H. S. Edwards in the production of such farces as *The Goose and the Golden Eggs* (Strand Theatre, 1859); *Christmas Boxes* (Strand, 1860); and *The Four Cousins* (Globe Theatre, 1871). From 1848 to 1850 he edited *The Comic Almanac*, to which he had been a contributor since 1845, and his individual productions include *Paved with Gold, or the Romance and Reality of the London Streets* (1857), and *Faces for Fortunes* (3 vols., 1865).

MAYHEW, EXPERIENCE (1673-1758). A New England divine. He was born in Martha's Vineyard, Mass., the oldest son of Rev. John Mayhew, and great-grandson of Gov. Thomas Mayhew. He began to preach to the Indians at the age of twenty-one, and had the oversight of five or six Indian assemblies, which he continued for sixty-four years. Having thoroughly mastered the Indian language, which he had learned in infancy, he was employed by the Society for the Propagation of the Gospel in New England to make a new version of the Psalms and of the Gospel of John, which he did in 1709 in parallel columns of English and Indian. He published *Indian Converts* (1727), comprising the lives of thirty Indian preachers and eighty other converts, besides a volume entitled *Grace Defended.* Consult Hallock, *The Venerable Mayhew and the Aboriginal Indians of Martha's Vineyard,* condensed from Rev. E. Mayhew's *History of Indian Converts* and brought down to date (New York, 1874).—His son, Jonathan, was distinguished as a preacher and patriot (see Mayhew, Jonathan).—Another son, Zachariah, was missionary to the Martha's Vineyand Indians from 1767 to his death, March 6, 1806.

MAYHEW, Henry (1812-87). An English author, son of a London attorney. From Westminster School he ran away to sea, making a voyage to Calcutta. On his return he was articled to his father for three years. In conjunction with Gilbert à Beckett, he started the *Figaro in London,* a comic weekly (1831-39), and *The Thief* (1832), 'a paste and scissors' journal, and was one of the founders of *Punch* (1841). He made a hit with *The Wandering Minstrel,* a one-act farce (1834), which was followed by *But However* (1838), written in conjunction with Henry Baylis. Along with his brother Augustus (1826-75), he wrote several clever fictions, as *The Greatest Plague of Life* (1847); *The Good Genius that Turned Everything to Gold,* a fairy tale (1847); *Whom to Marry* (1848); and *Living for Appearances* (1855). His most important work was a series of articles in collaboration with John Binny, written to make known the actual condition of the lower classes in London. Originally appearing in the *Morning Chronicle,* they were collected in 1851 under the title *London Labour and the London Poor.* In 1856 the series was continued in monthly numbers with the title *The Great World of London* (completed and published in 1862 as *Criminal Prisons of London*).—His brother Horace (1816-72) was also a well-known humorist. He wrote farces and tales and was for a time subeditor of *Punch.*

MAYHEW, Jonathan (1720-66). An American clergyman, born on the island of Martha's Vineyard, Mass. He graduated at Harvard in 1744, studied theology, and from 1744 until his death was pastor of the West Church (Congregational), Boston. He became one of the best known preachers in New England and his influence on the political views and theories of the colonists in the pre-Revolutionary period was probably greater than that of any other clergyman. Dr. Mayhew was an ardent believer in the rights of the American colonies, and expressed his views with great boldness from his pulpit. In January, 1750, he preached a sermon on the execution of Charles I., in which he declared that all allegiance was limited by certain inalienable rights that could not be abrogated by the sovereign without giving a corresponding right of abrogation to the subject. His fearlessness led to his being bitterly attacked by the Tories, who charged him, without warrant, with being the instigator of the Boston Stamp Act riots that resulted in the sacking of Governor Hutchinson's house. In May, 1766, he preached a Thanksgiving sermon for the repeal of the Stamp Act that was a remarkable plea for civil and religious liberty. Later in the same year and only a short time before his death he wrote to James Otis a letter which probably contains the earliest suggestion of a union of all the colonies. The subsequent institution of committees of correspondence undoubtedly had its inception in Dr. Mayhew's plan. His sermons were published separately in pamphlet form and in collections. Among them were: *Seven Sermons* (1749); *Discourse Concerning Unlimited Submission and Non-Resistance to the Higher Powers* (1750); *Sermons* (1756); and *Sermons to Young Men* (1767). Consult Bradford, *Memoir of the Life and Writings of the Rev. Jonathan Mayhew* (Boston, 1838).

MAYHEW, Thomas (1592-1682). An American colonial Governor. He was born in England and was a merchant in Southampton before he emigrated to America in 1631. He settled in Watertown in 1636, obtained in 1641 from the agent of Lord Sterling a grant of Martha's Vineyard and the neighboring islands, and in 1642 became both patentee and Governor of the granted district. His son Thomas having been called to the ministry at Edgartown, Governor Mayhew encouraged his work, both by his advice and by inducing the Indian sachems to govern their people according to the English laws. After his son's death, Mayhew continued the ministrations, and organized an Indian church. For forty years while he lived among them the English and Indians were at peace. He died in Martha's Vineyard in March, 1682.

MAY LAWS. The name applied to a series of laws enacted by the Prussian Diet in May, 1873, marking the opening of the conflict between Church and State generally known as the Kulturkampf (q.v.).

MAYNA, mī′nȧ, or **MAINA.** A group of tribes constituting a distinct linguistic stock, upon the Upper Marañon (Amazon) between the Santiago and Pastaza rivers on the Peru-Ecuador frontier. Their language is particularly harsh and difficult. A part were gathered in missions during the eighteenth century, but the majority are still wild and unsubdued, living by hunting and fishing. The name is also frequently used collectively to include all the tribes of the Ucayali and Huallaga region, the former Peruvian Province of Maynas.

MAY′NARD, Edward (1813-91). An American dental surgeon and inventor, born at Madison, N. Y., of Puritan ancestry. He entered the United States Military Academy at West Point in 1831, but his delicate constitution caused him to resign and take up the profession of dentistry, a calling which he followed more or less from 1836 to 1890, in the city of Washington, D. C. In 1846 he made known his discovery of the great diversity of situation, form, and capacity of the maxillary antra. He also exploited the existence of dental febriles and demonstrated that sensitive dentine could be cut with less suffering to the patient by operating in certain directions than in the opposite ones; a fact subsequently demonstrated by the microscope. In 1838 he introduced the method of filling the nerve cavity of teeth with gold foil, including the nerve canals in molar and bicuspid teeth; and seven years later introduced the system into Europe. He became a member of the faculty of the Baltimore College of Dental Surgery, and of the National University of Washington. His first important mechanical invention in the construction of firearms dates from 1845, in which year he patented a system of priming for firearms, which practically superseded the percussion cap. (See SMALL ARMS.) The United States Government bought the right of use and manufactured nearly 50,000 rifles employing the new principle of ignition. Germany and one or two other European powers also adopted his inventions in part. In 1851 he patented a breechloading rifle, afterwards known as the Maynard rifle, and five years afterwards adapted it to the use of the metallic cartridge, also an invention of his. In 1860 he patented a method of converting muzzle-loaders into breech-loaders. Other important inventions in firearms were a method of joining together two rifle or shot barrels, which permitted the expansion or contraction of one barrel independently of the other (1868); an invention invaluable to sportsmen, and a mechanism for indicating at any time the number of cartridges in the magazine of a repeating rifle (1886). He was granted the Great Medal of Merit of Sweden and was appointed chevalier of the military order of the Red Eagle of Russia.

MAYNARD, GEORGE WILLOUGHBY (1843—). An American portrait and figure painter, born in Washington, D. C. He was a pupil of the Royal Academy at Antwerp, and in 1878 opened a studio in Paris; later he settled in New York City. He was elected member of the National Academy of Design in 1885, and is also member of the Society of American Artists and of the American Water-Color Society. In 1884 he received a medal at the Pennsylvania Academy. Maynard was one of the early painters to devote himself to decorative painting, and his work may be seen in private houses and hotels of New York City, in the Congressional Library at Washington, D. C., and in the Appellate Court of New York City. Among his works are: "Vespers at Antwerp" and "1776," sent to the Centennial Exhibition of 1876; "Water Carriers of Venice" (1878); "Musical Memories;" "Venetian Court;" "An Ancient Mariner" (1883); "Aurora;" "Old and Rare;" and "Strange Gods;" also portraits of Frank Millet and of his father, and a portrait of a child.

MAYNARD, HORACE (1814-82). An American politician, born in Westboro, Mass. He graduated at Amherst College in 1838, and shortly afterwards removed to Knoxville, Tenn., where for some years he was a tutor and then professor of mathematics and natural history in the East Tennessee College. In 1845 he became a lawyer, and in 1857 was elected by the 'Americans' to Congress, where he continued to sit until 1863. Like Andrew Johnson, W. G. Brownlow, and others, Maynard strove hard but unsuccessfully to keep Tennessee in the Union, and because of his loyalty suffered loss of property and exile. He was again a Representative in Congress from 1866 to 1875, was Minister to Russia from 1875 to 1880, and was Postmaster-General in President Hayes's Cabinet from August, 1880, to March, 1881.

MAYNARD, Sir JOHN (1602-90). An English constitutional lawyer. He was born at Tavistock, England, and was educated at Exeter College, Oxford. After the regular course of study in the Middle Temple he was called to the bar in 1626; he had been elected a member of Parliament in the previous year. He was subsequently made a sergeant-at-law and King's sergeant, but declined the place on the bench offered him by Charles II. in 1660. While an advocate for increasing the power of the people, he never concurred in the extreme views taken by the radical republicans, and, although an earnest Presbyterian, stood aloof from the fanaticism of many in his party. He was active in the prosecution of Strafford and Laud, but opposed the arbitrary power assumed by the army, and Cromwell's evident intention of making himself King in fact, if not in name; for the position he took in this respect he was twice imprisoned in the Tower of London by order of the Protector. At the Restoration, the honor of knighthood was conferred upon him by Charles II.; his political course under that monarch was judicious and conservative. In the time of the revolution and the accession of William and Mary, he showed ability, notably in the great conference held between the House of Lords and the Commons in regard to the abdication of James II., a measure which he strenuously advocated. In the same year, 1689, he was made a commissioner of the Great Seal. A number of his political speeches and legal decisions have been printed in various collections. His manuscript collections in eighty-seven volumes are preserved in Lincoln's Inn Library. He died at Gunnersbury Manor.

MAYNE, JASPER (1604-72). An English dramatist and divine, educated at Westminster School, and at Christ Church, Oxford (B.A. 1628; M.A. 1631). While at the university he wrote considerable occasional verse. To him has been ascribed the beautiful eulogy signed I. M. S. prefixed to the second folio of Shakespeare's works (1632). He afterwards wrote verses in honor of Ben Jonson and Beaumont and Fletcher. His two plays are the *City Match*, a comedy (printed 1639), and *The Amorous War* (printed 1648), a tragi-comedy, containing the quaint lyric beginning "Time is a feathered thing" (reprinted in *The Oxford Book of English Verse*, A. T. Quiller-Couch, Oxford, 1900). In 1638 he began a translation of Lucian's *Dialogues* (printed 1664), afterwards completed by Francis Hicks; and for Donne's *Paradoxes* (1652), he translated several Latin epigrams. During the civil war he lived mostly at Oxford, where he frequently preached before the King. After the Restoration he was appointed a canon of Christ Church, and Archdeacon of Chichester. He died at Oxford, December 6, 1672.

MAY'NOOTH. A village of Kildare, Ireland, a short distance west of Dublin, having a population of less than a thousand. It was the seat of the Geraldines, the ruins of whose castle remain. It was of importance in the rebellions of the Irish in the reign of Henry VIII., and in the time of the civil wars and the Commonwealth. It is chiefly known now as the site of the Roman Catholic College of Saint Patrick. There have been 600 students in attendance, all candidates for the priesthood, and more than half supported by funds for that purpose.

MAYO, mā′ō. A maritime county of the Province of Connaught, Ireland, bounded north and west by the Atlantic Ocean, east by Sligo and Roscommon, and south by Galway (Map: Ireland, B 3). Area, 2126 square miles. The coastline of Mayo is about 250 miles long. The surface is very irregular, the interior being a plain bordered by two ranges of mountains. The chief branch of industry is cattle-raising. Fisheries and linen manufactures are also carried on. The capital is Castlebar. Population, in 1841, 389,-260; in 1901, 202,630.

MAYO, mä′yō. A tribe of Piman stock (q.v.) upon the river of the same name in Southern Sonora, Mexico. They and the Yaqui (q.v.), their northern neighbors and allies, speak dialects of the same language, and in physical characteristics and habit are identical. They are agricultural and very industrious, cultivating corn, cotton, squashes, beans, tobacco, and maguey, from which last they manufacture mescal. They also work as miners, teamsters, and the like. Their houses are light structures of cane and boughs, covered with palm leaves. They are now very much Mexicanized and number perhaps 7000.

MAYO, mā′ō, AMORY DWIGHT (1823—). An American clergyman and educator. He was born in Warwick, Franklin County, Mass.; educated at Amherst College; studied theology with the Rev. Hosea Ballou. He was pastor of a Universalist church in Gloucester, Mass., in Cleveland, Ohio, in Albany, N. Y., and later of Unitarian churches in Cincinnati, Ohio, and in Springfield, Mass.; afterwards he engaged in educational work in the South. For several years he was professor of ecclesiastical polity in the Meadville (Pa.) Theological School. He edited the *Massachusetts Journal of Education* and engaged besides in general labors throughout the country to stimulate popular interest in the school system. Among his works are: *The Balance: or Moral Arguments for Universalism* (1846); *Graces and Powers of the Christian Life* (1852); *Symbols of the Capitol: or Civilization in New York* (1859); *Southern Women in the Recent Educational Movement in the South* (1892); and *Talks with Teachers* (1885).

MAYO, FRANK (1839-96). An American actor, doubtless best known for his long-continued popularity in the backwoods character of Davy Crockett, which somewhat obscured his more legitimate laurels. He was born in Boston. Early in life he went to San Francisco, where at seventeen he began his career, and within a few years was appearing with the young Edwin Booth. In 1863 he became a leading man in San Francisco and in 1865 in Boston. He won applause in Othello, Hamlet, Ferdinand in *The Tempest*, and other classic rôles, but greater success with the public as Badger in *The Streets of New York*, till in 1872 he brought out *Davy Crockett*. Among his later productions were his own dramatizations of *Nordeck* and of Mark Twain's *Pudd'nhead Wilson*, the latter a character well suited to display his peculiar gifts as a comedian.

MAYO, RICHARD SOUTHWELL BOURKE, sixth Earl of (1822-72). An English statesman. He was born in Dublin, Ireland, was educated at Trinity College there, afterwards traveled in Russia, and published an account of his trip, entitled *In Saint Petersburg and Moscow* (2 vols., 1846). From 1847 to 1869 he was a member of Parliament, and in 1852, 1858, and 1866 was appointed Chief Secretary for Ireland. In January, 1869, by Disraeli's appointment, he became Governor-General of India, in which capacity he introduced extensive and careful reforms in the conduct of the public service, and was an efficient and successful administrator. While inspecting the penal settlement at Port Blair, Andeman Islands, he was killed by one of the convicts. Consult Hunter, *Life of the Earl of Mayo* (London, 1875).

MAYO, WILLIAM STARBUCK (1812-95). An American novelist and traveler. He graduated from the New York College of Physicians and Surgeons (1833), traveled widely in little explored regions, and first won notice in fiction by *Kaloolah* (1849), a romance of Central Africa. This was followed by *The Berber*, a story of the mountaineers of the Atlas (1850); *Romance Dust from an Historic Placer*, a collection of short stories (1851); and *Never Again* (1873). Mayo's novels are strong in narration, good in plot, weak in character.

MAYÓN, mȧ-yōn′, or ALBAY. An active volcano and the highest peak in Luzon, Philippine Islands. It is situated in the Province of Albay, near the southeastern extremity of the island (Map: Philippine Islands, H 6). It is a majestic cone, rising from the seashore to a height of 8274 feet, and capped by a white cloud of smoke which in the night assumes a fiery glow. Its sides are covered with grass and moss, and though apparently smooth and unobstructed, the mountain is very difficult of ascent. There have been a number of eruptions during the past century, in which the mountain emitted great quantities of lava, cinders, and incandescent rocks, on more than one occasion destroying an entire town.

MAYOR (from Lat. *major*, greater, comparative of *magnus*, great). The chief executive officer of a municipal corporation. In England the mayor was originally a steward, bailiff, or overseer. Later he became the chief magistrate of a corporate town. During the reign of John the right of formally choosing their mayor was conceded to the barons of London, the election being subject to the approval of the King. During the same reign the other large towns of England were given mayors. The mayors of the cities of York, Dublin, and London bear the title of 'lord mayor.' The lord mayor of London, whose jurisdiction extends only to the ancient inner city, is chosen annually from among the aldermen, practically by the liverymen of the guilds. His chief duty is to sustain the hospitality of the city, for which purpose he receives an allowance of £8000 a year, together with the use of the mansion house. The ordinary English mayor is elected by the municipal council, usually from among the aldermen, for a term of one year. He is an *ex-officio* justice of the peace and usually serves as a returning officer. In France there is a mayor (*maire*) at the head of each commune, elected by the municipal council from among its own members. He serves during the term of the council. In the Germanic countries the mayor or burgomaster is usually a highly trained professional officer with more or less experience in the municipal service, and is frequently called to the headship of a larger muncipality after having gained a reputation as mayor of a smaller town. He is elected by the city council for a long term, often for life. The prevailing method of selecting mayors in the larger countries of Europe is election by the municipal council. In Belgium, Denmark, Holland, Norway and Sweden, and in Italy, so far as the larger towns are concerned, the method of appointment is by the central government.

In the United States the office of mayor existed from the earliest colonial times, being taken over as a part of the English municipal system. At first the mayor was usually appointed by the Governor, and was generally a member of the municipal council. Later he was excluded from the council and then came to be chosen by the council, although occasionally, as in the city of Boston, he was elected by popular vote from the beginning. This is now the rule in the United States almost without exception. The term of the mayor in the United States varies from one year to five, the usual term being two years. Everywhere in Europe the mayor acts as the local agent of the central government and consequently is often subject to disciplinary control by the central government. Thus the French mayor may be suspended by the prefect for one month, by the Minister of the Interior for three months, and may be permanently removed by the President; a somewhat similar rule prevails in other Continental States. In several American States the mayor may be removed by the Governor for cause, subject to the power of the courts to determine what shall constitute just cause in a given case. Besides his duty as agent of the central government the mayor is the official head of the municipal corporation. His powers are much larger in some countries than in others. In the United States there is a marked tendency of late years toward increasing the power of this officer and making him chiefly responsible for the good government of the city. See sections *Local Government* in the various countries mentioned. See also MUNICIPALITY.

MAY′OR, JOHN EYETON BICKERSTETH (1825—). An English classical philologist, born at Baddagama, Ceylon. He graduated from Saint John's College, Cambridge, and was appointed fellow in 1849; from 1849 to 1853 he was assistant master at Marlborough College. In the latter year he was appointed college lecturer, and since 1872 has been professor of Latin in the university. He also held the office of librarian of the university from 1863 to 1867. Professor Mayor is best known as editor of *Thirteen Satires of Juvenal* (2 vols., 4th ed., London, 1881). He has also edited some of Cicero's works, Homer's *Odyssey*, books ix.-xii., and is the author of many other works relating to the classics, the history of education, and the Church. He was formerly one of the editors of the *Journal of Philology* and of the *Classical Review*.

MAYOR, JOSEPH BICKERSTETH (1828—). An English classical scholar. He was educated at Rugby and at Saint John's College, Cambridge. From 1863 to 1868 he was head master of Kingston Proprietary School, and in 1870 became professor of classics in King's College, London. This post he resigned in 1879. Mayor had married in 1863 a niece of the historian George Grote, and became his literary executor, editing his posthumous essays on philosophy. His other works include an edition of Cicero, *De Natura Deorum* (1880-85); a valuable bibliography entitled *A Guide to the Choice of Classical Books* (1880-96); *Chapters on English Metre* (2d ed. 1901); and editions of the *Epistle of Saint James* (2d ed. 1892) and of Clement of Alexandria, *Stromateis, Book VII.* (based on Hort's notes, 1902). He edited the *Classical Review* (1887-93).

MAYORGA, mȧ-yôr′gȧ, MARTIN DE (c.1715-83). A viceroy of Mexico. In 1773 he was appointed Governor of Central America. In 1779, on the death of Bucareli, he was made Viceroy of Mexico. While he was in power there broke out an epidemic of smallpox, to arrest which he made great exertions. He founded an academy of arts in Mexico, and sent to the royal archives of Spain for publication copies of the manuscripts of the historian Veytia. His attitude toward foreign encroachment was vigorously defensive.

MAYOR OF THE PALACE. See MAJOR DOMUS.

MAYORUNA, mä′yȯ-rōō′nȧ. A fierce and savage tribe of Panoan stock (q.v.) living south of the Marañon (Amazon), between the Ucayali and Javari rivers, Northeastern Peru. They are supposed to have lived formerly farther to the west and to have been driven into the forest by the Inca conquest. From the frequency of beards and light skins among them, traditionally due to admixture of Spanish captive blood, they are sometimes called *Barbados* (bearded) by the Spaniards. They live by hunting and keep to the forests, seldom coming down to the rivers, being at war both with all the other tribes and with the whites. Their weapons are spears, clubs, and blowpipes, and they are famous for their powerful blowgun poison. They are tall and well formed, go perfectly naked, and cut their hair across the forehead, letting it fall loosely down behind.

MAYO-SMITH, RICHMOND (1854-1901). An American economist and educator, born in Troy, Ohio. He graduated at Amherst in 1875, and after two years at Berlin and Heidelberg became assistant professor of economics at Columbia. In 1880 he began to teach in the graduate school of political science, where he devoted himself especially to statistics, a form of investigation in which he was an acknowledged authority. He was an editor of the *Political Science Quarterly*, vice-president of the American Statistical Association, and one of the founders of the American Economic Association. His publications include: *Emigration and Immigration* (1890); *Sociology and Statistics* (1895); and *Statistics and Economics* (1899).

MAYOTTA, mȧ-yŏt′tȧ. One of the Comoro Islands (q.v.).

MAYOW, mā′ȯ, or **MAYO,** JOHN (1643-79). An English scientist and philosopher, born in Cornwall. He studied law and medicine at Oxford, and practiced medicine at Bath, but devoted himself specially to research in chemistry and physiology, and is chiefly known for his ingenious speculations concerning the process of combustion, in which he anticipated, to some extent, the ideas which have since been induced from the discoveries of Priestley, Lavoisier, and others. His principal publication is *De Sale Nitro et Spiritu Nitri Aëreo* (1674). His work in anatomy and physiology, especially on the subject of muscular action and on respiration, is scarcely less important. His *Opera Omnia Medica Physica* appeared in 1681.

MAYOYAO, mä'yô-yä'ô. A head-hunting Malay people in Central Luzon, speaking Ifugao. See Philippine Islands.

MAYPOP. The fruit of a Passion flower (q.v.).

MAYR, mīr, Georg von (1841—). A German statistician and economist, born in Würzburg. He studied at Munich, where he became professor in 1868; he was appointed in 1879 under secretary to the Ministry for Alsace-Lorraine; he was retired in 1887, and became docent (1891) and professor (1895) in the University of Strassburg. In 1898 he was called to Munich. He founded the *Zeitschrift des bayrischen statistischen Bureaus* (1869) and *Das allgemeine statistische Archiv* (1887); and wrote: *Die Gesetzmässigkeit im Gesellschaftsleben* (1877); *Zur Reichsfinanz-reform* (1893); *Statistik und Gesellschaftslehre* (1895-97); *Die Pflicht im Wirtschaftsleben* (1900); *Flotte und Finanzen* (1900); *Grundriss zu Vorlesungen über praktische Nationalökonomie* (1900 sq.); and *Zolltariffentwurf und Wissenschaft* (1901.)

MAYR, or **MAYER**, Johann Simon (1763-1845). A German-Italian dramatic composer, born at Mendorf, Bavaria. His father was a musician, and the boy studied under him and at a Jesuit seminary at Ingolstadt, and later under Lenzi at Bergamo, Italy, where he settled permanently. In 1791 an oratorio, *Jacob a Labano Fugiens*, was so successful that he was commissioned to write three more, and in 1794 he produced his first opera, *Saffo, ossia i riti d'Apollo Leucadio*. During the next twenty years he wrote about seventy operas, which were only surpassed in popular favor by those of Rossini. In 1802 he became chapel-master at Santa Maria Maggiore in Bergamo, and while there refused the offers of posts at London, Paris, Dresden, and Milan. He was also professor of composition in the music school of Bergamo, and Donizetti was one of his pupils. His best operas were: *Lodoïska* (1795); *Ginevra di Scozia* (1801); *Media* (1812); and *Rosa bianca e Rosa rosso* (1814). He was blind for a number of years before his death, which occurred at Bergamo. In 1852 a monument was erected to his memory in that city.

MAY SUCKER. A fish. See Cutlips.

MAYS'VILLE. A city and the county-seat of Mason County, Ky., 64 miles southeast of Cincinnati; on the Ohio River, and on the Chesapeake and Ohio and the Louisville and Nashville railroads (Map: Kentucky, H 2). It has the Maysville and Mason County Public Library, incorporated in 1878, and Odd Fellows and Masonic temples. There are important commercial interests, the city being the centre of a fine agricultural country, and its industries are represented by cotton mills, flour, saw, and planing mills, foundries, distilleries, cigar, chewing tobacco, furniture, and shoe factories, and plow and pulley works. The government is administered under a charter, revised in 1894, which provides for a mayor, elected every four years, and a unicameral council. Settled as early as 1784, Maysville was incorporated as a town by the Virginia Legislature in 1787, and was chartered as a city in 1833, becoming a fourth-class city sixty years later. In 1848 it was made the county-seat. Population, in 1890, 5358; in 1900, 6423.

MAYWEED (older Eng. *maiweed*, variant of *maytheweed*; influenced by popular etymology with *May*, the fifth month), Dog Fennel (*Anthemis Cotula*). A common roadside plant of the order Compositæ, growing also in pastures and meadows. It is a native of Europe, but, although widely spread in America, it is not an aggressive weed. The flower has somewhat the appearance of chamomile, and is sometimes called stinking chamomile.

MAZADE, må'zäd', Charles de (1820-93). A French publicist, born at Castel-Sarrazin (Tarn-et-Garonne). He studied law at Toulouse, and afterwards became a contributor to the French periodicals. After writing for the *Presse* and the *Revue de Paris*, he became one of the editors of the *Revue des Deux Mondes*, and from 1852 to 1858, and again from 1865 until his death directed its department of politics. His publications include: *L'Espagne moderne* (1855); *L'Italie moderne* (1860); *La Pologne contemporaine* (1863); *L'Italie et les Italiens* (1864); *Lamartine, sa vie littéraire et politique* (1872); *La guerre de France* (1875); *Le comte de Cavour* (1877); and he edited the *Correspondance du maréchal Davout* (1887).

MAZAGAN, må'zå-gän'. A seaport of Morocco, Africa, situated on the Atlantic coast, about 110 miles north of the city of Morocco, of which it is the port (Map: Africa, D 1). It is strongly fortified, and is the centre of a brisk trade in agricultural products, fruit, and wool. The trade for 1900 exceeded $3,000,000, and the shipping was over 300,000 tons. The settlement was founded by the Portuguese in 1509. The population is estimated at 6000, including a number of European merchants and consular agents.

MAZAMET, må'zå'må'. A town in the Department of Tarn, France, situated about 50 miles east-southeast of Toulouse (Map: France, J 8). It is noted for its extensive manufactures of cloth, flannel, and leather. Population, in 1901, 13,978.

MAZANDERAN, mä'zän-de-rän'. A northern province of Persia, south of the Caspian Sea, bounded respectively east, south, and west by Astrabad, Irak-Ajami, and the Elburz Mountains and Gilan (Map: Persia, D 3). It is about 200 miles long by 50 miles broad, with an estimated area of 10,000 square miles. The surface sinks from the elevated wooded ranges of the southern Elburz to an extensive level along the sea, and is watered by numerous streams. The climate is malarial. The chief minerals are iron ore and petroleum and its by-products. The ground in many parts is swampy, but fertile, and rice, cotton, sugar-cane, fruit-trees, and the mulberry for the silk industry are largely cultivated. Fishing is an important industry, as also is grazing, horses, cattle, sheep and goats, being raised in great numbers. There is a considerable export trade with Russia of silk, caviare, and agricultural products, the imports being cotton and woolen goods, cutlery, and tobacco. Population, estimated at 300,000. Capital, Sari.

MAZANDERANI, mä′zân-de-rä′nė. The natives of Mazanderan, or Taberistan, in Northern Persia, on the Caspian Sea. They speak a dialect of Persian which, like the speech of the neighboring Province of Ghilan, has peculiarities justifying its classification as a special form of the Persian tongue. The Mazanderani are of smaller stature than the people of the highlands, well-proportioned, with regular features, bushy eyebrows, and abundant hair.

MAZARIN, mȧ′zȧ′răɴ′, Jules (1602-61). A Cardinal and Prime Minister of France during the minority of Louis XIV. He was born July 14, 1602, at Piscina, in the Abruzzi, Italy, his father being intendant of the household of Philip Colonna. He was educated in the Jesuit College at Rome, and later accompanied Jerome Colonna to the Spanish University of Alcalá, where he studied law, but also indulged in gambling and love-making—practices which were continued at Salamanca. On returning to Rome, Mazarin became a doctor of canon and civil law, and entered the Pope's military service as a captain of infantry in the Colonna regiment. His talents, however, were more diplomatic than military, and after being employed on several political missions in Italy he accompanied the Papal legate to the Court of France, and there, about 1628, became known to Richelieu, who perceived his peculiar talents and engaged him to maintain the French interests in Italy. This he did while still employed by the Pope as vice-legate to Avignon (1632) and nuncio to the French Court, an office to which he was appointed in 1634. The Spaniards complained of his partiality for France, and the Pope was obliged to recall him. In 1639, however, he openly entered the service of Louis XIII., was naturalized a Frenchman, and in 1641 received a cardinal's hat, through the influence of Richelieu, who, when dying, recommended Mazarin to the King as the only person capable of carrying on his political system. Mazarin's position was one of great difficulty amid the intrigues, jealousies, and strifes of the earlier years of Louis XIV.'s minority. The Queen mother, Anne of Austria, was at first hostile to him, but although she was declared sole regent and guardian of the young King, Mazarin kept his place as Minister, and soon made himself indispensable to her by his wonderful business qualities, while the exquisite charm of his manner eventually gained her heart. It is said, in fact, that a secret marriage took place between the Queen Regent and her Prime Minister, but this has never been absolutely proved. The result of the close alliance between the Queen and himself was that Mazarin ruled with almost as unlimited sway as Richelieu had done. The Parlement of Paris, thinking to conquer political power, resisted the registration of edicts of taxation; but Mazarin caused the leaders of the opposition to be arrested, upon which began the disturbances of the Fronde (q.v.). Twice compelled to retire from Court, he made a triumphant entry into the capital in 1653, and in a short time had regained his former power.

In the internal government of the country those principles of despotism were established on which Louis XIV. afterwards acted. Mazarin continued Richelieu's foreign policy, waging war vigorously against the Hapsburg power in Austria and Spain; his most important diplomatic acts were in connection with the Peace of Westphalia in 1648, and that of the Pyrenees in 1659. The administration of justice in France under Mazarin became very corrupt, and the commerce and finances of the country underwent a great depression. As a financier Mazarin was far inferior to Richelieu. He was avaricious, and enriched himself at the expense of the country. He died at Vincennes, March 9, 1661. His magnificent library he bequeathed to the Collège Mazarin at Paris. The best idea of Mazarin is obtained from his correspondence, published by Chéruel, "Lettres du cardinal Mazarin pendant son ministère," in the *Collection de documents inédits sur l'histoire de France*, first series (Paris, 1872-94). Consult, also: Mason, *Mazarin* (London, 1886); Cousin, *Jeunesse de Mazarin* (Paris, 1865); Perkins, *France Under Mazarin* (New York, 1894); Chéruel, *Histoire de France sous le ministère de Mazarin, 1651-1661* (Paris, 1882).

MAZAR-I-SHERIF, mȧ-zär′-ê-she-rēf′. A fortified town of Afghan Turkestan, situated about 20 miles southeast of Balkh (Map: Afghanistan, K 3). It manufactures swords and other weapons, and attracts many pilgrims on account of the tomb of the Prophet Ali, which it contains. In the vicinity are mineral springs. Population, estimated at 25,000

MAZARRÓN, mȧ′thär-rôn′. A town of Southeastern Spain, in the Province of Murcia, situated 2½ miles from the Mediterranean coast, 16 miles west of Cartagena (Map: Spain, E 4). In the neighboring mountains are mines of iron and argentiferous lead, and the town contains several metallurgical establishments, besides soap factories and flour mills. A railroad five miles long connects it with its port in the small Bay of Mazarrón, where there is a good roadstead and a lighthouse. At this port is located one of the largest and best lead-smelting establishments of Spain, capable of producing 125 tons of lead daily. There is also considerable trade in lead and ores, machinery, coal, and timber. Population, in 1887, 16,445; in 1900, 23,362.

MAZAS, mȧ′zȧ′, Prison of. A prison in Paris in which the first trial of solitary confinement was made in France. It was built between 1845 and 1850 to replace the prison of La Force, and contained 1200 cells arranged in six converging galleries. It stood on the Boulevard Mazas (now the Boulevard Diderot), and was officially known as *Maison d'arrêt cellulaire*. The building was demolished in 1900.

MAZATEC, mä′zȧ-tĕk′. A Zapotecan tribe occupying the districts of Teotitlan and Cuicatlan, in Northeastern Oaxaca, Mexico. They are agricultural and are noted silk-raisers, weaving gorgeous fabrics of that material, and having many curious beliefs and tabus in connection with the tending of the silkworms.

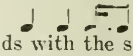
MAZATLAN, mä′sȧ-tlän′. A seaport in the State of Sinaloa, Mexico, situated at the entrance of the Gulf of California (Map: Mexico, F 6). It is a well-built and picturesque town, and has a handsome city hall, a nautical school, and two hospitals. A street railroad runs through the town, which is lighted by gas. The harbor is the best on the Pacific coast, and has direct steamship communication with San Francisco and other towns along the coast. The chief exports are silver, pearls, copper, lead, dyewoods, and skins. Population, 13,000. In 1903 the bubonic plague made its appearance at the port. Great excitement prevailed, and many deaths resulted.

MAZDAK, mäz′dȧk (470-?). A Persian reformer, who founded a religious and social sect that existed for a time and were known as Mazdakites, after his name. He was born at Persepolis, and belonged originally to the Magian faith, being a priest at Nishapur. He became imbued with communistic and reformatory views and preached the doctrine not alone of the equality of mankind, but the community of property, including women, and the consequent abolition of marriage laws. Simplicity in manner of life and dress, and abstinence from animal food, except milk and eggs, were enjoined. He succeeded in converting to his faith King Kavadh, or Kobad (A.D. 488-531); but a revolution of the nobles, urged on doubtless also by the jealous Magian clergy, resulted in dethroning the King and placed Jamasp, his brother, on the throne (A.D. 497). Three years later Kobad was restored to power, and for political purposes he outwardly recanted his Mazdakite views. Toward the end of his reign, suspecting State intrigues by the Mazdakites, he allowed Mazdak and thousands of his followers to be put to death. Traces of the sect lingered on in the neighborhood of Hamadan as late as the Seljukid era.

MAZE, mȧz, HIPPOLYTE (1839-91). A French historian and politician, born at Arras. He entered the Ecole Normale Supérieure in 1859, became a fellow in history in 1863, and taught at the lycées of Cahors, Saint-Quentin, Angers, and Versailles. He was appointed a prefect in 1870. The next year, however, he returned to teaching, and became first professor of history at the Lycée Fontanes in Paris. He was elected to the Chamber of Deputies in 1879 as a Republican and reëlected in 1881. From 1886 until his death he was Senator from Seine-et-Oise. Among his publications are: *La république des Etats-Unis d'Amérique, sa fondation* (1869); *Hoche en Vendée* (1882); and *La lutte contre la misère* (1883).

MAZEP′PA, IVAN STEFANOVITCH (1640-1709). A leader of the Cossacks, born in the Russian Government of Kiev, of a noble family. He became a page in the service of John Casimir, King of Poland. A Polish nobleman surprised him in an intrigue with his wife, bound him naked on his own horse, and lashed the animal out into the steppes. The horse carried him to his own distant residence—not to the Ukraine, as has been often said; but Mazeppa, out of shame, fled to the Ukraine, joined the Cossacks, rose to high distinction among them, overthrew their hetman, Samilovitch, and in 1687 was elected in his place. He won the confidence of Peter the Great, who loaded him with honors and made him Prince of the Ukraine; but on the curtailment of the freedom of the Cossacks by Russia, Mazeppa, hoping to achieve complete independence, entered into negotiations with Charles XII. of Sweden, joined him with a considerable band, and took part in the battle of Poltova, in 1709, after which he fled to Bender, and there died in the same year. His story has been widely treated in painting, poetry, the novel, and the drama, notably by Byron in his poem *Mazeppa*.

MAŽURANIĆ, mä′zhōō-rä′nĭch, IVAN (1814-90). A Croatian poet and statesman, born in Novi. He studied at Fiume and Agram, and practiced law for several years. He took an active part in promoting the national spirit of the Croats, and wrote the influential manifesto *Hrvati Magjarom* ('The Croats to the Magyars') (1848). He was made procurator-general of Croatia and Slavonia in 1850. Afterwards he became first Chancellor of Croatia and Slavonia (1861), and from 1873 to 1880 was Ban, or Governor, of Croatia. Mažuranić is one of the most representative as well as the greatest of Croatian poets. His poems first appeared in the *Danica ilirska* ('The Star of Illyria') in 1835. His masterpiece is the epic poem on the death of Ismaíl Čengić, *Smrt Smail-age Čengića* (1846).

MAZURKA, mȧ-zōōr′kȧ (Pol., Mazur dance, so named from the Mazurs, a branch of the Polish nation inhabiting Masovia, in Russian Poland, and a district in East Prussia). A national Polish dance in triple time and moderate tempo. Its principal rhythm is  Frequently the musical phrase ends with the second beat, so that the third becomes an up beat to the next bar. The history of the mazurka goes back to the sixteenth century, when it was a song accompanied by a dance. Augustus III. (1733-63) introduced it into Germany, and from that country it spread to France and, about 1845, to England. The Russian mazurka differs from its original prototype in that it may be danced by any number of people, while the Polish mazurka is generally performed by either four or eight couples. The steps and even the figures are frequently varied. Chopin revolutionized the mazurka. He extended its form and introduced characteristic Polish melodies, leaving practically only the intense character.

MAZZARA DEL VALLO, mȧt-sä′rȧ dĕl väl′lȯ. A city in the Province of Trapani, Sicily, 13 miles by rail from Marsala, on the Mediterranean (Map: Italy, G 10). A massive wall 36 feet high encircles the city, which has many interesting ruins. Its cathedral and castle, dating from the Norman period, and the archiepiscopal palace are the most attractive buildings. The inhabitants of the neighboring region are engaged in agriculture, and an important trade is carried on in barley, corn, olive oil, fruit, cotton, and wine. Mazzara del Vallo, the ancient *Mazara*, was settled by colonists from Selinus, and figured prominently in the early history of the island. Population, in 1901 (commune), 20,130.

MAZZARINO, mät′sȧ-rē′nȯ. A town in the Province of Caltanissetta, Sicily, situated about 35 miles east of Girgenti (Map: Italy, J 10). It has an old castle and sulphur springs in the vicinity. Its products consist of fruit, vegetables, and wine. Population, in 1901 (commune), 16,355.

MAZZEI, mȧt-sä′ē, PHILIP (1730-1816). An Italian physician, author, and traveler, a native of Tuscany. In December, 1773, he went to Virginia for the purpose of introducing grape and olive culture in that colony. There he became acquainted with Thomas Jefferson, and later, after his return to Italy, corresponded with him. From 1779 to 1783 he was the official agent of Virginia in Italy for the purchase of arms, ammunition, and supplies, and in 1785 he revisited America. The correspondence between him and Jefferson was renewed after this second visit, and in April, 1796, Jefferson wrote to him the famous 'Mazzei letter.' In it he bitterly attacked the Federalist leaders (including, by implication, Washington) for their 'monarchistic' tendencies, and declared that democracy was being betrayed by "men who were Samsons in the field and Solomons in the council, but who have had their heads shorn by this harlot, England." The letter was translated into Italian and published in an Italian paper, translated into French and published in the *Moniteur* at Paris, where it was seen by an American by whom it was translated into English, and sent to the United States, where it appeared in print in May, 1797, soon after Jefferson's inauguration as Vice-President. Its publication raised a furor among the Federalists, who, in their feeling against Jefferson, even suggested his impeachment. Mazzei subsequently became a privy councilor to the King of Poland, and later in life was pensioned by the Czar of Russia. He wrote *Recherches historiques et politiques sur les Etats-Unis de l'Amérique septentrionale* (1788).

MAZZINI, mät-sē'nē, GIUSEPPE (1808-72). An Italian patriot prominently connected with the struggle for Italian unity and the republican movement throughout Europe. He was born in Genoa, June 28, 1808, studied at the University of Genoa, and practiced law in his native city. In 1827 his first essay in literature, "Dell' amor patrio di Dante," appeared in the Liberal journal *Il Subalpino*; and he subsequently contributed critical, literary, and political papers to the *Antologia* of Florence and the *Indicatore Genovese*. In the pages of the latter originally appeared the essay subsequently republished under the title of *Scritti d'un Italiano vivente*. In 1830 Mazzini joined the Carbonari (q.v.) and at once became an active and influential member. He was soon arrested, detained for six months in the fortress of Savona, and finally liberated on condition of his departure from Italy. After short residences in several places, he made his home in Marseilles, and thence addressed to Charles Albert of Sardinia the famous letter which caused him to be condemned to perpetual banishment. Having become convinced that the Carbonari was not efficient for the work of Italian regeneration, Mazzini now undertook the organization of a new liberal league, Young Italy (1831). This organization sought to secure the overthrow of all existing Italian governments and the union of the peninsula under a republican government. In addition to its paramount aim, the general principles of this association enforced the obligation to labor for a common moral regeneration and the establishment of political equality over the world. Liberty, equality, and humanity were the watchwords of the body; education and insurrection the great agencies of its operations; assassination was erased from its statutes, and the symbolic dagger of the Carbonari was replaced by the more humane emblems of a book and the cypress. The white, red, and green tricolor flag of the society became that of the new Italian nation. Mazzini was the animating spirit of this league, which was the parent of similar associations adapted to the individual requirement of the various European nationalities. In 1834 Mazzini planned an armed invasion of Savoy from Switzerland, and on February 1st an attack was made on some customhouse officials at the frontier of Savoy; but the undertaking failed utterly. In 1837 Mazzini quitted Switzerland for England, and took up his residence in London. There he maintained incessant activity in literary propaganda, and was in touch with political agitators of his own country, Poland, and other countries. He wrote much for various periodicals, on literary subjects, communism, education, music, etc. After the February Revolution of 1848 Mazzini went to Milan, where he was a resolute opponent of the proposed annexation of the smaller Italian States to Sardinia. He retired to Switzerland on the capitulation of Milan to the Austrians, only to reappear in Florence on the rising in Tuscany. He became a member of the Provisional Government, and when, almost simultaneously, Rome was proclaimed a republic, he was sent there as a Deputy, and was elected triumvir. On the taking of Rome by the French troops under Oudinot, he went to Switzerland and thence returned to London. He bitterly attacked the course of France in public letters to De Tocqueville and others. At his instigation, as president of the Italian National Committee, risings in Milan (1853) and in Genoa (1857) were attempted. In 1859, while lending the whole weight of his influence to the revolutionary movements going on in Italy, he combated the threatened French intervention. He assisted in organizing Garibaldi's expeditions of 1860, 1862, and 1867. Though repeatedly elected by Messina to the Italian Parliament, Mazzini refused to take his seat under a monarchical government. In 1866 the Italian Government abrogated the sentence of death under which Mazzini had been living for many years, but he refused to accept a "pardon for having loved Italy beyond all earthly things." In 1868 he fell into a dangerous illness, from the effects of which his health never recovered, though his zeal remained as ardent as ever. After an ineffective scheme for a republican rising in Sicily in 1870, Mazzini ventured to enter Italy, and was arrested at Gaeta, where he remained a prisoner till Rome was occupied by the Italian army. On his death, at Pisa, March 10, 1872, the Italian Government accorded him a public funeral. Of the value of Mazzini's services to the cause of Italian independence there are widely differing opinions. Republicanism was a cardinal principle with him, to which he adhered with inflexible tenacity, never being willing to yield his personal conviction to the actual necessities of Italy as did Manin, Garibaldi, and Crispi. Hence he antagonized the Sardinian monarchy, and obstructed the work of Cavour. His impassioned writings often led less noble spirits into deeds that he would not at all approve. Mazzini possessed in the highest degree that personal fascination by which friends are converted into ardent partisans. In his private life he was a model of purity and frugal simplicity, as in his public career he was conspicuous for disinterestedness and self-abnegation.

A comprehensive edition of Mazzini's works, in eighteen volumes, *Scritti edite ed inedite*, appeared in Milan, 1861-91. Editions of his letters were published at Milan in 1875, at Rome in 1885, and at Turin in 1888. Consult:

Nardi, *Giuseppe Mazzini, la vita, gli scritti e le sue dottrine* (Milan, 1872); Count Schack, *Mazzini und die italienische Einheit* (Stuttgart, 1891); Simoni, *Histoire des conspirations mazziniennes* (Paris, 1870); Mario, *Mazzini nella sua vita e nel suo apostolato* (Milan, 1891); Bouiller, *Un roi et un conspirateur—Victor Emanuel et Mazzini* (Paris, 1885); Saffi, *Il pensiero politico e sociale de Giuseppe Mazzini* (Rome, 1887); E. A. V. (Mme. Ashurst-Venturi), *Memoir of Joseph Mazzini*, with two essays (London, 1877); Linton, *Recollections of Mazzini and His Friends* (London, 1892). See Cavour; Garibaldi; Italy.

MAZZOLINI, mȧt′sō-lē′nē, Lodovico (1479-1528). An Italian painter, born at Ferrara, whose real name was Mazzuoli, though Vasari calls him Malino. He studied at Bologna under Lorenzo Costa. His best pictures are small in size and of a fresh, exquisite coloring, and he has been considered the finest painter of the Ferrarese School. "Christ with the Doctors" (1524) in the Berlin Gallery is considered his masterpiece, and there are pictures by him in many of the great European museums.

MAZZONI, mȧt-sō′nē, Guido (?-1518). An Italian sculptor, born at Modena and called *Il Modanino.* After the capture of Naples by Charles VIII. in 1494, he went to France and stayed there for about twenty years. Many of his works have been destroyed; those that remain, notably that of a group round the Sepulchre, which is in the Church of Monte Oliveto at Naples, show uncommon technique and a realistic treatment not usual in that age. Other works by him are in the Church of San Giovanni Decollato and the Duomo at Modena; their material is terra-cotta.

MAZZONI, Guido (1859—). An Italian poet and critic, born at Florence. He studied at Pisa and Bologna, was made professor of Italian language and literature at the University of Padua in 1887, and occupied the same position at the Florence Institute from 1894. Like many of the younger Italian poets, he was at first a disciple of Carducci, but afterwards his expression became more individual. His criticism is marked by a pure, elegant style and an evident knowledge of foreign literatures. His works include: *Meleagro da Gadara* (1880); *Esperimenti metrici* (1882); *In Biblioteca* (1882-86); *Poesie* (1883); *Nuove poesie* (1886); *Rassegne litterarie* (1887); *Tra libri e carte* (1887); *Poesie* (1891); *Voci della vita* (1893); and *Il teatro della rivoluzione, La vita di Molière e altri scritti di letteratura francese* (1894).

MAZZUCHELLI, mȧt′so͞o-kĕl′lē, Giovanni Maria, Count (1707-65). An Italian writer on science and literature. He studied jurisprudence, then turned to scientific research. In 1737 he published his *Notizie storiche e critiche interno alla vita e agli scritti d'Archimede.* His principal work was the compilation of a great cyclopædia of Italian literature and science from the beginnings of Italian civilization. *Scrittori d'Italia, cioè notizie storiche e critiche intorno alle vite e agli scrittori de' letterati italiani.* This task he did not live to complete. He also wrote biographies of Scipio Capece and Giusto de' Conti; and he edited Villani's series of biographies of illustrious Florentines.

MAZZUOLA, mȧt′so͞o-ō′lȧ, Francesco. See Parmigiano.

MEAD (AS. *medu*, OHG. *metu*, *mito*, Ger. *Meth;* connected with Ir. *meadh*, Welsh *medd*, mead, OChurch Slav. *medŭ*, Lith. *medus*, Lett. *maddus*, honey, Gk. *μέθυ*, *methy*, mead, Av. *madu*, wine, Skt. *madhu*, honey, sweet). A fermented liquor made from honey. The honey is mixed with water, and fermentation is induced and conducted in the usual manner. Mead has been in use from very ancient times, and was known equally to the nations of Southern Europe and the barbarous tribes of more northern regions. Pliny says it has all the bad qualities of wine, but not the good ones. The Latin name is *hydromeli.*

MEAD, mēd, Edwin Doak (1849—). An American author and editor, born in Chesterfield, N. H. In 1866 he entered the employ of Ticknor & Fields, the Boston publishers. From 1875 until 1879 he studied at Oxford, Cambridge, and Leipzig, and upon his return to America began to lecture on American literature and politics. In 1883 he became director of the Old South Historical Work, and in 1890 succeeded Edward Everett Hale as editor of the *New England Magazine.* His publications include *The Philosophy of Carlyle* (1881), and *Martin Luther: A Study of the Reformation* (1884).

MEAD, or **MEDE**, Joseph (1586-1638). A Church of England theologian. He was born at Berden, Essex. While a boy at school at Wethersfield he accidentally picked up a copy of Bellarmine's Hebrew grammar, and soon acquired a good knowledge of the language. He graduated at Christ Church, Cambridge, in 1610. In 1613 he was made a fellow of his college, and reader of the Greek lectures on Sir Walter Mildmay's foundation, which office he occupied till his death. He was learned in mathematics, medicine, and various branches of natural science, history, antiquities, and the literature and sciences of the East. His chief work was *Clavis Apocalyptica* (1627), translated into English in 1643, which has been called the first rational attempt to interpret the Apocalypse. His complete works were published at London, 1648-52; new edition with life, 1672.

MEAD, Larkin Goldsmith (1835—). An American sculptor. He was born at Chesterfield, N. H., and in the earlier part of his life resided at Brattleboro, Vt. He studied under Henry K. Brown, of Brooklyn, N. Y. His earliest work in marble was called "The Recording Angel." In 1857 he modeled the colossal statue "Vermont," which now crowns the dome of the State House at Montpelier. "Ethan Allen" adorns the same building. During the Civil War he was for six months an artist for *Harper's Weekly*, contributing numerous spirited sketches. In 1862 he went to Italy, and has since then resided chiefly at Florence. There he executed a number of statuettes, such as "Echo," "La Contadinella," "Sappho," "Mountain Boy," and an elaborate group, "The Returned Soldier" (1866). His other works include the Lincoln monument at Springfield, Ill.; the soldiers' monument at Saint Johnsbury, Vt.; "Columbus's Last Appeal to Isabella;" the statue of Ethan Allen (1874) in the National Statuary Hall at Washington; and the group, "The Return of Proserpine from the Realms of Pluto," in the pediment of the main entrance of the agricultural building at the Columbian Exposition at Chicago. He subsequently executed a large group of the Stanford family for the Stanford University, California. His work is characterized by fine decorative feeling and by a skillful accentuation of light and shade.

MEAD, Richard (1673-1754). An English physician. He was born at Stepney, and at an early age entered the university at Utrecht. After three years' study he went to Leyden, where he entered upon the study of medicine under the noted Professors Pitcairne and Hermann. Having taken his degree of doctor of philosophy and physics, he returned to Stepney and began the practice of his profession in 1696. In 1703 Dr. Mead was made a member of the Royal Society, and a lecturer at Saint Thomas's Hospital. His reputation both as a practitioner and as a writer on medical subjects was very great, and he was in constant correspondence with the most eminent scientists of the day in his own and foreign countries. He received the appointment of physician-in-ordinary to George II., and in 1716 was elected a fellow of the College of Physicians. In addition to his acquirements as a physician, Dr. Mead devoted much time to the study of natural history, antiquarianism, and numismatics. He was an intimate friend of Bentley, Pope, and Johnson. His works were first published in Latin, and subsequently translated into English, French, and Italian. They include *A Mechanical Account of Poisons* (1702) and *Monita et Præcepta Medica* (1751).

MEADE, George Gordon (1815-72). An American soldier, born of American parentage at Cadiz, Spain, December 31, 1815. He attended school in Philadelphia, Washington, and Baltimore; graduated at West Point in 1835, and served in the Seminole War. In October, 1836, he resigned from the army, adopted the profession of civil engineer, and between 1837 and 1842 was employed as an assistant engineer in the surveys made by the United States Government of the delta of the Mississippi, the Texas boundary, and the northeastern boundary of the United States. In 1842 he was reappointed to the army as a second lieutenant in the corps of topographical engineers. On the breaking out of the war with Mexico, when General Taylor crossed the Rio Grande, he was ordered to the front, and served with distinction throughout the war. Later he was employed in superintending river and harbor improvements, and in the construction of lighthouses on Delaware Bay and off the coast of Florida. He was promoted to be first lieutenant in 1851 and captain in 1856, and had charge of the national survey of the northern lakes until 1861. At the outbreak of the Civil War he was ordered to Washington; was commissioned brigadier-general of volunteers August 31, 1861, and was placed in command of the second brigade of the Pennsylvania reserve corps. He was in the action at Dranesville, Va., December 20th; was at Mechanicsville, June 26, 1862, and at the battle of Gaines's Mill on the following day; and served with his reserves throughout the Peninsular campaign, being severely wounded, June 30th, at the battle of Frazier's Farm. On August 29-30, having recovered from his wound, he was engaged in the second battle of Bull Run; and in September took command of a division of the First Army Corps. At the battle of Antietam he was slightly wounded and had two horses shot under him. In recognition of his gallantry in this battle he was given command of the Fifth Army Corps, and on November 29, 1862, was commissioned major-general of volunteers. He was engaged in the battles of Fredericksburg and Chancellorsville, covering the retreat at Chancellorsville with his corps and guarding the crossings until the entire army was safely over the Rappahannock. On June 28, 1863, he was unexpectedly ordered to succeed General Hooker in the command of the Army of the Potomac. The main army of the Confederates, under General Lee, had invaded Pennsylvania, and it devolved upon Meade to arrest this movement and drive back the enemy. Portions of Lee's army had reached York, Carlisle, and the Susquehanna; but upon the advance of the Federal army these were called in. On July 1st the hostile armies met at Gettysburg, and a three days' battle ensued, which resulted in the utter discomfiture of Lee, who, however, was not pursued with any vigor. (See Gettysburg, Battle of.) For this victory Meade was publicly thanked by a resolution of Congress, passed January 28, 1866. From May 4, 1864, to April 9, 1865, General Meade commanded the Army of the Potomac, under General Grant, through the bloody struggle in the Wilderness, and until the surrender of Lee. On August 18, 1864, he was commissioned a major-general in the United States Army. At the close of the war he was placed in command of the Military Division of the Atlantic, which command he retained from July 1, 1865, to August 6, 1866. During the years 1866-67 he was in command of the Department of the East, and subsequently of the third military district of the South (under the reconstruction laws). From March, 1869, until his death, he was again in command of the Military Division of the Atlantic. He died on November 6, 1872. Citizens of Philadelphia presented him with a house, and after his death a fund of $100,000 was collected by subscription and presented to his family. Consult: Bache, *Life of General G. G. Meade* (Philadelphia, 1897); and Pennypacker, *General Meade* (New York, 1901), in the "Great Commanders Series."

MEADE, Richard Worsam (1837-97). An American naval officer, born in New York City. He entered the navy as midshipman in 1850; became navigating officer of the *Cumberland* in 1856; coöperated with General Sherman as commander of a division of the squadron off Helena, Ark., in breaking up guerrilla warfare on the Mississippi River in 1862-63; commanded the marines in New York City during the draft riots there in July, 1863; and subsequently served with distinction in the South Atlantic and West Gulf blockading squadrons. After the close of the war until 1868 he acted as head of the department of seamanship and naval tactics at the United States Naval Academy. He then served for a time in Alaska, and from 1871 to 1873, in command of the *Narragansett*, cruised in the Pacific. After his return he acted as president of the board appointed to revise the ordnance instructions of the navy. He was promoted to be captain in March, 1880, and to be commander in May, 1892. He was naval commissioner of the Government to the World's Columbian Exposition at Chicago, and succeeded Admiral Stanton in command of the North Atlantic squadron in 1894. In the same year he was promoted to be rear-admiral, but a disagreement between him and the Navy Department led to his retirement at his own request in May, 1895.

MEADE, William (1789-1862). Protestant Episcopal Bishop of Virginia. He was born near Millwood, Va.; was graduated at Princeton in 1808, studied theology, and was ordained priest in 1814; was assistant clergyman in his native parish at Millwood; from 1811, pastor of Christ Church, Alexandria, D. C., for eighteen months, and afterwards rector at Millwood. In 1829 he was appointed Assistant Bishop and in 1841 Bishop of Virginia. He contributed liberally to the foundation of the Diocesan Theological Seminary at Alexandria. He was an active member of the American Colonization Society, and was one of the founders of the Evangelical Knowledge Society (1847). In 1861 he labored to prevent the secession of Virginia, but acquiesced when that action was finally determined upon. His principal literary productions are: *Lectures on Family Prayers* (1834); *Letters on the Duty of Affording Religious Instruction to Those in Bondage* (1834); *Companion to the Font and the Pulpit* (1846); *Lectures on the Pastoral Office* (1849); *Reasons for Loving the Episcopal Church* (1857); *Old Churches, Ministers, and Families of Virginia* (1857); and *The Bible and the Classics* (1861). A memorial of Bishop Meade was published by the Rev. Dr. John Johns (Baltimore, 1857).

MEADOW (AS. *mæd*, OFries. *mede*, meadow, OHG. *mata-screch*, grasshopper, Ger. *Matte*, meadow; probably connected with OHG. *mæn*, Ger. *mähen*, AS. *māwan*, Eng. *mow*, Lat. *metere*, Gk. ἀμαν, *aman*, to reap, OIr. *meithel*, party of reapers). A tract of low, level land, especially upon the margin of a stream, in which the dominant plant forms are grasses. Prairies (q.v.) may be considered as extensive meadows. Some writers hold that meadows are the product of artificial conditions; others that they are natural formations. It seems scarcely to be doubted that alpine meadows are natural, either because trees fail to obtain a foothold on account of snow-slides or because the snow remains long in such situations, and grasses take possession during the short summer if there is sufficient soil moisture. Along streams, meadows are probably due to continued grazing or mowing, because tree vegetation may be kept down by such agencies. On the other hand, they are extremely unfavorable for the development of trees, which might fail to develop even in a region specially favorable to tree growth, since seeds would germinate with difficulty. Hence a meadow may perpetuate itself naturally, even though originally artificial. Besides the grasses, other plants are found in meadows, among which are many species of vernal herbs, which mature before mowing time arrives. Some botanists, as Wettstein, believe that plants have acquired certain habits which adapt them to life in meadows that are annually mowed.

From an agricultural standpoint a meadow is either a lowland or an upland field upon which hay or pasture grasses grow from self-sown or hand-sown seed. They are also permanent or temporary as well as natural and artificial. When the grasses are fed down by stock, meadows are called pastures. For artificial meadows the soil is plowed deeply and brought to the very best condition before the seed is sown. A rich, clean soil of fine tilth adds greatly to the weight of the crop. Frequently grass seed is sown with small grain as a nurse crop, but the practice is not always successful, since the faster growing cereal deprives the young grasses of light, and they consequently fail. The best method is to sow the grass seed broadcast without a nurse crop. Timothy, red-top, fescue-grass, orchard-grass, oat-grass, rye-grass, blue grass, bent-grass, and many other grasses are very commonly grown either as mixtures or alone. Timothy is often grown as a single crop. Clover is frequently added to a grass mixture. When a mixture is grown for hay, grasses which bloom about the same time are selected, but when used for pasture species that ripen at different times are preferred. Mowing machines and other implements have quite revolutionized haymaking within the last fifty years, and have enabled the farmer to make use of more extensive meadows than when all the work was done by hand. See also Hay and Pastures.

MEADOW FESCUE. See Fescue.

MEADOW FOXTAIL. A valuable fodder grass. See Foxtail Grass.

MEADOW GRASS. A name applied to many of the numerous species of the genus Poa, which are chiefly natives of the temperate and colder parts of the world, and form a very important part of the herbage of pastures and meadows. Most of the species are slender and of delicate appearance, tender, nutritious, and rather abundant. The rough-stalked meadow grass (*Poa trivialis*) and the blue grass or smooth-stalked meadow grass (*Poa pratensis*) are among the most common, and are esteemed among the most valuable for sowing in mixtures of grasses for pasture. The Abyssinian meadow grass (*Poa Abyssinica*), an annual species, yields immense returns of herbage in its native country. Its seeds are used as grain for making bread. Beer is made by putting slices of this bread into warm water, the temperature of which is kept up in a closed vessel for some days. *Poa annua* is a common species, frequently found as a weed in cultivated grounds, but it is employed with advantage for sowing on lawns in towns, and wherever from any cause perennial grasses are apt to be destroyed. It is often to be seen in flower, and is said to ripen its seeds in four or five weeks from the time of sowing. It is very abundant in most parts of Europe. The name is sometimes given to species of Alopecurus, which are more commonly known as foxtail grass (q.v.).

MEADOW-LARK. A North American starling-like bird frequenting meadows and open places. Few American song birds are more general favorites. This is not a lark at all, but belongs to the family Icteridæ, and is therefore a near relative of the bobolink, oriole, and blackbird. The genus (Sturnella) contains only one well-marked species, the common meadow-lark (*Sturnella magna*) of the Eastern United States, but there are several subspecies which, though they may not differ much in color, exhibit marked peculiarities in habit and song. The common meadow-lark ranges in summer from New Brunswick to the Gulf of Mexico, east of the Mississippi, and even in winter only retreats as far south as Southern New England and Illinois. The Western meadow-lark (variety *neglecta*) occupies the western half of the continent and extends southward into Western Mexico, while other subspecies occur in Cuba and Mexico. Meadow-larks are somewhat less than a foot in length, with large feet and a long, straight, sharp bill. The feathers of the upper surface are prevailingly black, with rufous and buff borders and tips, so that the whole upper surface is variegated with those three colors. The throat, breast, and anterior half of the belly are bright yellow, with a prominent black crescent about the middle of the breast. The tail feathers are narrow and short, and when the bird takes to the wing the white outer ones become very conspicuous. The Western meadow-lark has lighter upper parts, more perfect, less confluent bars on the tail feathers, and the sides, as well as the front, of the throat are yellow. The notes of the meadow-lark are clear and strong—a sort of cheerful whistle—but Chapman says that they differ in different localities, so that the notes of the Florida birds are markedly different from those heard in the Northern States. The notes of the Western meadow-lark are famous for their musical quality. The contrast between its brilliant song and that of the Eastern form, added to other peculiar traits, convince many students of the full specific rank of the Western bird. Consult on this point Coues, *Birds of the Northwest* (Washington, 1874).

Meadow-larks feed upon both seeds and insects, which they obtain upon the ground in the open meadows and fields. In summer they are not gregarious, though several pairs may be seen in neighboring fields; but in winter they are often found in swamps in some numbers. The nest is built upon the ground, and is composed of grasses, so arranged as to arch over at the top and make a more or less completely covered shelter. The eggs (see Colored Plate of Eggs of Song Birds) are four to six in number, large for the size of the bird, white, marked chiefly at the larger end with bright brown. Although not a game bird, meadow-larks are frequently hunted, both for sport and food, but they are not especially desirable for the table, and the shooting of them is nearly everywhere illegal. See Plate of Larks and Starlings.

MEADOW MOUSE. The American name for the short-tailed wild mice of the genus *Microtus* of the class called 'vales' in Europe. The commonest species is the widespread *Microtus Pennsylvanicus*, called in the older books *Arvicola riparia*. Many other species and subspecies are catalogued. See Mouse.

MEADOW MUSSEL, or Horse Mussel. See Mussel.

MEADOW SAFFRON. A European plant. See Colchicum.

MEADOW SNIPE. A gunner's name for snipe frequenting grassy places, especially Wilson's and the jack snipe. (See Snipe.) The marsh-hens and corn-crake are often called meadow crake or drake, meadow clapper, etc., by sportsmen.

MEADOW-SWEET. A plant. See Spiræa.

MEAD′VILLE. A city and the county-seat of Crawford County, Pa., 105 miles north of Pittsburg; on French Creek, and on the Erie and the Pittsburg, Bessemer and Lake Erie railroads (Map: Pennsylvania, A 2). It is the seat of Allegheny College (Methodist Episcopal), established in 1815, and of the Meadville Theological School (Unitarian), opened in 1844, and has four schools of music, two city hospitals, and a public library. Among the prominent structures are the courthouse, academy of music, First Methodist Episcopal Church, and Lafayette Block. Other noteworthy features are Huidekoper, Diamond, and Oakwood parks, three iron bridges, and the fair grounds and race track. Meadville is in a fertile agricultural valley, and its industries are represented by railroad shops of the Erie, the Phœnix iron works, malleable iron works, vise works, planing mills, silk mills, breweries, a distillery, chocolate chip works, etc. The city is also an important market, and a shipping point for the oil regions. The government is administered, under a charter of 1889, by a mayor, chosen every three years, and a bicameral council, which elects the solicitor, civil engineer, and city clerk, and confirms the executive's appointments to a number of minor offices, the treasurer, controller, and assessors being elected by the people. The city owns and operates the water-works and electric light plant. Settled in 1788, Meadville became a borough in 1823 and was chartered as a city in 1866. Population, in 1890, 9520; in 1900, 10,291.

MEAFORD, mē′fẽrd. A lakeport town of Grey County, Ontario, Canada, on Nottawasaga Bay, the south inlet of Georgian Bay, Lake Huron, 20 miles west-northwest of Collingwood (Map: Ontario, C 3). It has a fine harbor, factories, and several mills. Population, in 1891, 2000; in 1901, 1916.

MEAGHER, mä′hẽr, Thomas Francis (1823-67). An Irish-American soldier. He was born in Waterford, Ireland, and was educated at the Jesuit College of Clongowes Wood, and at Stonyhurst College, Lancashire, England. On the outbreak of the French Revolution of 1848 he was sent to Paris by the Irish Confederation to congratulate the republican leaders. On his return, he was arrested on a charge of sedition, tried for high treason, found guilty, and sentenced to death; but subsequently the sentence was changed to banishment for life to Tasmania. Transported thither, he escaped in 1852 and succeeded in reaching New York. In 1855 he began to practice at the New York bar, and the following year became the editor of the *Irish News*. At the beginning of the Civil War in 1861, he organized a company of zouaves, joined the Sixty-ninth Regiment, New York Volunteers, was acting major at the first battle of Bull Run, and after serving the three months of the first call, returned to New York and organized the Irish brigade, being commissioned brigadier-general on February 3, 1862. He served in the latter part of the Peninsular campaign, and participated in the second battle of Bull Run, and in the battles of Antietam and Fredericksburg, in the last of which he was seriously wounded while leading a charge on Marye's

Heights. He resigned temporarily, but was recommissioned in 1864, and for some time was in command of the District of Etowah. He was appointed secretary of Montana Territory in 1865, and for several months in 1866, during the absence of Governor Edgerton, served as Governor *pro tem.* On July 1, 1867, he fell from the deck of a steamer, at Fort Benton, on the upper Missouri, and was drowned. He published *Speeches on the Legislative Independence of Ireland* (1852) and *Last Days of the Sixty-ninth New York Regiment in Virginia.*

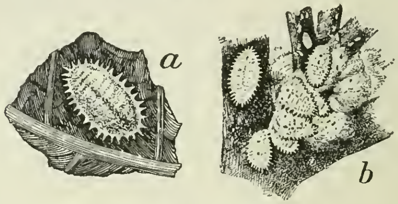
MEAGRE, or **MAIGRE** (OF., Fr. *maigre,* lean, from Lat. *macer,* lean; connected with Gk. *μακρός, makros,* long). Any of several European drumfish of the world-wide genus Sciæna. The typical meagre is *Sciæna aquila,* which ranges from Great Britain to the coasts of the Indian Ocean, but is best known about the Mediterranean Sea, where it has been very highly esteemed since the days of antiquity. It reaches a length of six feet, but ordinary specimens are about half that. The color is brownish gray on the back, with silvery gray sides and a white abdomen. It has always been highly valued, especially by the Italians, but to English palates the flesh seems rather dry and tasteless. A closely related species is the umbrine (*Sciæna umbrina*), also one of the favorite food fishes of the Mediterranean, and occasionally taken near Great Britain and elsewhere.

MEAL. See BREAD; FLOUR.

MEAL MOTH. A pyralid moth (*Pyralis farinalis*), cosmopolitan in distribution, which infests milling establishments and storerooms and which in the larval stage feeds upon stored grain, bran, and even straw, and occasionally upon dried plants in herbaria. A closely allied species (*Pyralis costalis*) is known as the clover-hay worm. There are probably four generations annually. The eggs are laid in small clusters and the larvæ live in long tubes constructed of silk and particles of meal and other material, and while thus incased in the obscure corners in which they habitually live they are completely concealed from observation. Another species, commonly called the Indian-meal moth (*Plodia interpunctella*), in the larval stages feeds not only upon Indian meal, but upon all sorts of dried vegetable products, such as peas, beans, nuts, acorns, and dried fruit, and upon root and bark preserved in drug stores.

MEAL WORM. The larva of either one of two or more beetles of the family Tenebrionidæ, which, originally of Asiatic or European origin, have become cosmopolitan enemies of meal, flour, bran, and other mill products. They develop in refuse grain-dust accumulated in dark corners and out-of-the-way places in flour mills, bakeries, stores, and stables. They are also of importance as enemies to ship biscuits and other kinds of crackers. These meal worms are easily bred in confinement, have a commercial value to the bird dealer, and are kept on sale in bird stores as food for 'soft-billed' cage-birds. The yellow meal worm (*Tenebrio molitor*) is the commonest of these insects. The beetle is over half an inch in length, somewhat flattened, shining, and nearly black; and the larva is cylindrical, slender, over an inch long, and has a waxy appearance and a yellowish color. The eggs are white, bean-shaped, about one-twentieth of an inch long, and are deposited in the meal or other food substance. The dark meal worm (*Tenebrio obscurus*) is very similar to the yellow meal worm, but dull black in color; it has been found in black pepper, phosphate fertilizers, cotton seed and cotton meals, and in commercial soda ash. Perfect cleanliness about storerooms and milling establishments is the best preventive of the attacks of these insects, and rooms or buildings once infested may be freed by the use of disulphide of carbon or hydrocyanic acid gas. Consult Chittenden, *Bulletin 4, New Series, Division of Entomology, Department of Agriculture* (Washington, 1896).

MEALY BUG. A naked scale-insect of the genus Dactylopius, so called because of the white, meal-like powder which covers it. Like other members of the subfamily Coccinæ, the body is not covered by a scale, and the females keep the form of the body with the segments distinct until the end, and also retain the power of motion. The antennæ of the female are six-jointed in the larva and eight-jointed in the adult; the male larva has seven-jointed antennæ. The tarsi are furnished with four digitules, and the anal ring with four hairs. Most of the mealy bugs are tropical or subtropical, but several species breed abundantly out of doors in the Southern United States, e.g. *Dactylopius citri,* a well-known enemy of orange groves in Florida. It is, however, as greenhouse pests in temperate regions that the mealy bugs are best known. They secrete a certain amount of honeydew, and are frequently attended by ants, which are responsible for much of the spread of mealy bugs in greenhouses, since they attend the young bugs and carry them to appropriate feeding grounds. The mealy secretion which covers these bugs renders it difficult to destroy them with some of the insecticide mixtures, but a dilute kerosene-soap emulsion is efficacious. Consult Comstock, *Report of the United States Department of Agriculture* (Washington, 1880).



THE MEALY BUG

a, Female (enlarged); *b*, group of mealy bugs on a tree.

MEALYWING. A bug of the family Aleyrodidæ, so called from the white, meal-like excretion on the wings of the adult insect. The mealywings are allied to the aphids and scale-insects. They are very small, frequently minute, and infest the leaves of plants, both herbaceous and of trees, usually on the lower side. In their early stages they are scale-like, and much resemble some of the Coccidæ. Unlike the Coccidæ, the two sexes develop in a similar manner, and both males and females are active and have two pairs of wings. In the early stages the body may be more or less covered with wax. The antennæ of the adults are seven-jointed, and the eyes are usually constricted near the middle, being sometimes entirely divided. The wings are broad and well-rounded, and may be clear or spotted and banded in different ways. About 150 species are known, of which more than 50 occur in the United States. The most destructive species is *Aleyrodes citri*, which attacks the orange and lemon in Florida and Louisiana, and causes the leaves to turn yellow and die. They secrete a considerable amount of honeydew, which attracts the spores of smut fungi, resulting ultimately in the blackening of the foliage of the orange trees.

MEAN (OF. *meien*, *moien*, Fr. *moyen*, from Lat. *medianus*, middle, from *medius*, middle). In mathematics, a term interpolated between two other terms of a series. The *arithmetic* mean of two quantities a, b, is $\frac{a+b}{2}$; their *geometric* mean is $\sqrt{ab}$, and their *harmonic* mean is $\frac{2ab}{a+b}$. The arithmetic mean is greater than the geometric mean, and the latter is greater than the harmonic mean. In averaging observed results of physical experiments, the mean result may be found by dividing the sum of the observed results by the number of observations. But in case the observed results are not regarded as equally accurate, certain numbers may be assigned to these results representing their relative accuracy; e.g. four men, A, B, C, D, have determined the area of a triangle and found 19.50, 19.75, 20, and 20.25 square meters, respectively. If the relative accuracy of their work may be represented by the numbers 3, 2, 2, 4 respectively, the area of the triangle will be taken as:

$$\frac{3\cdot 19.50 + 2\cdot 19.75 + 2\cdot 20 + 4\cdot 20.25}{3+2+2+4} = 19.91.$$

For further practical methods of averages, see LEAST SQUARES, METHOD OF.

MEAN′DER. A river of Asia Minor. See MÆANDER.

MEANING (from *mean*, AS. *mænan*, OHG. *meinan*, Ger. *meinen*, to think; connected with OChurch Slav. *mĕniti*, Skt. *man*, to think). The mental processes that constitute the unanalyzed consciousnesses of ordinary, everyday experience are always surcharged with meaning or significance. Mind, as it is given, is mind in function; mental stuff that stands for, represents, symbolizes, refers to, objects and events in the outside world. The value and validity of such objective reference form a question for epistemology. (See KNOWLEDGE, THEORY OF.) But the psychologist, after he has analyzed consciousness into its simplest structural elements (see ELEMENTS, CONSCIOUS), and has traced the formation of the more complex processes from connections of the elements (see ASSOCIATION OF IDEAS; FUSION)—after, that is to say, he has analyzed and reconstructed mind without regard to mind's significance and meaning—is met by the question: What is, in psychological terms, the vehicle of meaning? How did meaning get into mental processes? What are the processes, or what the aspects of process, that 'carry' the meaning of a given psychical complex?

As regards what we may term the 'origin' of meaning, only two views seem to be possible. Mind may, at its first appearance in the world, have been meaningless; and meaning may have been 'worked into' it, in the course of natural evolution. This view, however, presents extreme difficulties. It is not hard to conceive that the meaningful or significant aspect of mental process should have been refined and differentiated under the operation of natural selection; but it is impossible to form any definite idea of the way in which an organism should lay hold of meaningless material, and press it into service as meaningful. We have, in other words, a recurrence of the difficulty which characterizes heterogenetic will theories (see WILL): we can no more derive meaning from the unmeaning than we can derive voluntary action from the physiological reflex. The alternative view is thus forced upon us, that meaning did not 'get into' mind, for the simple reason that it was always there. Mind is 'struck out' in the interaction between organism and natural environment; and, arising as it did, could do nothing else than mean. A mind that should not mean is a contradiction in terms: we may abstract from meaning, in our laboratory dissections of consciousness, as we abstract from life in the anatomical laboratory; but a meaningless mind is not a mind, as a dead organism is not an organism. See NOETIC CONSCIOUSNESS.

When, therefore, we come to our other question, regarding the processes or aspects of process that form the vehicle of meaning, we find an answer ready to our hand. Mental process is intrinsically meaningful; any process can carry meaning. And it may be remarked, by the way, that this fact largely accounts for the short cuts in mental function, the substitutions of process for process within a functional formation (like that of space perception, e.g.), that make mental analysis so difficult, and render a lapse into the 'psychologist's fallacy' a matter of such fatal ease. (See INTROSPECTION.) On the other hand, as mind advances in complexity, it becomes necessary that arrangements be made (if we may use that expression) for devolving the carriage of meaning upon determinate constituents of consciousness. In the absence of such arrangements the grossest confusion would result. To take a simple instance: there are many words which, as the spelling-books say, are pronounced alike but spelled differently. "The rain (reign) is over at last!" What is it that makes one hearer think of the weather, and another of the Queen of England? Why does the auditory stimulus *mean* rain to the one and reign to the other?

In replying to this question, we must remember that consciousness is a complex affair, and that its range is wider than the range of attention (q.v.). Hence there will always be, in a given consciousness, a certain 'focal' process or group of processes, corresponding to the range of attention, and a group or groups of obscurer 'marginal' processes which lie beyond that range. Now, as Bagley puts it, the "same symbol [e.g. word] arouses at different times *focal* references which may be uniform or disparate, consistent or inconsistent; and yet the meaning of the symbol, in combination with other symbols, is perfectly unequivocal." The required uniformity is furnished, and the inconsistencies compensated, by the *marginal* context: "the meaning is a function of the more transitive parts of consciousness, the fringe or relations which we feel surrounding the image" (James). The 'arrangement' spoken of above consists, then, in the relegation of the meaning-function to the background of consciousness; that constancy of adaptation to the outside world, which becomes impossible to the focal processes as mental development advances and experience widens, but which is nevertheless necessary if mind is to remain meaningful, is secured by constancy of the marginal elements. One man hears 'rain,' because the fringe of felt relations clustering round the auditory symbol puts him in a weather mood: another hears 'reign,' because his margin puts him in the mood of politics. The chief constituents of the mood are, undoubtedly, organic sensations, whereby the organism is literally 'adapting' itself to the reception of the stimulus. The meaning-reaction may become so automatic that the margin thins out to a mere thread of organic process; or it may demand so distinct a wrench from the present topic of thought that the shift of mood is clearly noticeable. In either case the fringe is essential to meaning. We have all noticed how empty and meaningless a word becomes when we have repeated it over and over again: we listen blankly to the sound of it, wondering if we are ever to recover the idea that we have used so long and found so useful. But all that repetition does to the word is to strip it of its fringes. There could hardly be a more striking proof of the fact that mental economy has shifted the burden of meaning from the centre of consciousness to its periphery. Consult: James, *Principles of Psychology* (New York, 1890); Bagley, in *American Journal of Psychology*, vol. xii. (Worcester, 1900); Titchener, *Primer of Psychology* (New York, 1900).

MEARES, mērz, JOHN (c.1756-1809). An English navigator. He entered the navy in 1771; served against the French in the West India Islands, and at the conclusion of peace became captain in the merchant service. He went to India and formed at Calcutta what was called the Northwest America Company for opening trade with Russian America. In 1786 he explored a part of the coast of Alaska. He went to China by way of the Hawaiian Islands, and entered Nootka Sound (1788). The next year he sent to Nootka Sound three ships which were seized by the Spaniards on the ground that Englishmen had no right to trade in those waters. The act caused great excitement in England and a large fleet known as the 'Spanish Armament of 1790' was collected to punish the Spaniards, who saved themselves only by making ample reparation. Meares published *Voyages Made in the Years 1788 and 1789 from China to the Northwest Coast of America* (1790).

MEARIM, mā'ȧ-rēɴ'. A river in the State of Maranhão, Brazil, rising in the Serra do Negro and flowing north into the Bay of São Marcos near the city of Maranhão (Map: Brazil, J 4). It is about 350 miles long and navigable, but subject to very sudden and violent bores.

MEARNS, mârnz. A county of Scotland. See KINCARDINESHIRE.

MEASLES (from MDutch *maselen*, *masselen*, spots; connected with OHG. *masala*, *masara*, Ger. *Maser*, diminutive of OHG. *māsa*. Ger. *Mase*, spot, mark of a wound), known also as RUBEOLA and MORBILLI. One of the group of diseases termed *exanthema* (q.v.). It is communicable from person to person, and seldom occurs more than once in the same individual. Its period of incubation is usually about a fortnight; then come lassitude and shivering, which are soon followed by heat of skin, increased rapidity of the pulse, loss of appetite, and thirst. The respiratory mucous membrane is also affected, and the symptoms are very much the same as those of a severe cold in the head, accompanied with a dry cough, a slight sore throat, and sometimes tightness of the chest.

The eruption which is characteristic of the disease usually appears upon the fourth day from the commencement of the febrile symptoms and the catarrh, seldom earlier, but not unfrequently some days later. It is a rash, consisting at first of minute red papulæ, which, as they multiply, coalesce into crescentic patches. It is two or three days in coming out, beginning on the face and neck, and gradually traveling downward. The rash fades in the same order as it occurs; and as it begins to decline three days after its appearance, its whole duration is about a week. The red color gives way to a somewhat yellowish tint, and the cuticle crumbles away in a fine bran-like powder, the process being often attended with considerable itching.

There are two important points in which it differs from smallpox (q.v.), with which in its early stage it may be confounded; they are: (1) That the fever does not cease or even abate when the eruption appears, but sometimes increases in intensity; and (2) that the disease is not more severe or more dangerous because the eruption is plentiful or early. The character of the eruption, after the first day, will serve to remove all doubt regarding these two diseases; and the comparative prevalence of either disease in the neighborhood will materially assist in forming the diagnosis. It is distinguished from scarlet fever (q.v.), or scarlatina, (1) by the presence at the outset of catarrhal symptoms, which do not occur in the latter disease, at any rate, prior to the eruption; (2) by the absence of the throat-affection, which always accompanies well-marked cases of scarlet fever; (3) by the character of the rash, which in measles is said to present somewhat the tint of the raspberry, and in scarlet fever that of a boiled lobster; which in measles appears in crescentic patches, and in scarlet fever is universally diffused.

In ordinary uncomplicated measles the prognosis is almost always favorable. The chief danger is from inflammation of some of the textures that compose the lungs, and in feeble children it often leaves chronic bronchial mischief behind it. No age is exempt from the disease, but it is much more common in childhood than subsequently, a second attack being comparatively rare.

In mild forms of the disease nothing more is requisite than to keep the patient on a low diet, attend to the state of the bowels, and prevent exposure to cold, which is best accomplished by keeping him in bed with the ordinary warmth to which he is accustomed in health. If the chest symptoms become urgent, they must be treated according to their nature. Bronchitis (q.v.), sometimes extending into pneumonia (q.v.), is most to be feared. If the eruption disappears prematurely, it may sometimes be brought back by placing the patient in a warm bath. In such cases stimulants are often required, but must, of course, only be given by the advice of the physician. The patient must be carefully protected from exposure to cold for a week or two after the disease has apparently disappeared, as the lungs and mucous coat of the bowels are for some time very susceptible to inflammatory attacks.

Except for the lesions of the skin there are no characteristic pathological changes in measles. As in other infectious diseases, degenerations in the internal organs, especially in the kidneys, are not uncommon. Extension of the catarrhal inflammation of the bronchi to the lungs frequently results in a broncho-pneumonia. As to the specific cause of the disease nothing is definitely known. Canon and Rielicke in 1892 reported the discovery in fourteen cases of measles of a peculiar bacillus which they considered specific. This bacillus was found in the blood, more rarely in the catarrhal exudate, and was from five to seven micromillimeters long. It was sometimes abundant, at other times only a few could be found. Its cultivation on ordinary media was difficult. These observations as yet lack confirmation.

MEASURE (OF., Fr. *mesure*, from Lat. *mensura*, measure, from *metiri*, to measure). In music, the smallest metrical division of a movement or piece, represented by the notes or rests comprised within two successive bars of the staff. The time-value of a measure is a fixed unit, depending on the character of the time which governs the movement. There are but two general kinds of time, viz. duple time, containing an equal quantity of notes in the bar, and triple time, containing an unequal quantity. See TIME.

MEASURE FOR MEASURE. A comedy by Shakespeare, produced in 1604, printed in 1623. The plot is found in Cuithio's "Hecatommithi," in the romance and tragedy *Epitia.* It was used by G. Whetstone in his play *Promos and Cassandra* (1578), and in his prose tales *Heptameron of Civill Discourses* (1582). If Shakespeare used that version, he took from it merely the outline, and may have known the original. The play belongs to the period of *Othello, Hamlet,* the revised, and *King Lear,* which Darmesteter calls his pessimistic period. Though called a comedy, it is gloomy, brightened only by the character of Isabella. After the Restoration it was revised and altered by D'Avenant as *The Law Against Lovers* (1662), and later adapted by Gildon (1700).

MEASUREMENT OF SHIPS FOR TONNAGE. The measurement of ships to determine their tonnage (q.v.) is now made in practically the same way by all maritime nations. The old rule in the United States was established by act of Congress in 1799. This provided that the tonnage should be ascertained as follows: From the extreme length in feet deduct three-fourths the breadth; multiply the remainder thus obtained by the breadth and this product by the depth; divide the last product by 95 and the quotient was the register tonnage for payment of dues. In this rule the depth of a double-decked vessel was arbitrarily assumed as one-half the breadth, so that it was to the interest of shipowners to build deep ships without much regard to the effect of the deepening upon other qualities. In Great Britain a somewhat similar rule obtained. The square of the breadth was multiplied by the inboard length and the product divided by 94. This rule had the same effect on ship construction as that of the United States; and the rule is still sometimes employed in yacht and pleasure boat measurement. Tonnage so obtained is designated as 'old measurement'; thus, 320 tons (O.M.).

In 1835, due to the efforts of Mr. Moorsom, an act of Parliament provided for a more accurate determination of the tonnage of vessels. Instead of a thumb rule which might be—and usually was—very much in error, the measurement of the cubic contents of vessels was effected in accordance with Newton's theorem for the determination of contents of solids bounded by irregular surfaces. This act was followed by the 'Merchant Shipping Act of 1854,' which is the basis of the present practice throughout the maritime world, though some of its provisions have been modified in England as well as elsewhere.

The method of measuring prescribed in this act and subsequent amendments is as follows: Measure the length of the ship on the tonnage deck from the inside of the planking or plating at the extreme forward end at the stem to the inside of the planking or plating at the extreme after end at the stern, and deduct the rake of bow and stern in the thickness of the deck so as to reduce the measurement to the length of the ship at the under side of the deck or tops of the beams. This is the 'length on the tonnage deck,' which deck is the upper one in all ships which have less than three decks and second deck from below in all others. Divide the length obtained as follows: In ships which have a length on the tonnage deck of 50 feet, this length is divided into 4 equal parts; a length of 50 to 120 feet, into 6 equal parts; 120 to 180 feet into 8 equal parts; 180 to 225 feet into 10 equal parts; and over 225 into 12 equal parts. The division marks being established, ascertain the depth at the midship division mark; if it exceeds 16 feet divide it into 7 equal parts, if 16 feet or less, into 5 equal parts. Measure the inside breadth of the ship at each mark and at the upper part of the depth and number them from top to bottom; multiply the 2d and 4th by 4 and the 3d by 2; add these products together and to the sum add the 1st and 5th; multiply the total by one-third the common interval between the breadths and this product will be deemed the transverse area of the upper part of the section. Divide the lower breadth (between the inner bottom, or upper side of double bottom and the lower division line) into four parts by equally spaced transverse horizontal lines: measure the breadth at the four new points and at the top of the inner bottom; and proceed as before. The sum of the two areas thus determined is the total transverse area at the point. The transverse areas at the different points (4, 6, 8, 10, or 12 in number) in the length of the ship being determined, they are to be numbered from forward (or aft, either will do), the forward one being at the extreme forward end of the measured length, and the other at its extreme after end. Multiply the second and every even numbered area (except the last) by 4, and the third and every odd numbered area (except the first) by 2; add these products together, and to the sum add the first and last if they yield anything; multiply the sum so obtained by one-third the common interval between the areas and the product will be the cubic contents of the ship below the tonnage deck. Add to this the cubic contents of all inclosed spaces above the tonnage deck including poop, forecastle, deckhouses, between decks, etc. From the total so obtained the following deductions are made: (1) Space exclusively occupied by the crew and the storage of their clothing, etc.; provided that this space does not exceed 20 per cent. of the remaining tonnage of the ship; if it is greater than 20 per cent. the excess is to be considered as part of the tonnage space. (2) Space framed in above the upper deck for machinery or for admission of light or air. (3) In vessels propelled wholly by sails, any space set apart and used exclusively for stowage of sails, if not exceeding 2½ per cent. of the tonnage of the ship. (4) Any space used exclusively for the accommodation of the master. (5) Any space used exclusively for the working of the helm or of anchor gear or for keeping charts, signals, instruments of navigation, and boatswain's stores. (6) Space occupied by donkey engine and boiler if connected with main pumps of ships. (7) Double bottom when not available for cargo, stores, or fuel. (8) Actual engine room and fire-room including shaft alley, but omitting all space not occupied by engines and boilers or necessary for working them. When the actual engine and fire rooms occupy in paddle vessels 20 to 30 per cent. of the gross tonnage the deduction is to be 37 per cent. of gross tonnage; when the engine and fire rooms occupy 20 per cent. or less the deduction may be 37 per cent. of the gross tonnage or 1½ times the actual engine and fire room space, the option resting with the Board of Trade; when the space occupied by the propelling machinery, etc., exceeds 30 per cent. of the gross tonnage the deduction to be made is 37 per cent. of it or 1½ times the actual engine and fire room space, the option remaining with the owners. In the case of screw steamers when the space occupied by the machinery and boilers is 13 to 20 per cent. of the gross tonnage the deduction is 32 per cent. of that tonnage; when the space occupied is 13 per cent. or less the deduction is 32 per cent. of the gross tonnage, or 1¾ times the actual space, the option remaining with the Board of Trade; when the space occupied is 20 per cent. or more the deduction is 32 per cent. or 1¾ times the actual space, at the option of the owners.

The total additions and deductions to the tonnage space having been made, the capacity in cubic feet so obtained is divided by 100, and the result is the *register tonnage* (or *net register tonnage*) of the ship. The *gross register tonnage* is obtained by dividing by 100 the total capacity of the hull and deckhouses without deductions.

When, owing to the presence of cargo or other reason, it is impracticable to measure a vessel as heretofore described, the tonnage is determined as follows: Pass a chain around the hull at the midship section and measure the length under the bottom from the upper deck at one side to the upper deck at the other. Call this the *girth*. Add one-half the girth to one-half the main breadth; square the sum so obtained and multiply the result by the length of the ship from outside the stem to outside the stern post; multiply this product by .0018 for wooden ships and by .0021 for those built of iron or steel.

By the act of Congress of May 6, 1864 (taking effect January 1, 1865), the United States adopted the English system with slight changes in details which are thought to conduce to greater accuracy. This act has been supplemented by several others, notably that of March 2, 1895, which makes the American practice almost identical with the English; indeed, the wording of the law is generally the same throughout. In measuring, however, the United States law divides vessels into six classes according to length and the divisions in each class for measurement of transverse areas are: In Class 1 (vessels under 50 feet length on the tonnage deck) the length is divided into 6 equal parts; in Class 2 (vessels 50 to 100 feet long), 8 equal parts; in Class 3 (vessels 100 to 150 feet long), 10 equal parts; in Class 4 (vessels 150 to 200 feet long), 12 equal parts; in Class 5 (vessels 200 to 250 feet long), 14 equal parts; in Class 6 (vessels over 250 feet long), 16 equal parts. The method of measuring and computing net and gross tonnage is the same as that already described.

The British system of measurement has also been adopted by the following countries on the dates given: Denmark, 1867; Austria-Hungary, 1871; Germany, 1873; France, 1873; Italy, 1873; Spain, 1874; Sweden, 1875; Netherlands, 1876; Norway, 1876; Greece, 1878; Russia, 1879; Finland, 1877; Haiti, 1882; Belgium, 1884; Japan, 1884. In some of these the allowance of deductions, particularly that for propelling machinery, differs somewhat from the British rule.

Bibliography. For further information, consult: *Instructions to Measuring Surveyors* (London, 1891); *Lloyd's Seaman's Almanac* (London, 1893); *Revised Statutes of the United States*, Section 4153; and the *Supplements to the Revised Statutes*, also the *Statutes at Large* for 1895. The *Instructions to Measuring Surveyors* gives all the British acts complete with instructions for carrying them into effect, definitions, etc.

MEASURE OF DAMAGES. See Damages.

MEASURES. See Weights and Measures.

MEASURING WORM. Any one of the larvæ of the lepidopterous superfamily Geometridæ, also called loopers. The group is a very extensive one and consists of fragile moths with comparatively large wings. The caterpillars are long and slender, with only one pair of abdominal feet placed upon the ninth segment of the body. There is also an anal pair of feet which function as claspers. The measuring worms walk by moving these two pairs of feet up to the thoracic legs, so that the body forms a large loop, giving the insect the appearance of measuring the surface upon which it is walking. It is this habit which has given the popular names 'loopers,' 'inchworms,' etc. (see Geometrid Moth), and the scientific name Geometridæ to the insects of this group. Measuring worms feed upon the leaves of plants, with the exception of a few which bore into seeds. They are usually protectively colored so as to resemble twigs, and they have the attitude when at rest of holding the body stiff and erect at an angle from the main stem of the plant, so that they almost perfectly resemble twigs. The individuals of the same species vary in color during life, and with some species there is a well-marked dimorphism. In some species the dimorphism is potential, and the future color is settled by some condition occurring during the early life of the larva. Poulton has made a careful study of the attitudes and colors of these larvæ, and rates the value of their protecting influence at a very high point. In one variable English species he states that the dark tint is due to pigment in the skin or immediately below it and the green color to a layer of fat between the hypodermis and the superficial muscles. In some geometrids the adult females are wingless. A marked example of this group is seen in the canker-worm moths of the United States. (See CANKER-WORM.) The winter moth (*Cheimatobia brumata*), a species which is common and widespread in Europe and North America, has also a wingless female. One of the currant-worms common to Europe and North America (*Eufitchia ribearia*) is a member of this group in which the female is fully winged.

Certain moths of the noctuine series exist, whose larvæ lack certain of the middle prolegs, and which therefore walk in a looping or measuring manner, but these are not true measuring worms. The cotton caterpillar (*Aletia xylina*) is an example.

Consult: Edwards, *Standard Natural History*, vol. ii. (Boston, 1884); Comstock, *Manual for the Study of Insects* (Ithaca, 1895); Sharp, *Cambridge Natural History*, vol. vi. (London, 1899); Packard, "A Monograph of the Geometrid Moths or Phalænidæ of the United States," in Hayden's *Annual Report of the United States Geological Survey*, vol. x. (Washington, 1876).

MEAT (AS. *mete*, Icel. *matr*, *mata*, Goth. *mats*, OHG. *maz*, meat, Ger. *Mass-leid*, aversion to meat). The flesh of animals used as food. Sometimes the word is restricted to the domestic animals, cattle, sheep, pigs, while the term game is applied to the flesh of wild animals and poultry to the flesh of domestic fowl. The great importance of the meat industry is indicated by the following figures: In 1900 the estimated number of cattle in the United States was 67,000,000; of these some 17,000,000 were dairy cows, two years old and over, while the remaining 50,000,000 included beef cattle, dairy bulls, dairy heifers under two years old, dairy calves, etc. In 1901 the total number of cattle slaughtered in Chicago, Saint Louis, Kansas City, and Omaha was 4,500,000. The number slaughtered by large packers in other cities and by local butchers greatly exceeds this figure. The total number of hogs in the United States in 1900 has been estimated at 63,000,000, the number annually slaughtered at 40,000,000, in years when the business was most active and the supply most plentiful. The value of all hogs slaughtered during the year ending March 1, 1902, has been estimated at $338,350,000. Similar statistics for the sheep and lambs slaughtered for food are not available.

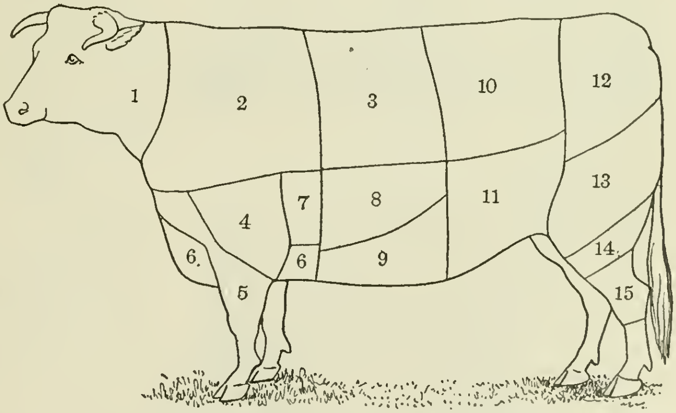


FIG. 1. DIAGRAM OF CUTS OF BEEF (live animal).

1, Neck; 2, chuck; 3, ribs; 4, shouldered clod; 5, fore shank; 6, brisket; 7, cross-ribs; 8, plate; 9, navel; 10, loin; 11, flank; 12, rump; 13, round; 14, second cut round; 15, hind shank.

Meat, i.e. flesh food, consists of the muscular tissue, or lean, and the varying quantities of fat which are found in the different parts of the carcass between and within membranes and tendons. Besides the fat ordinarily visible, there is always present more or less of fat in particles too small to be readily distinguished from the lean which surrounds it. These particles can, however, be readily obtained by chemical methods in quantities sufficient to be seen and weighed. The lean part of the meat has practically the same final structure, regardless of its kind and source. All muscular tissue is made up of prism-shaped bundles, which can be divided into smaller and smaller bundles, until finally the muscle fibres or tubes are reached. These irregular tubes vary in diameter from $\frac{1}{1000}$ to $\frac{1}{200}$ of an inch, and are therefore invisible to the unaided eye. They are held together in bundles by means of connective tissue between and inside which the invisible fat is stored. The envelope or wall of each tube is a very delicate, elastic membrane, composed of nitrogenous material. The walls themselves are comparatively permanent, but their contents are continually undergoing change and renewal.

Meat is very commonly eaten fresh, but large quantities are also salted, smoked, dried, and canned. The meats found in the markets consist of the lean or muscular tissue, connective tissue, or gristle, fatty tissue, blood vessels, nerves, bone, etc. No general statement can be made with regard to the proportion in which these substances occur, as it is found to vary greatly with the kind of animal, with different 'cuts' from the same animal, and with many other conditions. Nearly all meats bought and sold in the markets contain portions not suitable for eating, which may be properly designated as refuse.

CUTS OF MEAT. The methods of cutting carcasses of beef, veal, mutton, and pork into parts, and the terms used for the different 'cuts,' as these parts are commonly called, vary considerably in different localities. The figures for composition quoted below apply in general to cuts as indicated by the following diagrams. These show the positions of the different cuts, both in the live animal and in the dressed carcass as found in the markets. The lines of division between the different cuts will vary slightly according to the usage of the local market, even where the general method of cutting is as here indicated. The names of the same cuts likewise vary in different parts of the country. Thus the part nearest the ribs of beef is frequently called 'small end of loin' or 'short steak.' The other end of the loin is called 'hip sirloin' or 'sirloin.' Between the short and the sirloin is a portion quite generally called the 'tenderloin,' for the reason that the real tenderloin, the very tender strip of meat lying inside the loin, is found most fully developed in this cut. Porterhouse steak is a term frequently applied to either the short steak or the tenderloin. It is not uncommon to find the flank cut so as to include more of the loin than is indicated in the figures below, in which case the upper portion is called 'flank steak.' The larger part of the flank and the rump is very frequently corned or pickled in brine. In some markets the rump is cut so as to include a portion of the loin, which is then sold as 'rump steak.' The portion of the round on the outside of the leg is regarded as more tender than that on the inside, and is frequently preferred to the latter.

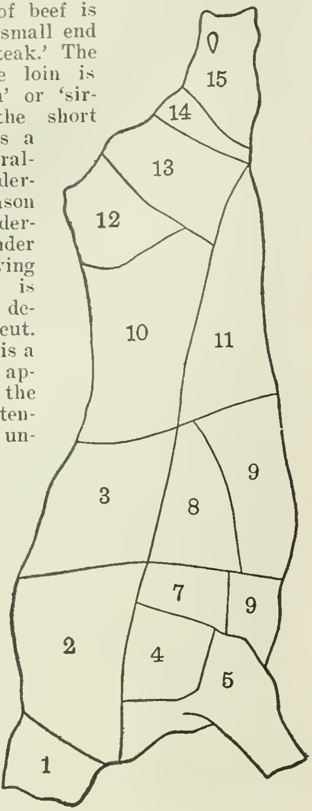


FIG. 2. DRESSED SIDE OF BEEF.

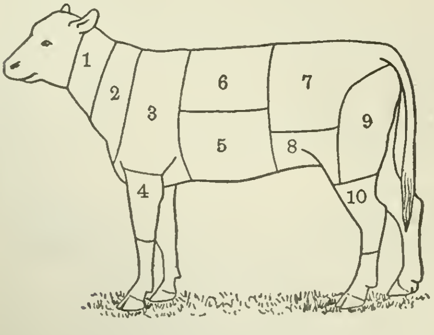


FIG. 3. DIAGRAM OF CUTS OF VEAL.

1, Neck; 2, chuck; 3, shoulder; 4, fore shank; 5, breast; 6, ribs; 7, loin; 8, flank; 9, leg; 10, hind shank.

The general method of cutting up a side of beef is illustrated in Figs. 1 and 2, which show the relative position of the cuts in the animal and in a dressed side.

The method of cutting up a side of veal differs considerably from that employed with beef. This is illustrated by Figs. 3 and 4, which show the relative position of the cuts in the animal and in a dressed side.

Figs. 5 and 6 show the relative position of the cuts in a dressed side of mutton or lamb and in a live animal.

The method of cutting up a side of pork differs considerably from that employed with other meats. A large portion of the carcass of a dressed pig consists of almost clear fat. This furnishes the cuts which are used for 'salt pork' and bacon. Figs. 7 and 8 illustrate a common method of cutting up pork, showing the relative positions of the cuts in the animal and in the dressed side. The hams and shoulders are more frequently cured, but are also sold as fresh pork 'steak.' The tenderloin proper, which is not indicated in the figure, is a comparatively lean and very small strip of meat lying under the bones of the loin and usually weighing less than a pound. In cutting up pork, some fat is usually trimmed off from the hams and shoulders, which is called 'ham and shoulder fat' and is often used for sausages, etc. What is called 'leaf lard,' at least in some localities, comes from the inside of the back, and is the kidney fat.

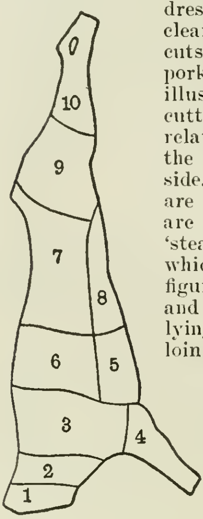


FIG 4. DRESSED SIDE OF VEAL.

The accompanying table shows the average composition of a number of kinds and cuts of meat and also that of a number of meat products.

The amount of refuse, chiefly bone, in meat as purchased, varies greatly with the different cuts. Judged by the averages of a large number of analyses, it ranges in beef from nothing in tenderloin to about 58 per cent. in lean hind shank; in veal, nothing in flank to 63 per cent. in medium fat hind shank; in lamb, from 7 per cent. in very fat hind leg to 20 per cent. in shoulder; in mutton, from about 10 per cent. in medium fat flank to about 28 per cent. in medium fat neck; and in pork, from about 1 per cent. in fresh lean ham to 68 per cent. in the head. It would perhaps not be incorrect to say that, considering all means, the refuse averages

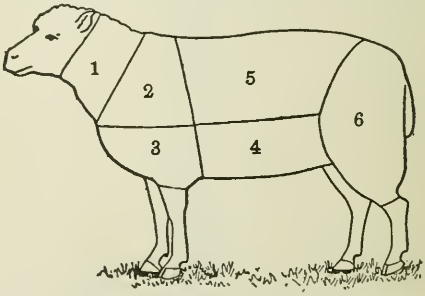


FIG. 5. DIAGRAM OF CUTS OF MUTTON OR LAMB IN THE LIVE ANIMAL.

1, Neck; 2, chuck; 3, shoulder; 4, flank; 5, loin; 6, leg.

from 15 to 20 per cent. of the material as purchased.

Digestibility. According to the results of a number of experiments, an average of 97 per cent. of the protein and 95 per cent. of the fat of meat is digested. Little is known of the relative digestibility of different kinds of meat, but is is probable that as regards thoroughness of digestion they do not vary greatly.

Texture (Toughness) of Meats. Whether meats are tough or tender depends upon two things: the character of the walls of the muscle tubes and the character of the connective tissues which bind the tubes and muscles together. In young and well-nourished animals the tube walls are thin and delicate, and the connective tissue is small in amount. As the animals grow older or are made to work (and this is particularly true in the case of poorly nourished animals) the walls of the muscle tubes and the connective tissues become thick and hard. This is the reason why the flesh of young, well-fed animals is tender and easily masticated, while the flesh of old, hard-worked, or poorly fed animals is often so tough that prolonged boiling or roasting seems to have but little effect on it.

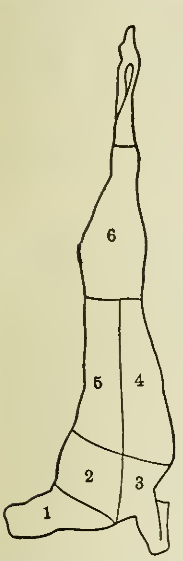


Fig. 6. dressed side of mutton or lamb.

After slaughtering, meats undergo marked changes in texture. These changes can be grouped under three classes or stages. In the first stage, when the meat is just slaughtered, the flesh is soft, juicy, and quite tender. In the next stage the flesh stiffens and the meat becomes hard and tough. This condition is known as *rigor mortis* and continues until the third stage, when the first changes of decomposition set in. In hot climates the meat is commonly eaten in either the first or second stage. In cold climates it is seldom eaten before the second stage, and generally, in order to lessen the toughness, it is allowed to enter the third stage, when it becomes soft and tender, and acquires added flavor. The softening is due in part to the formation of lactic acid, which acts upon the connective tissue. The same effect may be produced, though more rapidly, by macerating the meat with weak vinegar. Meat is sometimes made tender by cutting the flesh into thin slices and pounding it across the cut ends until the fibres are broken.

The flavor depends largely upon the kinds and amounts of 'nitrogenous extractives' which the muscle fibres or tubes contain. Pork and mutton are deficient in extractives, and what flavor they possess is due largely to the fats contained in them. The flesh of birds and of most game is very rich in extractives, which accounts for its high flavor. In general, the flavor of any particular meat is largely modified by the condition of the animal when slaughtered. and by its food, age, breed, etc. The flesh of young animals is more tender but not so highly flavored as that from more mature animals. It is often said that the flesh of males is more highly flavored than that of females. There are at least two exceptions to this rule, since the flesh of the goose is more highly flavored than that of the gander, while in the case of pork there is little difference between the flesh of the male and that of the female. Castration, as illustrated in the familiar example of the capon, tends to make the flesh more tender, fatter, and better flavored. The flesh of the animals which feed exclusively upon fish or flesh has a strong, disagreeable taste, and is eaten only by uncivilized people or those in great need. Fish is an exception to the rule, however. Meat which is allowed to hang and ripen develops added flavors. In the first stages of decomposition compounds quite similar to the nitrogenous extractives are formed, and it is to these that the improved flavors are due.

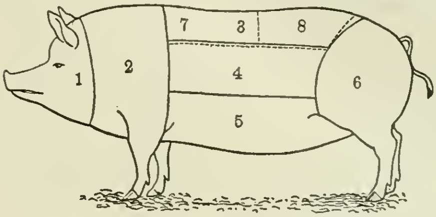


Fig. 7. diagram of cuts of pork.

1, Head; 2, shoulder; 3, back; 4, middle cut; 5, belly; 6, ham; 7, ribs; 8, loin.

Cooking. Meat is not often eaten raw by civilized people. For the most part it is either roasted, broiled, fried, stewed, or boiled. Among the chief objects of cooking are the loosening and softening of the tissues, which facilitates digestion by exposing them more fully to the action of the digestive juices. Another important object is to kill parasites and microörganisms if present, and thus destroy organisms that might otherwise expose the eater to great risks. Minor, but by no means unimportant, objects are the coagulation of the albumen and blood so as to render the meat more acceptable to the sight, and the development and improvement of the natural flavor, which is often accomplished in part by the addition of condiments.

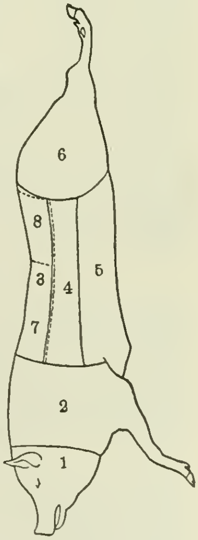


Fig. 8. dressed side of pork.

If meat in cooking is placed in cold water and heated gradually, part of the organic salts, the soluble albumen, and the extractives or flavoring matters will be dissolved out. The broth or soup obtained will be rich, but the meat will be correspondingly tasteless. This tasteless material has been found to be as easily and completely digested as the same weight of ordinary roast. It contains nearly all the protein of the meat, and, if it is properly combined with vegetables, salt, and flavoring materials, makes an agreeable as well as nutritious food. If a piece of meat is plunged into boiling water, the

Average Composition of a Number of Cuts of Meat and Meat Products

	Refuse	Water	Protein *	Fat	Total carbohydrates	Ash	Fuel value, per pound
BEEF, FRESH	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Calories*
Brisket, medium fat, edible portion	......	54.6	15.8	28.5	......	0.9	1,495
Chuck, including shoulder, edible portion	......	65.0	19.2	15.4	......	.9	1,005
Chuck, rib, edible portion	......	66.8	19.0	13.4	......	1.0	920
Flank, edible portion	......	59.3	19.6	21.1	......	.9	1,255
Loin, edible portion	......	61.3	19.0	19.1	......	1.0	1,155
Loin, porterhouse steak, edible portion	......	60.0	21.9	20.4	......	1.0	1,270
Loin, sirloin steak, edible portion	......	61.9	18.9	18.5	......	1.0	1,130
Loin, tenderloin	......	59.2	16.2	24.4	......	.8	1,330
Navel, medium fat, edible portion	......	47.6	15.6	36.5	......	.8	1,830
Neck, edible portion	......	66.3	20.7	12.7	......	1.0	920
Plate, edible portion	......	56.3	16.8	26.9	......	.8	1,450
Ribs, edible portion	......	57.9	17.8	24.6	......	.9	1,370
Rib rolls, as purchased	......	64.8	19.4	15.5	......	.9	1,015
Round, edible portion	......	67.8	20.9	10.6	......	1.1	835
Round, second cut, edible portion	......	69.8	20.4	8.6	......	1.1	740
Rump, edible portion	......	57.0	18.7	23.1	......	.9	1,325
Shank, fore, edible portion	......	70.3	21.4	8.1	......	.9	740
Shank, hind, edible portion	......	69.6	21.7	8.7	......	1.0	770
Shoulder and clod, edible portion	.....	68.9	20.0	10.3	......	1.1	805
Forequarter, edible portion	......	62.5	18.3	18.9	......	.9	1,135
Forequarter, as purchased	20.6	49.5	14.4	15.1	......	.7	905
Hindquarter, edible portion	......	62.2	19.3	18.3	......	.9	1,130
Hindquarter, as purchased	16.3	52.0	16.1	15.4	......	.8	950
Sides, edible portion	......	62.2	18.8	18.8	......	.9	1,145
Sides, as purchased	18.6	50.5	15.2	15.5	......	.7	935
Beef liver, edible portion	......	71.2	20.7	4.5	1.7	1.6	605
Tongue, edible portion	......	70.8	18.9	9.2	......	1.0	740
BEEF, CANNED							
Corned beef	......	51.8	26.3	18.7	......	4.0	1,280
Dried beef, as purchased	......	44.8	39.2	5.4	......	11.2	960
Roast beef, as purchased	......	58.9	25.9	14.8	......	1.3	1,105
BEEF, CORNED AND PICKLED							
Corned beef, edible portion	......	53.6	15.6	26.2	......	4.9	1,395
Tongues, pickled, edible portion	......	62.3	12.8	20.5	......	4.7	1,105
Tongues, pickled, as purchased	6.0	58.9	11.9	19.2	......	4.3	1,030
Tripe	......	86.5	11.7	1.2	.2	.3	270
Dried beef, salted and smoked, edible portion	......	54.3	30.0	6.5	.4	9.1	840
VEAL, FRESH							
Breast, edible portion	......	68.2	20.3	11.0	......	1.1	840
Chuck, edible portion	......	73.8	19.7	5.8	......	1.0	610
Flank, as purchased	......	66.9	20.1	12.7	......	1.0	910
Leg, edible portion	......	71.7	20.7	6.7	......	1.1	670
Leg cutlets, edible portion	......	70.7	20.3	7.7	......	1.1	705
Loin, edible portion	......	69.5	19.9	10.0	......	1.1	790
Neck, edible portion	......	72.6	20.3	6.9	......	1.0	670
Rib, edible portion	......	69.8	20.2	9.4	......	1.1	775
Shank, fore, edible portion	......	74.0	20.7	5.2	......	1.0	605
Shank, hind, edible portion	......	73.6	20.7	5.5	......	1.0	615
Forequarter, edible portion	......	71.7	20.0	8.0	......	.9	710
Forequarter, as purchased	24.5	54.2	15.1	6.0	......	.7	535
Hindquarter, edible portion	......	70.9	20.7	8.3	......	1.0	735
Hindquarter, as purchased	20.7	56.2	16.2	6.6	......	.8	580
Side, with kidney, fat and tallow, edible portion	......	71.3	20.2	8.1	......	1.0	715
Side, with kidney, fat, as purchased	22.6	55.2	15.6	6.3	......	.8	555
Heart, as purchased	......	73.2	16.8	9.6	......	1.0	720
Kidneys, as purchased	......	75.8	16.9	6.4	......	1.3	585
Liver, as purchased	......	73.0	19.0	5.3	......	1.3	575
LAMB, FRESH							
Breast or chuck, edible portion	......	56.2	19.1	23.6	......	1.0	1,350
Leg, hind, edible portion	......	58.6	18.6	22.6	......	1.0	1,300
Loin, without kidney and tallow, edible portion	......	53.1	18.7	28.3	......	1.0	1,540
Neck, edible portion	......	56.7	17.7	24.8	......	1.0	1,375
Forequarter, edible portion	......	55.1	18.3	25.8	......	1.0	1,430
Forequarter, as purchased	18.8	44.7	14.9	21.0	......	.8	1,165
Hindquarter, edible portion	......	60.9	19.6	19.1	......	1.0	1,170
Hindquarter, as purchased	15.7	51.3	16.5	16.1	......	.9	985
Side, without tallow, edible portion	......	58.2	17.6	23.1	......	1.1	1,300
Side, without tallow, as purchased	19.3	47.0	14.1	18.7	......	.8	1,055
MUTTON, FRESH							
Chuck, edible portion	......	48.2	14.6	36.8	......	.8	1,825
Flank, edible portion	......	42.7	14.3	42.6	......	.7	2,065
Leg, hind, edible portion	......	63.2	18.7	17.5	......	1.0	1,085
Loin, without kidney or tallow, edible portion	......	47.8	15.5	36.2	......	.8	1,815
Neck, edible portion	......	56.6	16.7	26.3	......	1.0	1,420
Shoulder, edible portion	......	60.2	17.5	21.8	......	.9	1,245
Forequarter, edible portion	......	52.9	15.6	30.9	......	.9	1,595
Forequarter, as purchased	21.2	41.6	12.3	24.5	......	.7	1,265
Hindquarter, edible portion	......	54.8	16.7	28.1	......	.8	1,495
Hindquarter, as purchased	17.2	45.4	13.8	23.2	......	.7	1,235
Sides, including tallow, as purchased	18.1	45.4	13.0	23.1	......	.7	1,215
Side, not including tallow, edible portion	......	53.6	16.2	29.8	......	.8	1,560
Side, not including tallow, as purchased	19.3	43.3	13.0	24.0	......	.7	1,255

	Refuse	Water	Protein *	Fat	Total carbohydrates	Ash	Fuel value, per pound
PORK, FRESH	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Calories*
Chuck, ribs, and shoulder, edible portion	......	51.1	17.3	31.1	......	0.9	1,635
Flank, edible portion	......	59.0	18.5	22.2	......	1.0	1,280
Ham, fresh, edible portion	......	50.1	15.7	33.4	......	.9	1,700
Head, edible portion	......	45.3	13.4	41.3	......	.7	1,990
Head cheese, edible portion	......	43.3	19.5	33.8	......	3.3	1,790
Loin, chops, edible portion	......	50.7	16.4	32.0	......	.9	1,655
Loin, tenderloin, as purchased	......	66.5	18.9	13.0	......	1.0	900
Middle cuts, edible portion	......	48.2	15.7	36.3	......	.7	1,825
Shoulder, edible portion	......	51.2	13.3	34.2	......	.8	1,690
Side, not including lard and kidney, edible portion	......	34.4	9.1	55.3	......	.5	2,505
Side, not including lard and kidney, as purchased	11.5	30.4	8.0	49.0	......	.5	2,215
Clear backs, edible portion	......	25.1	6.4	67.6	......	.4	2,970
Clear bellies, edible portion	......	31.4	6.9	60.4	......	.4	2,675
Back, fat, as purchased	......	7.7	3.6	89.9	......	.1	3,860
Belly, fat, as purchased	......	13.8	5.2	81.9	......	.2	3,555
Feet, edible portion	......	55.4	15.8	26.3	......	.8	1,405
Kidney	......	77.8	15.5	4.8	......	1.2	490
Liver	......	71.4	21.3	4.5	1.4	1.4	615
PORK, PICKLED, SALTED, AND SMOKED							
Ham, smoked, edible portion	......	39.8	16.5	38.8	......	4.7	1,945
Shoulder, smoked, edible portion	......	37.6	15.5	41.0	......	6.1	2,020
Tongues, pickled, edible portion	......	58.6	17.7	19.8	......	3.6	1,165
Feet, pickled, edible portion	......	68.2	16.3	14.8	......	.9	930
Dry, salted back, edible portion	......	17.3	7.7	72.7	......	2.8	3,210
Dry, salted bellies, edible portion	......	17.7	8.4	72.2	......	3.4	3,200
Salt pork, clear fat, as purchased	......	7.9	1.9	86.2	......	3.9	3,670
Salt pork, lean ends, edible portion	......	19.9	8.4	67.1	......	5.7	2,985
Bacon, smoked, edible portion	......	20.2	10.5	64.8	......	5.1	2,930
Ham, deviled, canned	......	44.1	19.0	34.1	......	3.3	1,790
SAUSAGE							
Bologna	......	60.0	18.7	17.6	.3	3.7	1,095
Frankfort	......	57.2	19.6	18.6	1.1	3.4	1,170
Pork	......	39.8	13.0	44.2	1.1	2.2	2,125
POULTRY AND GAME							
Chicken, broilers, edible portion	......	74.8	21.5	2.5	......	1.1	505
Chicken, broilers, as purchased	41.6	43.7	12.8	1.4	......	.7	295
Fowl, edible portion	......	63.7	19.3	16.3	......	1.0	1,045
Fowl, as purchased	25.9	47.1	13.7	12.3	......	.7	775
Goose, young, edible portion	......	46.7	16.3	36.2	......	.8	1,830
Goose, young, as purchased	17.6	38.5	13.4	29.8	......	.7	1,505
Turkey, edible portion	......	55.5	21.1	22.9	......	1.0	1,360
Turkey, as purchased	22.7	42.4	16.1	18.4	......	.8	1,075
Chicken, liver	......	69.3	22.4	4.2	2.4	1.7	640
Chicken, heart	......	72.0	20.7	5.5	......	1.4	615
Chicken, gizzard	......	72.5	24.7	1.4	......	1.4	520
Plover, roast, canned	......	57.7	22.4	10.2	7.6	2.1	985
Quail, canned	......	66.9	21.8	8.0	1.7	1.6	775

* In many cases the sum of the constituents does not equal 100, since no account is taken of the carbohydrates. In analyses of meat it is sometimes customary to estimate the protein as the difference between 100 and the sum of the other constituents.

albumen on the entire surface of the meat is quickly coagulated, and the enveloping crust thus formed resists the dissolving action of water and prevents the escape of the juices and flavoring matters. Thus cooked, the meat retains most of its flavoring matters and has the desired meaty taste. The resulting broth is correspondingly poor.

Theoretically, the principal difference between roasting or baking and boiling is the medium in which the meat is cooked. In boiling, the flesh to be cooked is surrounded by boiling water; in roasting, by hot air, although in roasting proper much of the heat comes to the joint as 'radiant' heat. In both cases, if properly conducted, the fibres of the meats are cooked in their own juices.

It is interesting and at the same time important to remember that the smaller the cut to be roasted the hotter should be the fire and the shorter the period of cooking. A very hot fire coagulates the exterior and prevents the drying up of the meat juices. This method would not, however, be applicable to large cuts, because meats are poor conductors of heat, and a large piece of meat exposed to this intense heat would become burned and changed to charcoal on the exterior long before the heat could penetrate to the interior. The broiling of a steak or a chop is done on exactly this principle. An intense heat should be applied to coagulate the albumen thoroughly and stop the pores, and thus prevent the escape of the juices.

Recent experiments on the losses in cooking meat lead to the following deductions: The chief loss in weight during the cooking of beef, and doubtless other meats also, is due to the driving away of water. When beef is 'pan-broiled' there appears to be no great loss of nutritive material. When beef is cooked in water from 3 to 20 per cent. of the total solids is found in the broth. Beef which has been used for the preparation of beef tea or broth has lost comparatively little nutritive value, though much of the flavoring material has been removed. The amount of fat found in the broth varies directly with the amount present in the meat—i.e. the fatter the meat the larger the quantity in the broth. The amount of water lost during cooking varies inversely as the fatness of the meat—i.e. the fatter the meat the less the shrinkage in cooking. In cooking in water the loss of constituents is inversely proportional to the size of the piece of meat. In other words, the smaller the piece the greater the percentage of loss. The loss appears to depend upon the length of time of cooking. When meat in pieces weighing from 1½ to 5 pounds is cooked in water at 80° to 85° C. (175° to 185° F.) there appears to be little difference in the amount of material found in the broth whether the meat is placed in cold water or hot water at the start.

Since meat nutrients are principally protein and fat, a considerable amount of carbohydrate foods (bread and other cereals, vegetables, fruits, etc.) are eaten with the meats to form a well-balanced diet. According to the results of a large number of dietary studies, beef and veal together furnished 10.3 per cent. of the diet of the average American family; mutton and lamb, 1.4 per cent.; pork, 5.4 per cent.; and poultry, 1.1 per cent. of the total food; beef and veal, 24.6; mutton and lamb, 3.3; pork, 8.8; and poultry, 2.6 per cent. of the total protein, and 19.5, 3.8, 30.0, and 1.2 per cent. respectively of the total fat.

For further information, consult the general works mentioned under FOOD; also Förster, *Der Nährwert des Rindfleisches bei den gebräuchlichsten Zubereitungsarten* (Berlin, 1897); United States Department of Agriculture, Office of Experiment Stations Bulletins Nos. 28 (revised), 66, and 102; United States Department of Agriculture, Bureau of Chemistry Bulletin 13, part 10; United States Department of Agriculture, Farmers' Bulletin No. 34.

MEAT-BIRD. The Canada jay. See JAY.

MEAT-FLY. See FLESH-FLY.

MEAT EXTRACT. The term meat extract is commonly applied to a large number of preparations of very different character. They may be conveniently divided into three classes: (1) True meat extracts; (2) meat juice obtained by pressure and preserved, compounds which contain dried pulverized meat, and similar preparations; and (3) albumose or peptose preparations, commonly called predigested foods. The true meat extract, if pure, contains little else besides the flavoring matters of the meat from which it is prepared, together with such mineral salts as may be dissolved out. It should contain no gelatin or fat, and cannot, from the way in which it is made, contain any albumen. It is, therefore, not a food at all, but a stimulant, and should be classed with tea, coffee, and other allied substances. It should never be administered to the sick except as directed by competent medical advice. Its strong meaty taste is deceptive, and the person depending upon it alone for food would certainly die of starvation. Such meat extracts are often found useful in the kitchen for flavoring soups, sauces, etc. Broth and beef tea as prepared ordinarily in the household contain more or less protein, gelatin, and fat, and therefore are foods as well as stimulants. The proportion of water in such compounds is always very large. The preserved meat juice and similar preparations contain more or less protein, and therefore have some value as food. The third class of preparations is comparatively new. The better ones are really what they claim to be—predigested foods. They contain the soluble albumoses (peptoses), etc., which are obtained from meat by artificial digestion. The use of such preparations should be regulated by competent medical advice.

MEATH, mēth. A maritime county of the Province of Leinster, Ireland, bounded on the east by the Irish Sea and the County of Dublin; area, 906 square miles (Map: Ireland, E 3). The soil is a rich loam and fertile; but it has long been devoted almost entirely to pasture, only 21 per cent. being under crops. The capital is Trim. Population, in 1841, 183,850; in 1901, 67,460.

MEAUX, mô. A town of France, in the Department of Seine-et-Marne, on the river Marne (Map: France, J 3). It is 28 miles east of Paris on the Paris and Strassburg Railroad. It has a fine cathedral, a college, and a public library. Bossuet, whose remains are in the cathedral, was bishop here for twenty-three years. It has a brisk trade in corn, cheese, eggs, and poultry; its mills supply Paris with most of its meal and corn. There are manufactures of cotton and other cloths, cheese, sugar, steel, etc. Population, in 1901, 13,690.

MECAP'TERA. An order of neuropteroid insects. See SCORPION-FLY.

MEC'CA (Ar. *Makkah*, or *Bakkah*, Koran, Sura iii. 90; called also *al-Musharrifah*, the Exalted, *Umm al-Kura*, mother of cities, and *al-Balad al-Amīn*, the safe place, known to the geographer Ptolemy as Macoraba). Capital of the Turkish Province of Hejaz in Arabia, and, through being the birthplace of Mohammed, and containing the Kaaba, the central and most holy city of all Islam. The two other principal holy cities are Medina and Jerusalem. It is situated in latitude 21° 28′ N. and in longitude 40° 15′ E., 250 miles south of Medina, and about 60 miles east of Jiddah, its port on the Red Sea, in a narrow, barren valley, surrounded by bare hills from 250 to 800 feet high. The city is about a mile and a half long, and from one-third to two-thirds of a mile wide, and is divided into the upper and lower city. An aqueduct built by Zubaidah (810), wife of Harun al-Rashid, brings good water from the mountains to the east. By its position, Mecca commands the trade routes connecting lower Hedjaz with North, South, and Central Arabia, and it has at all times been a commercial and religious centre. The streets are somewhat regular, but unpaved; dusty in summer, and muddy during the rainy season. The houses are often five stories high. Some of the Government buildings, the Hamidiyyah, or palace of the Governor, the printing office, the chief watch-house, and the three armories, are in the new part of the city (*al-Jiyād*) southeast of the *Ḥarām*, or sacred precincts, and this part of the city has a European appearance. The only manufactures of Mecca are rosaries and pottery; some dyeing is also done; the inhabitants make their living chiefly by letting rooms at the time of the pilgrimage (see HAJJ) to the pilgrims who come here often to the number of 100,000. The largest number of these pilgrims are Malays and Indians; then come negroes, Persians, Turks, Egyptians, Syrians, Tatars, and Chinese. Ordinarily the city contains about 50,000 inhabitants. The centre of the city is the *Masjid al-Ḥarām*, or Sacred Mosque, which lies beneath the level upon which the rest of the city stands and is always liable to inundations from the *Sail* or mountain torrent. This sacred area is capable of holding 35,000 people. (See KAABA.) A great number of people are attached to the mosque in some kind of ecclesiastical capacity, as *Khātibs* (preachers), *Kātibs* (scribes), Muftis, judicial assessors, muezzins, etc. In addition to this, each section of the Mohammedan world has its representatives in Mecca, who take care of its pilgrims, provide them with lodgings, instruct them in the ceremonies, and the like. By the side of the mosque runs the *Mas'ah*, a street lined by high houses and reaching up to the hills, Safa and Marwah, through which the pilgrims must run seven times. A telegraph line connects Mecca with Jiddah on the west and with Taif on the east, where the Meccans spend their summer.

The history of Mecca has been an eventful one. Mohammedan legend holds that it was inhabited by Ishmael, whose posterity was supplanted by the *Banu Jurhum* of Yemen, who in their turn were supplanted by the *Khuzā'a*, also of Yemen, in the year A.D. 210. About 450 a certain Kussaī of the Koreish family, and an ancestor of Mohammed, seized the Kaaba and his family is supposed to reign there to-day. Here Mohammed was born (c. 570), and in the same year the city was menaced by the Abyssinians ('Year of the Elephant'). Its patricians opposed the Prophet, but gave in eight years after he had fled to Medina. Though large sums of money were lavished upon it by successive Mohammedan rulers, it was not an easy city to hold. It had its own pretender to the Caliphate in Abdallah-ben-Zobeīr, who was besieged in Mecca in 692 by the Caliph al-Hajjaj and finally slain. In 930 it was devastated by the Karmathians. But it always had its own rulers or sherifs, descendants of the Prophet through Hasan, son of Ali; and, though they recognized the supremacy of the Fatimites, Mamelukes, and Turkish sultans, they had a large measure of independence. Since Selim I. (1517) they rule in the name of the Turkish Sultan. In 1803 the Wahhabis took the city, but were driven out by Mehemet Ali in 1813. A change in the dynasty of sherifs occurred in 1827. Since 1840 their prestige has gradually diminished, a Wali (Governor) being sent by the Porte to offset their power. Though all non-Mohammedans are strictly prohibited from visiting the sacred territory, a few Europeans have been there (see HAJJ, where the literature will also be found). Consult Snouck-Hurgronje, *Mekka* (The Hague, 1888-89, with atlas), which is the standard work on the subject.

MÉCHAIN, mā'shăn', PIERRE FRANÇOIS ANDRÉ (1744-1804). A French astronomer, born at Laon. He attracted the attention of Lalande (q.v.), who secured him a place as Government hydrographer. He still, however, managed to keep up his astronomical studies, and was in 1782 elected to the Academy. In 1791, when the Government had decided to use the arc of meridian between Dunkirk and Barcelona as a basis for the new metric system, he was employed to measure that portion which lies between Rodez and Barcelona. On the completion of this work he resumed his observations at Paris, but, an error having been discovered in his measurements, he returned to Spain to correct it and was there stricken with yellow fever. He contributed memoirs on eclipses and the theory of comets to the *Transactions* of the Academy of Sciences and to the *Connaissance du Temps*, of which he was editor from 1788 till 1794.

MECHANICAL ADVANTAGE. See MECHANICS.

MECHANICAL ENGINEER. See ENGINEER AND ENGINEERING.

MECHANICAL ENGINEERS, AMERICAN SOCIETY OF. An association of professional mechanical engineers, manufacturers, and professors in technical schools, organized in New York in 1880 to promote the arts and sciences connected with engineering and mechanical construction. There are two meetings yearly: one, the regular meeting, in New York City in December; the other in some manufacturing city. The society has a considerable membership in all civilized countries and has headquarters in New York City, with a library of over eight thousand volumes. Membership in the society is carefully guarded, and consists of honorary members, members, associates, and juniors. To be eligible as a member, the candidate must be not less than thirty years of age, and must be a competent engineer, designer, or constructor, or must have served as a teacher of engineering for more than five years. An associate must be not less than twenty-six years of age, and must possess the qualifications of a member. A junior must have had considerable engineering experience or must be a graduate of an engineering school. The society is governed by a council consisting of a president, six vice-presidents, nine managers, and a secretary and treasurer.

MECHANICAL EQUIVALENT OF HEAT. See HEAT.

MECHANICAL POWERS — MACHINES. Technically described a machine is a combination of resistant bodies for modifying energy and doing work, the members of which are so arranged that, in operation, the motion of any member involves definite, relative, constrained motion of the others. A brief analysis of this definition will help to make it clear. First, a machine must consist of a combination of bodies; thus a lever must have its fulcrum, a screw its nut, a wheel and axle its bearings, and so on with other examples; the simplest machine must have at least two members between which relative motion is possible. Second, the members of a machine must be resistant in order to transmit force; they generally are rigid, but not necessarily so, since flexible belts, chains, or springs may be employed to transmit force under the particular action to which they are adapted. Third, a machine is used to modify energy and perform work. This proposition is obvious. The conception of a machine involves the conception of some source of energy and a train of mechanism suitably arranged to receive, modify, and apply the energy derived from this source to the desired end. A machine, then, consists of (1) parts receiving the energy; (2) parts transmitting and modifying the energy; and (3) parts performing the required work. Finally, (4) the relative motions of the members of a machine are constrained or restricted to certain definite, predetermined paths in which they must move, if they move at all, relatively. The first two propositions of the definition are equally true of structures (such as a bridge) as of machines, but the third and fourth are true of machines only and serve to distinguish machines from structures. A structure modifies and transmits force only, and does not permit relative motion of its members; a machine modifies and transmits force and motion, that is, energy, and permits relative constrained motion of its members.

The distinction between a machine and a mechanism remains to be explained. A mechanism is a combination of resistant bodies for transmitting and modifying motion (not motion and force or energy as in machines) so arranged that, in operation, the motion of any member involves definite, relative, constrained motion of the other members. A mechanism does work incidentally such as the overcoming of its own frictional resistance; its primary function is to modify and transmit motion; a mechanism or combination of mechanisms which receive energy and transmit and modify it for the performance of useful work constitute a machine.

Machines are of various degrees of complexity, but the simple parts or elements of which they are composed are reducible to a very few. These elementary machines are called the mechanical powers, and are commonly reckoned as the lever, the inclined plane, the jointed link, or toggle joint, and the hydraulic press. All machines and all locomotive movements of animals resolve themselves into the action of one or a combination of these simple mechanical powers or machine elements. A few observations applicable to all may appropriately be made here. (1) In treating of the theory of the lever and other mechanical powers, the question really examined is, not what power is necessary to move a certain weight, but what power is necessary to balance it. This once done, it is obvious that the least additional force will suffice to begin motion. (2) In pure theoretical mechanics, it is assumed that the machines are without weight. A lever, for instance, is supposed to be a mere rigid line; it is also supposed to be *perfectly* rigid, not bending or altering its form under any pressure. The motion of the machine is also supposed to be without friction. In practical mechanics, the weight of the machine, the yielding of its parts, and the resistance of friction have to be taken into account. (3) When the effect of a machine is to make a force overcome a resistance greater than itself, it is said to give a *mechanical advantage*. A machine, however, never actually increases power—for that would be to create work or energy, a thing as impossible as to create matter. What is gained in one way by a machine is always lost in another. One pound of weight at the long end of a lever will lift 10 pounds at the short end, if the arms are rightly proportioned; but to lift 10 pounds through 1 foot, it must descend 10 feet. The two weights, when thus in motion, have equal momenta; the moving mass multiplied into its velocity is equal to the resisting mass multiplied into its velocity. When the lever seems to multiply force, it only concentrates or accumulates the exertions of the force. The descending one-pound weight, in the case above supposed, may be conceived as making ten distinct exertions of its force, each through a space of a foot: and all these are concentrated in the raising of the ten-pound weight through one foot. The principle thus illustrated in the case of the lever holds good of all the other mechanical powers. (4) The object of a machine is not always to increase force or pressure; it is as often to gain velocity at the expense of force. (See LEVER.) In a factory, for example, the object of the train of machinery is to distribute the slowly working force of a powerful water-wheel or other prime mover, among a multitude of terminal parts moving rapidly, but having little resistance to overcome. (5) The mechanical advantage of a compound machine is theoretically equal to the product of the separate mechanical advantages of the simple machines composing it; but in applying machines to do work, allowance must be made for the inertia of the materials composing them, the flexure of parts subjected to strains, and the friction, which increases rapidly with the complexity of the parts; and these considerations make it desirable that a machine should consist of as few parts as are consistent with the work it has to do. (6) The forces or 'moving powers' by which machines are driven are the muscular strength of men and animals, wind, water, electrical and magnetic attractions, steam, etc.; and the grand object in the construction of machines is, with a given amount of impelling power, to get the greatest amount of work of the kind required. (See WORK; FOOT-POUND.) This gives rise to a multitude of problems, some more or less general, others relating more especially to particular cases—problems the investigation of which constitutes the science of applied mechanics. One of the questions of most general application is the following: If the resistance to a machine were gradually reduced to zero, its velocity would be constantly accelerated until it attained a maximum, which would be when the point to which the impelling force is applied was moving at the same rate as the impelling force itself (e.g. the piston-rod of a steam-engine) would move if unresisted. If, on the other hand, the resistance were increased to a certain point, the machine would come to a stand. Now the problem is, between these two extremes to find the rate at which the greatest effect or amount of work is got from the same amount of driving power. The investigation would be out of place here, but the result is that the greatest effect is produced when the velocity of the point of application is one-third of the maximum velocity above spoken of. The moving force and the resistance should therefore be so adjusted as to produce this velocity. See MECHANICS.

MECHANICAL TISSUE. The supporting tissue (stereome) of the plant, including not only the vascular system, but also the cortical sclerenchyma and collenchyma. Cortical mechanical tissue is particularly prominent in the hypoderma of stems and leaves.

MECHANICAL UNITS. Various units or standards used in different countries and under different conditions for the expression of mechanical quantities. One system, the C. G. S. system (q.v.), is based upon the centimeter, the gram, and the mean solar second. Another uses the foot, the pound, and the mean solar second. The yard and the pound are legally defined as follows: "The straight line or distance between the centres of the transverse lines in the two gold plugs in the bronze bar deposited in the office of the Exchequer [London] shall be the genuine standard yard at 62° F.; the pound is the mass of a certain piece of platinum marked

'P. S. 1844, 1 pound,' and deposited at the office of the Exchequer." Both the standard yard and pound are now preserved at the Standards Office of the Board of Trade, London. Still another system is based upon the foot (one-third of the yard), the mean solar second, and the *weight of one pound at sea-level and latitude 45°* as the unit of force. (A unit mass is given an acceleration unity by a unit force; hence, since the unit force gives per second an acceleration 32.172 feet per second to a mass of one pound, it will give an acceleration 1 to 32.172 pounds; therefore, on this system, the unit of mass is 32.172 pounds.)

The relations between these units is as follows:

1 centimeter = 0.3937079 inches = 0.01093633 yards.
1 yard = 91.43835 centimeter.
1 gram = 0.00220462125 lb. = 15.43235 grains.
1 pound = 453.59265 grams.

The units for the various important mechanical quantities are derived from them. These derived units and a few others are given in the following sections:

Velocity.—One centimeter per second; one yard (or foot) per second; one nautical mile (6080 feet) per hour = *knot.*

Acceleration.—Unit velocity per second.

Force.—One gram with unit C. G. S. acceleration = *dyne;* one pound with unit (ft.-lb.-sec.) acceleration = *poundal* = 13,825 dynes. Weight of one pound = 44,520 dynes.

Work.—One dyne acting through one centimeter = *erg;* 10^7 ergs =*joule.* One pound raised one foot = *foot-pound* = 1.326 joules. One kilogram raised one meter = *kilogram-meter* = 9.81 joules. (The last two relations are approximate.)

Power.—One joule per second = *watt;* 33,000 foot-pounds per minute = *horse-power* = 746 watts; 'force de cheval'= 75 kilogram-meters per second = 736 watts.

Pressure.—One dyne per square centimeter = 'barie.' One megadyne (10^6 dynes) per square centimeter = 'megabarie.' 'Weight of one pound per square foot' = 47.9 dynes per square centimeter; one poundal per square foot = 14.88 dynes per square centimeter; 'one centimeter of mercury' = 13.5950 × 980.692 dynes per square centimeter = 13,332.5 dynes per square centimeter; hence 75 centimeters of mercury = 1 megabarie (very closely); 76 centimeters of mercury, 'one atmosphere' = 1.0133 megabaries.

MECHANICS (Lat. *mechanica,* from Gk. *μηχανικά, mēchanika, μηχανική, mēchanikē,* mechanics, from *μηχανή, mēchanē,* device). The science which is concerned with the motion of matter; the possible kinds of motion, the conditions under which the motion remains unchanged, and those under which it changes. That branch of mechanics which discusses the possible kinds of motion is called *kinematics;* while that which discusses the properties of matter in motion is called *dynamics.* Dynamics is divided also into two parts—*statics* and *kinetics*—the former treating the conditions under which there is no change in the motion; the latter, those under which there is change.

HISTORICAL SKETCH.

The first mechanical problems solved were those dealing with the simple machines. Archimedes (B.C. 287-212) was acquainted with the law of the lever in its simplest form; and Leonardo da Vinci (1452-1519) stated the law for the most general case, when the forces were in any directions and applied at any points. The principle of the inclined plane was known to Galileo (1564-1642) and to Stevinus (1548-1620). Stevinus was the first to use a line to describe a force, and to make use of the principle of the composition and resolution of forces; he also discussed the properties of pulleys and combinations of pulleys, using the principle that if force applied to the cord (a weight) move down a certain distance, a weight fastened to the pulley must move up a distance such that the product of each weight by its distance is the same. This principle is that of 'virtual velocities,' so called, which was applied also by Galileo, Torricelli, Bernoulli, and Lagrange. In his treatment of the inclined plane Galileo made use of the general principle that there is equilibrium in any case when the weight as a whole cannot descend farther; or, as Torricelli expressed it, when the 'centre of gravity' cannot descend.

Galileo was the founder of the science of dynamics. He recognized the fact that if a piece of matter was in motion and was free from external action it would continue its motion unaltered. He proved by experiment that all bodies fall with the same acceleration toward the earth, and proposed that the value of a force's action on a body be measured by the acceleration produced. He recognized the independence of different motions in discussing the motion of a projectile. He was acquainted, too, with the general properties of a simple pendulum, especially its property of having a definite period which varied with the length of the string.

Huygens (1629-95) did fully as important work as Galileo and deserves to rank with him. He deduced the formula for centrifugal motion, $a = s^2r$. He invented a pendulum clock and the 'escapement' for it; he used a pendulum to determine g; and proposed a seconds pendulum as a standard of length. He solved the problem of deducing the length of a simple pendulum which would vibrate in the same period as a compound one, that is, he determined the position of the centre of oscillation (q.v.). In this last deduction he made use of the principle that in whatever manner the particles of a compound pendulum influenced each other, the velocities acquired in the descent of the pendulum are such that by virtue of them their centre of gravity rises just as high as the point from which it fell, whether the pendulum is considered a rigid body or as breaking up into particles each connected with the axis by a cord and thus forming a great number of simple pendulums. If p_1, p_2, etc., are the *weights* of the particles, h_1, h_2, etc., are the distances they have fallen at any instant, and s_1, s_2, etc., are their speeds at that instant. Huygens's principle leads to the relation, $\frac{1}{2}p_1s_1{}^2 + \frac{1}{2}p_2s_2{}^2 +$ etc. $= (p_1h_1 + p_2h_2 + \text{etc.})\,\dfrac{1}{g}$ or

$$\Sigma\,\tfrac{1}{2}ps^2 = \frac{1}{g}\,\Sigma ph.$$

In the case of a rigid body turning around a fixed axis $\Sigma\frac{1}{2}ps^2 = \frac{1}{2}\omega^2\Sigma pr^2$, where ω is the angular speed and r is the distance of the particle of weight p from the axis. Thus Huygens was led to the use of Σpr^2 as a measure of the inertia of a rotating body. He did not, however, realize the idea of mass as distinct from weight. The name 'moment of inertia' was given Σmr^2 by Euler.

Newton gave the principles of mechanics their final form, and since his day there have been no important additions to them. We owe to Newton (1642-1727) the recognition of other forces than weight, the general idea of force, and in particular the conception of inertia or mass as a property of matter distinct from its weight, the general statement of the principle of the composition and resolution of forces, and the law of action and reaction being equal but opposite. Newton adopted as the proper measure of a force the acceleration produced in a given portion of matter; or, in other words, the velocity produced in a given time. According to Huygens the measure of the force is the square of the velocity produced in a given distance. Among the philosophers who came after Newton and Huygens there was a school, following Descartes, who measured forces by the change in mv; another, following Leibnitz, who measured it by the change in mv^2. Thus, to a certain extent one school succeeded Newton; the other, Huygens. The two were shown by D'Alembert to be identical, although there was a great controversy for many years concerning their relative merits.

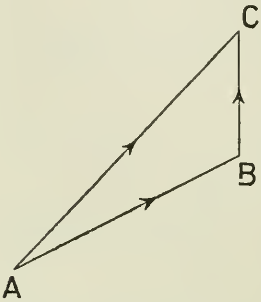
KINEMATICS.

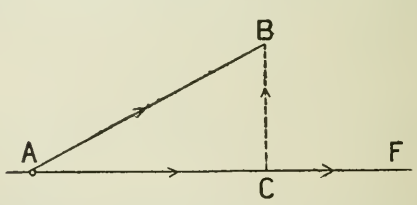
All possible motions of any geometrical figure may be divided into two classes, *translation* and *rotation*. In the former all lines in the moving figure remain parallel to themselves, i.e. the motions of all the points are identical; in the latter all the points of the figure are describing circles whose centres lie on a straight line called the 'axis.' In the general case the motion of a figure is a combination of translation and rotation.

TRANSLATION. In motion of translation it is necessary to consider the motion of one point of the figure only, as that is the same for all the points. If the figure is moved from one position to another, this *displacement* may be represented by a straight line joining the initial and final positions of any one point of the figure. This line indicates by its direction and its length the displacement of the whole figure; it is called a *vector*, and displacement is said to be a *vector quantity* because it requires for its complete understanding a direction and a numerical quantity only, and so can be pictured by a straight line having the proper direction and a length equal to or proportional to the numerical quantity.

If the motion of the figure is uniform—that is, if it passes over equal distances in equal intervals of time—the rate of motion, or the distance traversed divided by the time taken, is called the *linear speed*. If the motion is not uniform, the linear speed at any instant is the distance which the figure would move in the next second if its motion were to continue for that interval of time at exactly the same rate as it is at that instant: in mathematical symbols, if Δx is the length of the extremely short distance traversed in the extremely short interval of time Δt immediately following the given instant, the linear speed at that instant is the value of $\frac{\Delta x}{\Delta t}$ in the limit as Δt is taken smaller and smaller. Speed is therefore a number. If the speed in a particular direction is considered—that is, if a distinction is made between the motions of figures with the same speed but in different directions—the linear speed in a given direction is called the *linear velocity* in that direction. Linear velocity is evidently a vector quantity; the linear speed giving the numerical quantity, i.e. the length of the vector.

If a figure is given simultaneously two displacements, the resulting displacement is evidently found by 'adding geometrically' the two components. Thus if AB and BC represent the two component displacements, the actual one will be AC, formed by placing BC so as to continue the motion indicated by AB and completing the triangle. (A man walking across the deck of a moving ship illustrates this 'composition' of displacements.) Similarly, if AB and BC represent the linear velocities of the two component motions, the actual velocity is represented in direction and speed by AC. In a perfectly similar manner, three, four, etc., vector qualities may be added geometrically. Further, conversely, any displacement or velocity may be regarded as made up of two displacements or two velocities, the condition being that the two vectors representing the component quantities should form a broken line joining the ends of the vector representing the actual quantity. This is called 'resolution' of displacement or velocity. In resolving vectors it is nearly always best to take the components so that they are at right angles to each other, for then they are independent of each other. Thus if AB is a displacement—or any vector—its 'component in the direction' AF is the vector AC obtained by dropping a perpendicular from B upon AF. AB is equivalent to AC and CB, but CB has no connection with the direction AF, and AC is then that component of AB which indicates how much AB is concerned with the direction AF. In mathematical language the component in the direction AF of a vector AB is AB cos (CAB).





In general the velocity of a moving figure will not be constant; and the rate of change of the linear velocity at any instant—that is, if Δv is the extremely small change of the velocity in the extremely small interval of time Δt, the limiting value of $\frac{\Delta v}{\Delta t}$ — is called the *linear acceleration* at that instant. It is evident that acceleration being the change in velocity, and therefore the difference between two lines, is itself a vector quantity: it has a numerical value and a definite direction, and as with displacements and velocities, accelerations can be compounded by geometrical addition or resolved into components. Since linear velocity is characterized by a speed and by a direction, it can change in two independent ways: the speed can change, the direction remaining the same, e.g. a falling body; the direction can change, the speed remaining the same, e.g. a particle moving in a circle at a uniform rate. (In general, both speed and direction change, e.g. a vibrating simple pendulum.) There are therefore two independent types of linear acceleration. The three most interesting cases of linear acceleration are the following:

(1) Motion in a straight line, constant acceleration. If the acceleration is positive, the speed increases; if it is negative, the speed decreases. Let the acceleration be called a, and the speed at any instant s_0; then, t seconds later, the speed will be $s = s_0 + at$, and the distance traversed in that time will be $x = s_0t + \ at^2$. If t is eliminated from these equations it is seen that $s^2 - s_0^2 = 2ax$. These formulæ apply to a body falling freely toward the earth, in which case $a = 980$; to a body thrown vertically upward, in which case $a = -980$; and to many other illustrations.

(2) Uniform motion in a circle. If the circle has a radius r, and if the constant speed is s, the acceleration has for its numerical value $\frac{s^2}{r}$ and its direction at any instant is along the radius toward the centre from the point where at that moment the moving point is. This last fact is evident if the change in the *velocity* is considered. At any position in its path around the circle the moving point has a *velocity* along the tangent to the circle; the following instant this velocity is changed into the next tangent; and to secure this change a small vector perpendicular to the first tangent must be added to the vector representing the first velocity. The proof that the numerical value of the acceleration is $\frac{s^2}{r}$ will be found in all text-books on mechanics.

If the point makes N complete revolutions per second $s = 2\pi r\mathrm{N}$; and the acceleration equals $4\pi^2 r\mathrm{N}^2$.

(3) Simple harmonic motion of translation. This is a vibratory motion, to and fro along a straight line, such that, if distances from its middle point are called x, the acceleration of the moving point when it is at a distance x from the centre has the numerical value n^2x, where n is a constant quantity, and its direction is toward the middle point or centre. (Distances to one side of the centre are given positive values; to the other side negative.) This motion can be easily shown to be identical with that of the point which is the projection on a diameter of a point moving in a circle with uniform speed. It can be shown further that the *period* of this harmonic motion, that is, the time required for the point to go from one end of its path to the other and back again, is $2\pi/n$, where $\pi = 3.1416$. The length of the path is called the *amplitude;* and the position of the vibrating point at any instant gives its *phase.* Thus there may be two vibrating points which have the same period and the same amplitude, but differ in phase—one lags apparently behind the other.

A pendulum with a long supporting cord makes harmonic vibrations, if the amplitude is small; so does any point of a violin string if the string is vibrating in its simplest mode; so does a weight hanging from a rubber band or a spiral spring, if it is set vibrating in a vertical direction.

ROTATION. It can be shown by geometry that if a figure of any shape with one point fixed is displaced in any way by any series of rotations, the final position may be reached from the initial one by a single rotation around an axis passing through the fixed point. The simplest mode of describing such a displacement is to imagine a plane section through the figure perpendicular to this axis, to take in this plane a line *fixed in space* and one *fixed in the figure,* and then to measure the rotation by the change in the angle made with the former line by the latter as the figure turns around the axis. Three things are then necessary for the representation of the angular displacement: (1) The *position* of the axis; (2) its *direction*—a line in one direction will represent rotation in the direction of the hands of a watch, while one in the opposite direction will represent opposite rotation; (3) the *numerical value* of the angle of displacement, measured as just described.

(The numerical value of the angle between two lines is obtained by describing a circle of any radius R with the point of intersection of the lines as the centre, measuring the length of the arc, A, intercepted between the two lines, and dividing A by R. See TRIGONOMETRY).

This angular displacement can be completely pictured by a straight line in the proper direction made to coincide with the axis of rotation and of a length proportional to the angle of rotation: such a line is called a *rotor,* or a *localized vector,* because it is a vector placed in a definite position.

If a rotation around a fixed axis is considered, the *angular speed* is the rate of change of the angle formed by the line fixed in space and that fixed in the figure, as described above. The *angular velocity* in this case is the angular speed around the given axis in a definite sense of rotation; it is therefore a rotor. If a figure with one point fixed is given simultaneously two angular velocities around two different axes, the resultant angular velocity will be a rotor which is the geometrical sum of the two component rotors. *Angular acceleration* is the rate of change of angular velocity; and there are two independent types: (1) the position of the axis fixed, but the angular speed changing; (2) the angular speed constant, but the position of the axis changing. A door or gate when opening or closing is an illustration of the first type; while a spinning top generally furnishes an illustration of the second, because, when the axis of the top is not vertical, it is moving so as to describe a cone in space. Actually in the case of a spinning top the angular speed is decreasing owing to friction, so it is an illustration of the combination of the two types.

The three most interesting cases of rotation are the following:

(1) Position of axis fixed, constant angular acceleration. If the constant acceleration is α, and if at any instant the angular speed is ω_0, the angular speed t seconds later will be $\omega = \omega_0 + \alpha t$, and the angle rotated through in that interval of time will be $\theta = \omega_0 t + \frac{1}{2}\alpha t^2$. If t is eliminated from these two equations, it is seen that $\omega^2 - \omega_0^2 = 2\alpha\theta$. This

motion is illustrated by a fly-wheel or grindstone coming to rest under a constant friction or being set in motion at a uniform rate.

It is evident from the above definition of the numerical value of an angle that if the *linear* speed and acceleration of any point at a distance R from the axis are s and a, they are connected with the *angular* speed and acceleration of the whole figure by the relations $s = R\omega$, $a = R\alpha$.

(2) Angular speed constant, but the position of the axis describing a cone at a uniform rate. This motion is illustrated, as explained above, by a spinning top. A piece of apparatus which furnishes a more accurate illustration consists essentially of a heavy wheel whose axle is so supported that it can turn freely within a circular ring which is fastened rigidly to a metal rod carrying sliding weights at its further end; this rod is pivoted at its middle point so as to be free to turn in any direction; and the axle of the wheel is set in the same line as this rod. This instrument is called a 'gyroscopic pendulum.' (For a description of one made out of a bicycle wheel, see *Physical Review*, vol. x. p. 43, 1901.) To produce the desired motion, balance the wheel and its ring by means of the sliding weights until the rod is horizontal, set the wheel in rapid rotation, and disturb the balance slightly by adding a small weight to either portion of the rod. The rod will immediately begin to move around in a horizontal plane; and thus the position of the axis of rotation of the wheel will change, and will describe a plane—the limiting form of a cone. The reason for this change is that there is compounded with the angular velocity of the wheel around its own axis another one due to the disturbed balance of the rod which would of itself make the whole apparatus rotate around a horizontal axis, i.e. turn over as the extra weight pulls its side down. This added angular velocity is about an axis at right angles to that of the wheel, and both lie in a horizontal plane; the two angular velocities will compound therefore to form an angular velocity about an axis in the same horizontal plane, but in a position different from that of the axis of the wheel before it was disturbed. As fast as this axis takes up its new position, it is again disturbed; and so the motion is a continuous change of position of the axis of the wheel in a horizontal plane. (This case in rotation corresponds, therefore, perfectly to the one in translation of motion of a point in a circle at a uniform speed.) In the actual use of the gyroscopic pendulum there are other phenomena depending upon the properties of matter in motion; the above description is designed to be a purely kinematic one.

(3) Simple harmonic motion of rotation. This motion is illustrated by the to and fro rotation of an ordinary clock pendulum or by the vibrations of any body set swinging through small arcs when suspended on a horizontal axis, also by the balance-wheel of a watch. Let, as before, two lines be taken in a plane at right angles to the axis, one fixed in the figure, the other in space, but so chosen that they coincide when the vibrating figure is in its central position. Then, if θ is the angular displacement at any instant of the line fixed in the figure from the one fixed in space, the angular acceleration equals $m^2\theta$, where m is a constant quantity, and the direction of the axis of the acceleration is such as always to produce an angular velocity toward the position of equilibrium. The period of a complete vibration may be shown to be $2\pi/m$. The amplitude is the extreme angle turned through by the line fixed in the figure; the phase at any given instant depends upon the position of this line at that instant.

Motion in General. Translation and rotation are particular types of motion, and in general the motion of a figure includes both. It may be proved, however, by geometry that the most general displacement of a figure, produced by any number of motions, may be reduced to a combination of a translation along a certain line and a rotation around it as an axis; such a combination is called 'screw-motion.'

DYNAMICS.

Kinematics is a science which is concerned with geometrical ideas alone; it is the application of logical principles to certain definitions and axioms; it is not concerned with any appeal to experience. On the other hand, dynamics is fundamentally a science based on our experience of certain sensations associated with the idea of matter; and the object of the science is to make such an analysis of the facts of observation and experience as will lead to the statement of a few principles from which all observed phenomena may be predicted. It is possible to have a science based entirely on definitions—which are suggested by observations, however—and to show that all observed phenomena can be regarded as consequences of these definitions, if they are identified with actual physical quantities which appeal to our senses. Such a science is called 'theoretical dynamics.' In the following treatment statics is considered as a special case of kinetics.

Translation. The simplest property of matter (q.v.) is illustrated by an experiment due to Galileo. If a ball rolls down an inclined plane and then meets another plane inclined in the opposite direction, the ball will roll up it with a constantly decreasing velocity; the less inclined this second plane is, the less is the rate of change of the velocity of the ball as it rolls up; therefore, if the plane is perfectly horizontal, there is every reason for believing that the cause of the observed decreasing velocity of the ball is friction, and that if there were no friction the velocity of the ball would not change. In other words, it is thought to be a general law of nature that a portion of matter free from all external actions will maintain its state of motion unaltered.

If, however, the motion of one portion of matter is influenced by the presence of another piece of matter, it is observed that the effect is mutual. The simplest case of two bodies influencing each other's motion is illustrated by two billiard balls striking when rolling on a *smooth* table, i.e. a surface free from friction; by a man standing on a board which rests on *smooth* ice, and then jumping off; by a bullet fired from a gun; etc. One law applies to all such cases: if m_1 and m_2 are the masses of the two pieces of matter which are supposed to be so small as to be called 'particles,' v_1 and v_2 their linear velocities at any instant, V_1 and V_2 their linear velocities at any later time, then

$$m_1v_1 + m_2v_2 = m_1V_1 + m_2V_2,$$

provided there are no external actions, that is, provided that the only cause of the change in the linear velocity of one body is connected with the presence of the other. In this equation the sum of m_1v_1 and m_2v_2 and of m_1V_1 and m_2V_2 is a *geometrical* one, for each of the terms is a vector quantity. Owing to the importance of the product mass × linear velocity, it has received a name, *linear momentum*. See IMPACT.

This law can be expressed in a different way. If the positions of two particles of matter of masses m_1 and m_2 at any instant are given by coördinates x_1y_1 and v_2y_2, the coördinates of the 'centre of inertia' (q.v.) are defined to be

$$\bar{x} = \frac{m_1x_1 + m_2x_2}{m_1 + m_2} \text{ and } \bar{y} = \frac{m_1y_1 + m_2y_2}{m_1 + m_2}$$

Consequently as the particles move, the centre of inertia changes its position. If u_1 and u_2 are the components along the axis of X of the velocities of the two particles and w_1 and w_2 their components along the axis of Y, the components along the axes of X and Y of the velocity of the centre of inertia are

$$\bar{u} = \frac{m_1v_1 + m_2u_2}{m_1 + m_2} \text{ and } \bar{w} = \frac{m_1w_1 + m_2w_2}{m_1 + m_2}$$

But if v_1 and v_2 are the actual velocities of the two particles, v_1 is the geometrical sum of u_1 and w_1. Consequently, if the actual velocity of the centre of inertia is $\bar{V}$, it is the geometrical sum of $\bar{u}$ and $\bar{w}$; that is,

$$\bar{v} = \frac{m_1v_1 + m_2v_2}{m_1 + m_2}$$

or $(m_1 + m_2)\,\bar{V} = m_1v_1 + m_2v_2 = m_1V_1 + m_2V_2$. Since $m_1 + m_2$ does not change in any physical action, $\bar{v}$ must remain constant in direction and amount, however the velocities of the two particles are altered by their mutual influence.

So far as is known this law of influence of two bodies can be extended to any number of bodies mutually influencing each other; that is, if any number of particles of matter of masses, m_1, m_2, etc., are left alone, free from external actions, their velocities, however changed by mutual reactions, must satisfy the law that the geometrical sum of the linear momenta remains unchanged,

$$m_1v_1 + m_2v_2 + \text{etc.} = \text{constant.}$$

Expressed in terms of the properties of the centre of inertia of the system of particles, this law is that the centre of inertia of a system of particles free from external influences moves in a straight line with constant speed. A large solid is of course a special case of a system of particles; and the motion of the centre of inertia of such a body must obey the same laws as does a single particle.

This principle of dynamics is known as the 'conservation of linear momentum.' When this principle is applied to the mutual action of two bodies, it takes the form

$$m_1v_1 + m_2v_2 = \text{constant,}$$

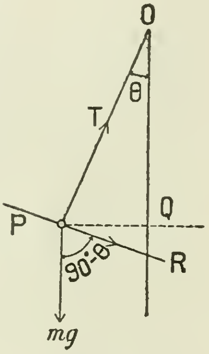
where m_1 is the mass of one body and v_1 is the velocity of its centre of inertia, m_2 is the mass of the second body and v_2 the velocity of its centre of inertia, and the summation is a geometrical one. This equation means then, that if m_1v_1 is changed in any way by v_1 changing either in direction or in speed, m_2v_2 must change at the same time by an amount equal and opposite to that of the change of m_1v_1. The rates of changes of the two momenta must then be equal and opposite vectors in the same straight line; that is, $m_1a_1 = -m_2a_2$ if a_1 and a_2 are the linear accelerations of the two centres of inertia. (Illustrations are afforded by a body falling toward the earth, the earth has an acceleration upward; by a piece of iron attracted to a magnet which is suspended free to move, etc.) This may be expressed by saying that under the influence of the second body the first has received an acceleration a_1. The product m_1a_1 is called the 'kinetic reaction' of the body of mass m_1 against the given influence, which is equal and opposite the kinetic reaction of the second body against the action of the first. The influence of any body on another of mass m is measured, therefore, by the product of m and the acceleration produced, i.e. ma. If there is a system of many bodies, the action on one due to all the others is the sum of its kinetic reactions against all the actions; that is, it is the product of the mass of that one into the geometrical sum of the accelerations which each in turn of the others by itself would produce—or the actual acceleration of the one. The product of the mass of any body, therefore, by the linear acceleration of its centre of inertia measures the external influences acting on it. These external influences combine to form what is called the 'external force.' In symbols

$$F = ma$$

meaning that if a body of mass m is subjected to a given set of external influences its acceleration is given by F/m or if bodies of different masses are subject to the same force the accelerations produced vary inversely as the masses. A 'unit force' is such an external action as results in an acceleration of 1 when the mass is 1, or an acceleration 2 when the mass is ½, etc. If the C. G. S. system is used, the unit of mass is a gram, and a unit acceleration is a change in one second of the velocity by an amount of one centimeter per second; the unit force on this system is called the 'dyne.' The dyne is so small, being illustrated nearly by the upward force of the hand required to keep a milligram from falling, that a 'megadyne' (or $10^6 \times$ dyne) is used as a practical unit.

There are many kinds of forces (q.v.): gravitation, electrical, magnetic, muscular, elastic, etc. It should not be thought that they are *things* that exist; they are simply numerical values of quantities giving the measure of external influences on the motion of a body, e.g. the effect of pulling a string attached to a body, the effect of a magnet on a piece of iron, etc. Forces are vector quantities and may be compounded or resolved into components. The commonest illustrations of a force are given by a body falling freely toward the earth, in which case the acceleration, g, is a constant for all bodies at any one place on the earth's surface (see GRAVITATION), and so the force on a body of mass m is mg, and if a body is suspended and kept from falling, there must be an upward force mg due to the suspension; g is nearly 980 centimeters per-second per second, or about 32 feet per-second per second. This product mg is called the 'weight' of the body.

One of the most important illustrations of force is shown by uniform motion of a particle in a circle, which may be produced by a string whirling the body in a sling, or by making the body roll around inside a horizontal circular hoop on a smooth table. In the former case the string is said to 'exert a tension' on the particle; in the latter, the hoop is said to 'exert a pressure' on it. In both cases the acceleration is s^2/r, where s is the linear speed of the particle and r is the radius of its path, and has the direction from the moving particle toward the centre of the circle; consequently the force is ms^2/r in this direction. In other words, to make a particle of mass m move at a uniform speed s in a circle of radius r requires a force acting on it directed toward the centre and with a numerical value ms^2/r, or, if ω is the angular speed of the particle, $mr\omega^2$. If this force is decreased, the particle will cease to move in a circle and will move farther away from the centre; if the force is removed at any instant—by cutting the string—the particle will continue to move with the same velocity that it has at that instant, i.e. along the tangent to the circle with a constant speed. This fact that, unless the force is sufficiently great, the particles of a rotating body will move farther away from the axis of rotation is illustrated in many ways. The body is said to move under the action of a 'centrifugal force.'



A simple pendulum is defined to be a particle of matter suspended by a long massless string. If it swings through small angles in a vertical plane, the motion of the particle or 'bob' is practically in a straight line, and is simple harmonic. Let O be the point of suspension of the pendulum, let OQ be its position when hanging at rest, and OP its position at any instant while it vibrates; call the angle QOP, θ. There are two forces acting on the particle of mass m placed at P: one is the tension of the string along the string toward O, the other is its weight mg, vertically down. The actual motion at this instant is tangent to the circle whose radius is OP, that is, it is in the direction PR, either up or down. The force T has no component in this direction, being perpendicular to it; and that of the force mg is $mg \sin\theta$ (using the general formula for resolving a vector). Therefore the acceleration of the vibrating particle, in the direction PR, the force divided by the mass, is

$$\frac{mg\sin\theta}{m} \text{ or } g\sin\theta$$

This acceleration may be written

$$g\,\frac{PQ}{OP}; \text{ or calling PQ, } x, \text{ and OP, } l;\ g\,\frac{x}{l}$$

If the amplitude is very small, PQ is practically the path of the moving particle; and thus the motion is harmonic, in accordance with the definition of such motion; and its period, therefore, is

$$2\pi\sqrt{\frac{l}{g}}$$

For other illustrations of forces see ELECTRICITY; MAGNETISM; ELASTICITY; GRAVITATION; CENTRAL FORCES.

It has been shown that, if there are no external influences, the centre of inertia of a system of particles or of a large body continues, if in motion, to move in a straight line with a constant speed. This is owing to the fact that the action and reaction of each pair of particles are equal and opposite. If, however, there are external forces, the acceleration of the centre of inertia in any direction is the sum of the components of these forces in this direction divided by the mass of the whole system. This is equivalent to saying that the motion of the centre of inertia of a system of particles is exactly as if a single particle of the mass of the system were under the influence of the given forces. Thus if an iron beam falls from a building (without touching anything as it falls) the motion of its centre of inertia is like that of a falling particle—vertical—however the beam revolves. If a hammer is thrown at random into the air, its centre of inertia will describe a parabola, because that is the path of a projected particle. See PROJECTILE.

Many forces are not constant and some are abrupt, like the blow of a hammer; and in these cases it is impossible to measure them. Their *effect* is evidently to produce a sudden change in velocity; and it is measured by the *total* change in the linear momentum. Force itself is the rate of change of linear momentum; so if a force F acting on a particle produces a change of momentum from mv_0 *to* mv in an interval of time t,

$$F = \frac{mv - mv_0}{t};$$

and thus the total change of momentum equals the product of the force and the interval of time. This product Ft is called the 'impulse' of the force, and may be measured even if both F and t are unknown. Similarly, if an impulsive force acts on a large body, the velocity of its centre of inertia will be changed from v_0 to v in the *direction* of the force. In other words, the change of velocity of the centre of inertia, $v - v_0$, equals the amount of the impulse divided by the mass of the body, entirely regardless of the *point* of application of the force. The *time* required for a force F to change the velocity from v_0 to v is

$$\frac{mv - mv_0}{F}$$

The *distance* required for this same force F to produce this change in velocity from v_0 to v in its direction is found by the formulæ of kinematics, which show that under a constant acceleration a, the distance traversed while the speed changes from s_0 to s is such that $2ax = s^2 - s_0^2$. Therefore, in this case, since $a = F/m$,

$$x = \frac{\frac{1}{2}ms^2 - \frac{1}{2}ms_0^2}{F}$$

The product Fx, that is, the force multiplied by a distance in its line of action, is called the 'work'; the quantity $\frac{1}{2}ms^2$ is called the 'kinetic energy' of translation of the body whose mass is m when it has the speed s. This formula is expressed in words by saying that the '*work done by the force*' on the body equals the *increase* in its kinetic energy of translation, provided the speed is increasing, e.g. a train being set in motion. If the speed is decreasing, e.g. a train slowing up by virtue of its brakes and the resulting friction, it is said that the body *loses* an amount of kinetic energy of translation equal to the work it does in overcoming friction or '*against the force*' F.

ROTATION. A 'rigid body' is defined as one which is not deformed in any way under the forces acting on it. If such a body is pivoted on an axis whose position is fixed, e.g. a door, a grindstone, etc., it is self-evident that the angular motion produced in it by a force such as a push or pull depends not alone on the amount of the force and its direction, but also on its point of application. Thus if the force is at right angles to the door and near the hinges, there is only a slight effect; if it is applied near the edge of the door, it is much greater; and if the line of action of the force passes through the axis of rotation, there is no effect so far as rotation is concerned. If a plane section be imagined in the body, at right angles to the axis, it is evident that a force perpendicular to this plane, i.e. parallel to the axis, has no effect on the angular motion; while a force lying in this plane has an effect which depends upon both the force and the perpendicular distance from the point where the axis cuts the plane to the line of action of the force. This perpendicular distance is called the 'lever-arm' of the force with inference to the axis; and the product of the numerical value of the force and its lever-arm is called the 'moment of the force' around the axis. A 'moment' such that the resulting effect of the force is to produce rotation in one direction is called positive; while if its effect is to produce the opposite rotation, it is called negative. A moment is then a rotor. It can be shown by theoretical considerations that the 'moment of a force' about an axis is the proper numerical value to give the rotational effect of the force; and this is in accordance with experience, for, if a body pivoted on an axis is kept from turnreg under the opposing actions of two forces differently placed, it is found that the moments of the two forces about the axis are equal and opposite.

If a moment is acting on a pivoted body such as a door, its immediate effect is to produce angular acceleration; just as the effect of a force in translation is to produce linear acceleration. It is important to determine the connection between the moment of the force and the resulting angular acceleration. The simplest case is that of a particle of matter joined to an axis by a massless rigid rod, and a force acting on the particle at right angles to the rod. If the rod has a length r, and the particle has a mass m, the moment of the force F around the axis is Fr, and the *linear* acceleration of the particle in the direction of the force is $\frac{F}{m}$. Therefore, the *angular* acceleration (α) is $\frac{F}{mr}$; and if the moment of the force is called L,

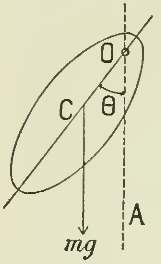
$$L = Fr = mr^2\alpha.$$

The coefficient of α, mr^2, is called the 'moment of inertia' of the particle around the axis. If, now, the rotating body is of any shape or size, it may be shown that the angular acceleration (α) resulting from a moment (L) is given by the formula $\alpha = \frac{L}{\Sigma mr^2}$, where Σmr^2 is the sum of the products of the mass of each particle of the body by the square of its distance from the axis. Σmr^2 is called the moment of inertia of the whole body around the axis and is commonly written I. Hence

$$L = I\alpha,$$

a formula for rotation of a rigid body around an axis whose position is fixed, which corresponds perfectly with the formula $F = ma$ for translation. In the same way, therefore, that m measures the inertia of a body so far as translation is concerned, I measures its inertia for rotation.

A simple illustration is that of a body pivoted about a horizontal axis so that it can make oscillations under the action of gravity, like a common clock's pendulum. Take a plane section of the body at right angles to the axis of rotation (at O) and passing through the centre of inertia (C), to describe the rotation choose the line fixed in the body as the one joining the centre of inertia of the body and the point where the axis meets the plane (OC), and as the line fixed in space the one where OC comes when the body is hanging at rest (OA). As the body vibrates, it will occupy in turn different positions which are completely described by the angle (θ) between OC and OA. The problem is to find the angular acceleration. There are two forces acting on the body: one is the supporting force of the pivot, and its moment about the axis is zero because it passes through O; the other is the weight of the body, which is mg, where m is the mass of the body and g is the linear acceleration of a body falling freely, and its line of action is vertically down through the centre of inertia—both of which facts will be explained later. Calling the length of the line OC, l, the moment of the force mg about the axis through O is $mgl\sin\theta$; therefore the angular acceleration is $\frac{mgl\sin\theta}{I}$, and it is in such a direction around the axis as to produce angular motion tending to bring OC to coincide with OA. If the amplitude of the vibration is small the $\sin\theta$ may be replaced by θ; and the angular acceleration is $\frac{mgl}{I}\theta$. Consequently the motion is simple harmonic; and the period of one complete vibration is $2\pi\sqrt{\frac{I}{mgl}}$. Such an oscillating body is called a 'compound pendulum,' and it has many interesting properties. (See CENTRE OF GYRATION; CENTRE OF OSCILLATION.) A simple pendulum is a special case of a compound one; in it $I = ml^2$ and so the period becomes, as before, $2\pi\sqrt{\frac{l}{g}}$.



Since $L = I\alpha$, if the angular velocity around the axis is called ω, this equation may be written

$$L = \frac{I\omega - I\omega_0}{t},$$

where $\omega - \omega_0$ is the change in the angular velocity in t seconds. The product Lt is called the 'impulse' of the moment of the force, or the moment of the impulse of the force. As a result of an impulsive moment, the product Iω—called the 'angular momentum'—is changed.

The time taken for a moment L to change the angular velocity from ω_0 to ω is evidently

$$t = \frac{I\omega - I\omega_0}{L}$$

The angle through which the body turns while this change is going on is given by the formula of kinematics $2\alpha\theta = \omega^2 - \omega_0$; and as $\alpha = L/I$, the angle

$$\theta = \frac{\frac{1}{2}I\omega^2 - \frac{1}{2}I\omega_0{}^2}{L} \text{ or}$$

$$L\theta = \tfrac{1}{2}I\omega^2 - \tfrac{1}{2}I\omega_0{}^2$$

The product L is called 'work'; and the work is said to be *done by* the moment if ω is increasing, and *against* the moment if ω is decreasing. $\frac{1}{2}I\omega^2$ is called the 'kinetic energy of rotation' of the body whose moment of inertia about a given axis is I and whose angular speed is ω.

Motion in General. If the rigid body is not pivoted around a fixed axis, but is free to move in any direction or manner, it will receive, in general, both linear and angular acceleration under the influence of a force, e.g. if a body is thrown in the air. (Under the action of gravity alone there is, however, only linear acceleration, for reasons to be given immediately.) It has been shown that the linear acceleration of the centre of inertia of a body acted on by any forces is the same as that which a particle having a mass equal to that of the body would have under the action of the same forces. A force in general does not have a line of action passing through the centre of inertia; imagine a plane section of the body through the line of action and the centre of inertia; the force will then in general have a moment about an axis through the centre of inertia perpendicular to this plane. Since the translation of the centre of inertia of the body under the action of the force is quite independent of the rotation, the rotation will be exactly as if the above axis is fixed, i.e. if m is the total mass of the body, I its moment of inertia about this particular axis, F the force, and L its moment about the axis, the linear acceleration of the centre of inertia will be $\frac{F}{m}$ and the angular acceleration $\frac{L}{I}$. So, if the force has its line of action through the centre of inertia, there will be no angular acceleration, e.g. the action of gravity.

If an impulsive force, whose impulse is K and whose lever arm with reference to an axis through the centre of inertia is k, acts upon the body, the velocity of the centre of inertia in the direction of the force will change according to the formula $v - v_0 = K/m$, and the angular velocity about the axis through the centre of inertia will be given by the formula $\omega - \omega_0 = \frac{Kk}{I}$. If the body is originally at rest, its centre of inertia will move instantly in the direction of the force with a velocity K/m, and it will instantly rotate with an angular velocity $\frac{Kk}{I}$. If the line of the force is through the centre of inertia $k = 0$, and there is no angular motion. This fact furnishes an experimental method for the determination of the centre of inertia (q.v.).

If the linear velocity of the centre of inertia at any instant is v, and if the angular velocity is ω, the entire kinetic energy is $\frac{1}{2}mv^2 + \frac{1}{2}I\omega^2$, where m is the total mass and I is the moment of inertia of the body about the axis of rotation through the centre of inertia.

Composition of Forces—Statics. If several forces are acting on a rigid body there will be produced as a rule both linear and angular accelerations; it is a problem then to determine what single force, if any, can produce the same result. If such can be found, it is called the 'resultant.' Since, as stated in kinematics, the most general motion is a 'screw-motion,' it is impossible in general to have a resultant. If, however, the forces all have their lines of action in one plane, they have a resultant except in one case to be noted hereafter. Such forces are called 'coplanar.' It is simplest to distinguish between two groups of pairs of forces, parallel and non-parallel.

Two Non-Parallel Coplanar Forces. The lines of action of two such forces meet in a point in their plane. Consider a case in which this point is in the rigid body on which the two forces are acting. The effect of a force upon a rigid body is evidently the same wherever its *point* of application is, provided it is in the line of action of the force. Therefore the action of the two forces in this case is as if they were both applied at that point of the rigid body where their lines of action cross. Their resultant is then found by constructing their geometrical sum at this point; for such a force has obviously a translational effect equivalent to the sum of the effects of the two forces, and it may be shown by simple geometry that its moment around any axis is equal to the sum of the moments of the two forces around that axis, and so its rotational effect is the same as the combined effects of the two forces. The line of action of the resultant passes through the point of intersection of the two forces, but its *point* of application can be anywhere in this line; consequently, it is entirely immaterial whether the point of intersection itself is a point of the body or not.

It is evident that if the body is under the action of three forces, one of which is equal and opposite to the resultant of the other two, there is no resulting force or moment; that is, there is neither linear nor angular acceleration. Such a condition is called 'equilibrium' (q.v.). The stability, instability, etc., of equilibrium are discussed in the article on Equilibrium.

Conversely, if a rigid body is in equilibrium under the action of three non-parallel forces, their lines of action must meet in a point, they must lie in one plane, and one must be equal and opposite to the geometrical sum of the other two.

Two Parallel Forces. Two parallel forces form a limiting case of two non-parallel coplanar forces whose point of intersection recedes to an infinite distance. Their geometrical sum then becomes their *algebraic* sum; if the two forces are in the same direction, their resultant is a force parallel to them, in the same plane, and numerically equal to the sum of their numerical values; if they are in opposite directions, their resultant is a force parallel to them, in the same plane, and numerically equal to the difference of their numerical values. (For the time being, the case is excluded in which the two parallel forces are equal and opposite; such a combination is called a 'couple,' q.v.). This resultant must have such a position relative to the two forces that its moment about any axis equals the sum of their moments about the same axis. If the forces are as shown in the figure, F_1 and F_2 being at a known distance $\overline{AC}$ apart and O being the intersection of any axis perpendicular to their plane with the plane, OCBA, being a line perpendicular to the forces, the resultant R must have such a position that

$$R\overline{BO} = F_1\overline{AO} + F_2\overline{CO}$$

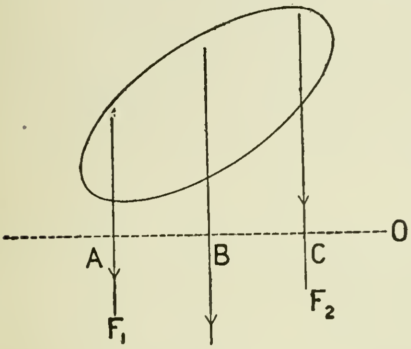
Substituting for R its value $F_1 + F_2$, this becomes

$$(F_1 + F_2)\overline{BO} = F_1\overline{AO} + F_2\overline{CO}$$

or $$F_1\overline{AC} = (F_1 + F_2)\overline{BC}$$

hence $$\overline{BC} = \frac{F_1}{F_1 + F_2}\overline{AC}$$

and therefore the position of the resultant is given in terms of known quantities. (This expresses the obvious fact that the moment of the resultant around an axis through C equals the moment of F_1 around the same axis; for the moment of F_2 around this axis is zero.) In a perfectly similar manner the resultant of two parallel forces in opposite directions may be found.



$R = F_1 + F_2$

One of the most important illustrations of parallel forces is given by the gravitational action of the earth on a body. Experiments show that the accelerations of all bodies—all materials and all quantities—when falling freely toward the earth at any point on its surface are the same, '*g*.' Therefore each particle of matter of mass *m* near the surface of the earth is being acted upon by a force *mg*, whose direction is toward the centre of the earth. Any large rigid body is, then, under the action of a great number of parallel forces. Their resultant is a vertical force *Mg*, if M is the total mass of the body. Its centre, i.e. the point through which its line of action always passes, however the body is turned, is called its 'centre of gravity' (q.v.). It may be shown analytically and by experiment that this point coincides with the centre of inertia of the body. This is further evident from the fact that, if a body falls, however it revolves in so doing, its centre of gravity must have the acceleration *g;* and this property has been shown to be peculiar to the centre of inertia.

It is evident that if a rigid body is under the action of three co-planar parallel forces, one of which is equal and opposite to the resultant of the other two, the body is in equilibrium. The conditions then are (1) that the algebraic sum of the three forces equals zero; (2) that the algebraic sum of the moments of the three forces around any axis equals zero. If any number of co-planar forces, parallel or non-parallel, act on a rigid body their resultant may be found by compounding them in pairs, as described. If, however, the final pair of forces is a couple, that is, consists of two equal and opposite forces, there is no resultant. The moment of a couple around any axis perpendicular to their plane is the product of either of the forces by their distance apart; this product is called the 'strength' of the couple. The action of a couple is to make a body rotate about an axis perpendicular to its plane and passing through the centre of inertia of the body; and this can be balanced, not by a single force, but by another couple of equal strength, and opposite in direction. A couple is then a rotor.

The action on a rigid body of any number of forces in all directions can be reduced in the end to a single force through the centre of inertia and a couple; for each force can be replaced by a parallel force through the centre of inertia and a couple lying in their plane, and so all the forces reduce to the sum of a number of forces all passing through the centre of inertia and to the sum of an equal number of couples each tending to produce rotation around its own axis passing through the centre of inertia.

The dynamics of fluid bodies are considered in HYDRODYNAMICS and PNEUMATICS (qq.v.).

WORK AND ENERGY. Two general formulæ were developed in the discussion of translation and rotation,

$$Fx = \tfrac{1}{2}ms^2 - \tfrac{1}{2}ms_0^2$$
$$L\theta = \tfrac{1}{2}I\omega^2 - \tfrac{1}{2}\omega_0^2$$

The first formula may be expressed in words as follows: if a particle whose mass is *m* is moving with a speed s_0 in any direction, this will be changed to *s* in that same direction under the action of a constant force F in that direction, provided the distance traversed in that time is *x* as given by the relation $Fx = \frac{1}{2}ms^2 - \frac{1}{2}ms_0^2$. An illustration is afforded by an arrow shot from a bow: $s_0 = 0$, then $Fx = \frac{1}{2}ms$. Fx is called the 'work' done by the bow, and the quantity $\frac{1}{2}ms^2$ is called the *kinetic energy of translation.* Any body, not itself in motion, which has the power of producing kinetic energy in another body is said to have *potential energy.* Thus a bent bow, a compressed spring, a stretched elastic cord, etc., have potential energy. To bend the bow, compress the spring, stretch the cord, etc., a force must be overcome; that is, motion is produced in a direction contrary to the elastic force of the body. The numerical value of the potential energy is defined as equal to the product of the force overcome and the distance through which this has been done, i.e. to the 'work done on' the bow, spring, or string. If the spring is compressed by a body falling upon it, the spring gains potential energy since work is done on it and the body loses kinetic energy. (The spring and body together would naturally continue to vibrate up and down, but it may be supposed here that the spring is caught and held when it is compressed to its greatest extent.) If F is the force of opposition due to the spring; *x*, the distance required to change the speed of the body of mass *m* from *s* to s_0; the gain of potential energy of the spring in that distance is Fx, and the loss of kinetic energy is $\frac{1}{2}ms^2 - \frac{1}{2}ms_0^2$, where $Fx = \frac{1}{2}ms^2 - \frac{1}{2}ms_0^2$. Similarly, if the spring expels the body, the spring does work on the body and loses potential energy, and the body gains kinetic energy; the loss in potential energy being Fx and the gain in kinetic energy being $\frac{1}{2}ms^2 - \frac{1}{2}ms_0{}^2$ if in the distance x the speed is increased from s_0 to s; and as before $Fx = \frac{1}{2}ms^2 - \frac{1}{2}ms_0{}^2$. The kinetic energy of the spring itself is neglected.

In words, this formula means that the loss of potential energy of the system producing the acceleration equals the gain of kinetic energy of the particle accelerated; or, the gain of potential energy of a system producing retardation equals the loss of kinetic energy of the retarded particle. Kinetic energy may also be produced by the impact of another body; and all experiments are in accord with the idea that the kinetic energy gained by a body in this case equals that lost by the impinging particle *provided no other effects are produced.* This is illustrated by the impact of perfectly elastic bodies. (In general, when there is impact, heat-effects such as rise of temperature are produced, in which case the kinetic energy gained by the particle does not equal that lost.) In general, then, in mechanics, whenever one body loses energy another body gains an equal amount, work being simply the transfer of the energy. Work is done in two ways: producing a change in speed and in overcoming some opposing elastic force. Unless there is *motion* in the direction of the force, no work is done.

It is evident that the kinetic energy of a moving body involves the idea of *speed,* not *velocity,* because the amount of work it can do is independent of the *direction* of the motion. (Also if there is no change in the speed of a body, the force is at right angles to the motion and so no work is done, whatever the change in direction may be.) Illustrations of the second formula, $L\theta = \frac{1}{2} I\omega^2 - \frac{1}{2}I\omega_0{}^2$, are given by the turning of a grindstone, and by a fly-wheel being set in motion or stopped.

There are other ways of doing work than in overcoming elastic forces and producing speed, e.g. raising a body up from the earth, separating a piece of iron from a magnet, separating two bodies electrified oppositely, overcoming the force of friction, etc. In all these cases, the body doing the work loses energy and the system on which work is done gains energy. The 'principle of the conservation of energy' is that in every case the energy lost by the former equals that gained by the latter; so that on the whole there is no change. Every phenomenon in nature is in accord with this principle so far as is known.

When a body is raised from the earth, work is done equal to the product of the weight of the body and the *vertical* height it is raised, mgh. This amount of energy is gained by the system consisting of the earth and the body whose mass is m; but until gravitation is understood it will be impossible to locate the energy in any definite place or places. If a body falls through a height h, it and the earth lose potential energy, mgh, which is gained in the form of kinetic energy by the falling body and the earth, principally by the former, since the change in the speed of the earth occasioned by the body as it falls toward it is so infinitesimal. If, after the body falls a distance, h, its speed is s, its kinetic energy is $\frac{1}{2}ms^2$, and therefore $mgh = \frac{1}{2} ms^2$ or $s^2 = 2gh$. This formula shows that the speed of a falling body depends upon the *vertical* height traversed, not on the slope or length of the path itself; it may fall vertically, or down an inclined plane, or down a spiral, etc.

The cases of work being done against electrical and magnetic forces are discussed under ELECTRICITY and MAGNETISM (qq.v.). Whenever work is done in overcoming friction, it is observed that heat-effects are produced, which can be traced to the fact that the minute portions of the body on which the work is done gain energy. This question is fully discussed under HEAT (q.v.). Since, when any inelastic body is deformed in any way, there is internal friction, part of the energy gained by such a body when it strikes another body goes into producing heat-effects.

It is a general property of motion, which follows at once from the definition of potential energy, that all motions take place of themselves in such a manner as to make the potential energy of the system decrease, and that equilibrium is not reached until the potential energy has reached a value such that it is a minimum—that is, is as small as is possible under existing conditions.

The unit of work or energy is that corresponding to a unit force acting through a distance of a unit length. On the C. G. S. system this unit is, then, that corresponding to a force of 1 dyne acting through 1 cm.; it is called an 'erg.' An erg is, however, such a small unit that 10^7 ergs—a 'joule,' as it is called—is ordinarily used as the practical unit. The amount of work done in a unit interval of time by any agency is called its 'activity' or 'power' (q.v.). On the C. G. S. system the unit is, then, 1 erg per second. The practical unit is, however, 1 joule per second; this is called a 'watt.'

MACHINES are mechanical appliances by means of which a force applied at one point and in a definite direction is made to produce a different force at another point and generally in a different direction; the work done by means of the latter force can never be greater than that done by the former—it is in practice always less, owing to friction and other causes. The 'mechanical advantage' of the machine is the ratio of the two forces described above. There are many forms of machines: levers, pulleys, inclined plane, wedge, screw, windlass, etc. (See the separate articles.) The problem in any one case is to determine the theoretical mechanical advantage of a machine; that is, on the assumption that there is no friction when the forces are working. There are two general methods of solving this: one is to imagine a certain force acting on the machine and to determine by the ordinary principles of equilibrium what second force will just balance the action of the first; the second is to consider the machine in equilibrium under the action of these two forces, then to imagine a small displacement, and to express the fact that the work done by one force equals that done against the other. For the application of these principles to the various machines reference should be made to the separate articles in which they are described.

BIBLIOGRAPHY. A brief useful treatise for the general reader, which gives a clear conception of the elementary principles of mechanics, is Maxwell, *Matter and Motion* (New York, 1892). The following works, all of which are standard, can be recommended to the student of mechanics: Mach, *Science of Mechanics* (Eng. trans., Chicago, 1893), a critical and historical discussion of the principles; Ziwet, *Theoretical Mechanics* (New York, 1894), an elementary text-book of the best type; Love, *Theoretical Mechanics* (Cambridge, 1897), a most critical treatment of the fundamental principles; Routh, *Elementary Rigid Dynamics* (London, 1882); id., *Advanced Rigid Dynamics* (London, 1884); id., *Statics* (2 vols., Cambridge, 1892); id., *Dynamics of a Particle* (Cambridge, 1898).

MECHANICSBURG, mē-kăn′iks-bûrg. A borough in Cumberland County, Pa., 8 miles west of Harrisburg; on the Cumberland Valley Railroad (Map: Pennsylvania, D 3). It is the seat of Irving College (Lutheran), and has a public library. The city is surrounded by an agricultural and iron-mining country, is an important shipping point for iron ore and a depot for supplies for the iron region, and manufactures spokes, wheels, carriages, and foundry and machine-shop products. The government is vested in a mayor, elected every three years, and a council. Mechanicsburg was settled in 1806, and was incorporated as a borough in 1828. Population, in 1890, 3691; in 1900, 3841.

MECHANICS' LIEN. A statutory lien or charge upon real estate to secure payment for work and labor performed on, or materials furnished for, buildings or other improvements thereon, at the request or with the consent, express or implied, of the owner. Under the early English law no liens on real estate were recognized, as it was against the policy of the feudal system to permit a tenant thus to charge land which he held of his feudal lord, who in turn held of the King. After the feudal system was abolished, lands might be charged with liens by express agreement of the owner, and this became common in the form of mortgages. Courts of equity also recognized certain agreements in the nature of mortgages. Therefore, there are no common-law liens on real estate. By statutes, however, several liens were created, such as judgment liens, and liens for taxes and assessments. With the development of business customs much work which was formerly done by persons acting as servants for a master came to be performed by independent contractors who stood on an equal footing with those who engaged them. For the protection of such contractors and of material men whose wares are used in buildings and other improvements on real estate, the statutes known as 'mechanics' lien laws' have been enacted in all the United States and in Canada, but not in England. There was a precedent by analogy for such laws in the common-law liens of artisans on personal property for labor bestowed on it, such as the repair of a wagon or a pair of shoes. Somewhat similar liens on real estate were also recognized and protected by the civil law. The theory on which mechanics' liens are given by statute is that the value of the real estate has been increased by the addition of the improvements on which the work was performed or materials furnished, and that the property should accordingly be held subject to such claims. This creates a preference of these claims over those of unsecured creditors of the owner, but a mechanics' lien is subject to valid prior liens on the real estate, such as mortgages, judgments, taxes, etc. The term mechanics' lien is used in a general sense to cover all liens for labor, whether skilled or unskilled, and to describe liens for materials furnished. These liens give a right to look to the property for compensation, but do not create a personal claim against the owner. As a general rule, the lien attaches both to the building or improvement and to the land on which it is erected; but if the improvement is placed on the land without the owner's consent the lien will not extend to the land, but will cover the improvement to the extent of the interest of the person who ordered the work and materials. The lien only attaches to the very property on which the work was done, and will not affect the other real estate of the owner. A mechanics' lien may be filed against any title or interest in real estate, even though it is quite limited, as a lease for a year, provided it is such an interest as may be sold on execution.

The statutes in the different States vary in their provisions as to the character of the improvements which will serve to raise a lien. In general, however, such liens will attach to the real estate where any structure in the nature of a building is constructed, altered, or repaired. In some States the right is extended to cover the erection of fences, laying pipes, building sewers, grading, terracing, or sodding the land, and all other improvements which may be said to benefit the land. The idea of benefit is usually consistently followed, in that the lien does not attach where buildings are torn down or moved from the land. In most States only a person who does work or furnishes materials at the request of the owner is entitled to protect himself by a mechanics' lien. However, in a number of States, subcontractors, that is, those who work or furnish materials for the one who contracts directly with the owner, are allowed to file direct or subordinate liens against the property.

As a general rule the work to which the owner is entitled under a contract must be entirely performed before the contractor can file a lien, but where an owner defaults in his payments or otherwise breaks his part of the contract, the right to file a lien usually attaches at once. In order to perfect a mechanics' lien the statutes of most jurisdictions provide that a notice setting forth the names of the owner and the party claiming the lien, the character of the work done, a description of the premises, the total contract price, the amount paid thereon, the amount still due, and the date when the last item of work was performed, shall be filed in the county clerk's office and a copy thereof served on the owner of the property affected. In a number of the States this lien attaches and relates back to the time of the commencement of the work upon its being filed, and is prior to all liens subsequent to that time, but it is hardly the general rule, as they usually attach and take precedence according to the order of their being filed. The statutes of the States vary in their details as to procedure, time of filing, etc., and must be consulted to ascertain those particulars. See Garnishment; Lien; Mortgage.

MECHANICS OF DEVELOPMENT. This term, or 'Entwicklungsmechanik' of the German embryologists and cytologists, is in frequent use, suggested by the changes undergone during cell-division (see Mitosis) and also in the egg of all animals previous to and following fertilization. These changes are so orderly and complex as to suggest mechanical causes for them. As early as the first quarter of the last century Pander (1817) inquired into the mechanics of development, and Lotze followed him with some luminous suggestions. The subject was continued by His and by Rauber, Van Beneden, and more recently through observation and experiments in artificial fertilization and in animal grafting carried on by O. Hertwig, Boveri, Fol, Bütschli. Pflüger, Born, Roux, Driesch, Schultze, Gerlach, Wilson, Loew, and others. Thus Bütschli by his researches on 'foam' has shown that the forms of the amœba and other Protozoa may be due to mechanical causes of the environment. His studies may be called 'protoplasmic mechanics.' Here also come in the suggestions of Herbert Spencer and of Ryder as to the mechanics and mathematics of the initial steps taken during the growth of organisms. See Growth.

MECHANICSVILLE, mė-kăn'ĭks-vĭl. A village in Saratoga County, N. Y., 19 miles north of Albany; on the Hudson River and the Champlain Canal, and on the Delaware and Hudson and the Boston and Maine railroads (Map: New York, G 3). It has a public school library of over 4200 volumes. The industrial interests are favored by abundant water power, and include extensive manufactures of pulp and paper, knit goods, sash and blinds, and other establishments. The water-works are owned and operated by the municipality. Population, in 1890, 2679; in 1900, 4695.

MECHANICSVILLE, Battle of. A battle fought at Mechanicsville, on the Chickahominy River, seven miles from Richmond, Va., June 26, 1862, between a Federal force of about 5000 under the immediate command of General Fitz John Porter and a Confederate force of about 10,000 under the command of General Robert E. Lee. The Confederates in three corps, commanded by A. P. Hill, Longstreet, and D. H. Hill, made two attacks on the strong Federal position, but made little impression, and, after suffering great loss, were finally driven back. Early on the morning of the 27th, however, General Jackson with a strong Confederate reënforcement having arrived in the vicinity, General Porter abandoned his position for a stronger one several miles to his rear, where later in the day he was again attacked. (See Gaines's Mill.) In the engagement at Mechanicsville the Federals lost about 360; the Confederates about 2000. The engagement was the first of the so-called 'Seven Days' Battle' of the Peninsular campaign, and is sometimes known as the battle of Beaver Dam Creek.

MECHANISM (Lat. *mechanisma*, contrivance, from Gk. μηχανή, *mēchanē*, device). In philosophy properly employed to designate any view which seeks to explain the universe in terms of motion; in this sense it is practically equivalent to materialism (q.v.). It is, however, often used more loosely as a synonym for naturalism (q.v.); in this latter sense its antonym is teleology (q.v.).

MECHERINO, må'kå-rē'nȯ. It. A name sometimes applied to the Italian painter Domenico Beccafumi (q.v.).

MECHLIN, mĕᴋ'lĭn, or **MALINES**. One of the chief cities of the Belgian Province of Antwerp, situated 13 miles south-southeast of the city of Antwerp, on the navigable River Dyle, which flows through the city in a number of arms (Map: Belgium, C 3). The city is circular in shape, surrounded by a canal and a wide boulevard. As the See of the Cardinal Primate of Belgium, it retains a considerable ecclesiastical importance; of its numerous churches, the most noteworthy is the Cathedral of Saint Rombaud, a vast Gothic structure, adorned in the interior with many fine paintings and choice carvings, the altarpiece by Van Dyck being one of that master's finest works. It was built between the twelfth and fifteenth centuries, and one tower, 320 feet in height, remains unfinished. The other buildings most worthy of notice are the churches of Saint John and of Our Lady, which contain works by Rubens; the town hall, dating from the fifteenth century, and known as the Beyard; the market hall, erected in 1340; and the splendid modern archiepiscopal palace. Mechlin has two seminaries, an academy of painting, a gymnasium, and a botanical garden. It was formerly the seat of important lace manufactures, but its chief manufactures now are caps and woolen goods, 'gobelin' tapestry, tobacco, starch, and beer. There are also extensive workshops at the railroad station outside the city, which is the centre of several important railroad lines. Population, in 1890, 51,014; in 1900, 56,013.

MECHLIN LACE. A lace so named from being originally manufactured at Mechlin, in Belgium. It is a hexagon mesh of three threads in which the pattern is worked. The mesh consists of four plaited and two twisted sides. See Lace.

MECK'EL'S GANGLION, or The Spheno-Palatine Ganglion. The largest of the four sympathetic ganglia connected with the fifth cranial nerve, the others being the ophthalmic (q.v.), the otic (q.v.), and the submaxillary (q.v.). It lies deep in the spheno-maxillary fossa (a small triangular space just beneath the apex of the orbit), close to the spheno-palatine foramen. The ganglion is a small triangular or heart-shaped body, of a reddish-gray color, and was first described by Meckel. Like the other ganglia of the fifth nerve, it possesses a motor, a sensory, and a sympathetic root. Its sensory root is derived from the superior maxillary branch of the fifth nerve, through its two spheno-palatine branches; its motor root from the facial nerve, through the large superficial petrosal nerve; and its sympathetic root from the carotid plexus, through the large deep petrosal nerve. The ganglion gives off branches of distribution in four groups: an ascending group, which passes to the orbit; a descending, to the palate; an internal, to the nose; and posterior branches to the pharynx and nasal fossæ. See Nervous System and Brain.

MECK'LENBURG DECLARATION OF INDEPENDENCE. In American history, a series of resolutions purporting to have been adopted at Charlotte, Mecklenburg County, N. C., May 20, 1775, by a convention of delegates representing each militia company of the county. Another set of resolutions is attributed to a similar meeting on May 31, 1775, but the use at that time of both modes of reckoning time makes it probable that only one meeting was held, although this has always been a debatable question and has given rise to a detailed and prolonged controversy. The copy of the resolutions made by the secretary of the meeting is said to have been destroyed by fire, but on April 30, 1819, what purported to be a copy, made probably from recollection, was published in the Raleigh (N. C.) *Register*. The use of phrases in the published copy similar to certain passages in the real Declaration of Independence of July 4, 1776, caused doubt to arise as to the authenticity of the Mecklenburg Declaration. The Legislature of North Carolina in 1831, after an investigation of the subject, declared May 20th a legal holiday. The weight of authority at present is overwhelmingly against the authenticity of the Declaration, and favors the opinion that only one meeting was held—the one of May 31st—and that the resolutions there adopted, bearing no resemblance to Jefferson's Declaration, constitute the nearest approach there was to a Mecklenburg Declaration of Independence. The resolutions, as published in the Raleigh *Register* in 1819, are five in number. They declare: (1) that whoever aids or abets the invasion of American rights is "an enemy to this country—to America—and to the inherent and inalienable rights of man;" (2) that all political bands between those passing the resolutions and the mother country are dissolved, the allegiance of the citizens of Mecklenburg County to the British Crown being absolved and all political connection with that nation broken off; (3) that "we do hereby declare ourselves a free and independent people; are, and of a right ought to be, a self-governing association, under the control of no power other than that of our God and the general government of the Congress; to the maintenance of which independence we solemnly pledge to each other our mutual coöperation, our lives, our fortunes, and our most sacred honor;" (4) that those passing the resolutions acknowledge the existence of no law or public officer, but re-adopt their former laws in so far as these laws do not recognize the authority of the Crown, thus vacating all civil and military commissions granted by the Crown; and (5) that all military officers in the county are retained in their former command and that every member of the convention be henceforth a civil officer with power to issue process, hear and determine all matters of controversy, preserve peace and harmony, and endeavor to spread the love of country until a more general organized government be established in the province.

The best discussion of the authenticity of the Declaration is that by Lyman C. Draper, *The Mecklenburg Declaration: Its Origin, History, and Actors, with a Bibliography of its Literature and Explanatory Documents*, a work which was never published and forms part of the manuscript collections of the Wisconsin Historical Society. After an elaborate consideration of the evidence, Draper decided against the authenticity of the Declaration. In the library of the Wisconsin Historical Society are also many documents bearing on the subject. For briefer discussions consult articles in the *North American Review* for 1874, and in vol. xxi. of the *Magazine of American History*, and the note (p. 423) in Frothingham, *Rise of the Republic of the United States* (Boston, 1881) —all opposing the authenticity of the Declaration; and a chapter by Hawks in Cooke, *Revolutionary History of North Carolina* (Raleigh, 1853), and Graham, *Address on the Mecklenburg Declaration of Independence of May 20, 1775* (New York, 1875)—defending its authenticity.

MECKLENBURG-SCHWERIN, mĕk'lĕn-bōōrk shvä-rēn'. A grand duchy and constituent State of the German Empire, bounded by the Baltic Sea on the north, the Prussian Province of Pomerania and the Grand Duchy of Mecklenburg-Strelitz on the east, the Prussian provinces of Brandenburg and Hanover on the south, and Schleswig-Holstein, the Principality of Ratzeburg (belonging to Mecklenburg-Strelitz), and the Territory of Lübeck on the west (Map: Germany, D 2). Area, including the three enclaves in Brandenburg and Mecklenburg-Strelitz, 5135 square miles.

The country is generally flat with the exception of the central part, which is traversed from southeast to northwest by a chain of low hills, forming the watershed between the Elbe and the Baltic Sea. The flat coast-line is 100 miles long and is broken by a number of deep indentations, including the Bay of Wismar. Numerous rivers traverse the country from north to south. The Recknitz, the Warnow, and the Stepenitz flow toward the Baltic, and the New Elde and the Sude are tributaries of the Elbe, which for a few miles forms the southern boundary of the grand duchy. The country abounds in lakes, the largest of which are the Müritz See (51 square miles), the Schweriner See (23 square miles), the Kölpiner, and the Plauer See.

The climate is mild and healthful, although somewhat raw. The average annual temperature is 46° and the annual precipitation 21 inches. There are chalybeate springs at Doberan and Goldberg and saline springs at Sülze. According to the industrial census of 1895 nearly one-half of the population depended for their livelihood on agriculture. The land is divided between the Crown, the aristocracy, the clergy, and the towns, the peasantry forming an hereditary tenantry class. About 90 per cent. of the area is under cultivation in pastures and in forests. The crops exceed the local demand and are partly exported. Rye, wheat, oats, barley, and potatoes are the staples. Tobacco is cultivated to some extent. Stock-raising is carried on extensively, and dairying is an important adjunct to agriculture.

The manufacturing industries are far inferior to the agricultural interests. There are a number of foundries, machine works, sugar refineries, breweries, distilleries, paper mills, tanneries, tobacco factories, brick yards, etc.; but many manufactures are imported for local consumption, and the native exports contain no manufactured product of importance. The trade is very extensive and favored by the situation of the country. The imports pass chiefly through the seaports of Warnemünde and Wismar. The chief exports are agricultural, dairy, and animal products, live animals, etc., and are transported mostly by rail. The annual outward and inward shipping exceeds 900,000 tons. The transportation facilities are excellent, consisting of a system of navigable rivers and canals, and a number of State railway lines with a total length of 740 miles in 1901.

The constitution of the two duchies of Mecklenburg-Schwerin and Mecklenburg-Strelitz is based on the agreement concluded in 1755 between the Duke of Mecklenburg-Schwerin and his estates, and adopted in the same year by the Duchy of Mecklenburg-Strelitz. The crown is hereditary in the male line in both duchies and on the extinction of the reigning dynasty in either State the succession reverts to the other house. In the case of the extinction of both houses, the right of succession passes to Prussia. The government of the two Mecklenburgs is semi-feudal in character, and the proprietors of the land, whether belonging to the nobility or not, are endowed with many special privileges. The common assembly, or Landesunion, of both grand duchies consists of the representatives of the landed aristocracy, or Ritterschaft, and the burgomasters of 49 towns. The tenants of the royal domains are not represented.

The assembly convenes every year for a short period, alternately at Sternberg and at Malchin. There are also a permanent committee of nine members at Rostock representing the two estates when the Landtag is not in session, and convocation and deputation diets which can be assembled for special purposes in either of the duchies. The Principality of Ratzeburg is under the direct authority of the Grand Duke of Mecklenburg-Strelitz. The executive authority in Mecklenburg-Schwerin is vested in a Cabinet of four ministers. Mecklenburg-Schwerin is represented by two members in the Bundesrat and sends six Deputies to the Reichstag. The capital is Schwerin; the summer residence of the Grand Duke is Ludwigslust.

The two duchies have two separate systems of lower courts and a common supreme court at Rostock. There is no general financial system in the Grand Duchy of Mecklenburg-Schwerin. The revenue is divided into three classes, of which by far the largest (derived from the royal domains and ordinary taxes) is under the sole control of the Grand Duke. A part of it goes to cover the ordinary expenses of the Government. The total public debt, incurred to some extent for the purchase of railways, amounted in 1901 to $26,565,000. General and technical education is on a high plane. The university at Rostock (q.v.) provides higher education. Population, in 1890, 578,342; in 1900, 607,770, almost entirely Protestant.

History. The territory of Mecklenburg was anciently occupied by Germanic peoples, and at the beginning of the Middle Ages the Wends, Obotrits, and other Slavic tribes took possession of the region. The Slavic inhabitants long resisted the power of Germany, but were finally subdued in the second half of the twelfth century by Henry the Lion, Duke of Saxony. Henry left a part of the country (which took its name from Mikilinborg, the principal settlement of the Obotrits, near the modern Wismar) under the rule of the Obotrit princes, while at the same time the Germanization of the region was prosecuted. After 1229 the territory was frequently divided and subdivided among the descendants of the original Slavic rulers. In 1348 Mecklenburg was elevated into a duchy by the Emperor Charles IV. In 1363 Albert III., Duke of Mecklenburg, was called to the throne of Sweden, but in 1389 was dethroned by Margaret, Queen of Denmark and Norway. In the middle of the sixteenth century Lutheranism was made the established religion in Mecklenburg. About this time there was a division into the two ducal lines of Mecklenburg-Schwerin and Mecklenburg-Güstrow. In the Thirty Years' War the Dukes of Mecklenburg joined Christian IV. of Denmark in the struggle against the Catholic powers, and, as a result, were deprived of their possessions, which were conferred in 1629 upon Wallenstein. In 1631, however, the dukes were restored by Gustavus Adolphus of Sweden. After various subdivisions of the ducal line into the branches of Schwerin, Strelitz, and others, and the successive extinction of several of these collateral houses, the Imperial Commission, which met at Hamburg in 1701, brought about a family compact, by which it was arranged that Schwerin and Güstrow should form one duchy and Strelitz with Ratzeburg, Stargard, etc., another. In 1815 the dukes of both the Mecklenburgs assumed the title of Grand Duke. Frederick Francis (1785-1837), Grand Duke of Mecklenburg-Schwerin, abolished serfdom in his dominions, to which he added Wismar. The reign of Frederick Francis II. of the same duchy, who succeeded his father, Paul Frederick, in 1842, was disturbed by a contest between the nobles and the burghers and smaller landowners. The revolutionary movement of 1848 gave a fresh stimulus to the popular ferment in both duchies, and the disturbances could only be quelled by the intervention of the Prussian troops; but a reaction took place in 1850, and matters were restored to their former condition. Frederick Francis II. (q.v.), Grand Duke of Mecklenburg-Schwerin, was one of the principal generals in the Franco-German War of 1870-71. As members of the new German Empire, the two duchies have maintained their internal constitution very much on the old footing. Consult: Boll, *Geschichte Mecklenburgs* (Neubrandenburg, 1855-56); Mayer, *Geschichte des Grossherzogthums Mecklenburg-Strelitz 1816-90* (Neustrelitz, 1890).

MECKLENBURG-STRELITZ, -strā'lĭts. A grand duchy and constituent State of the German Empire, consisting of the grand duchy proper, bounded by the Prussian provinces of Pomerania and Brandenburg and the Grand Duchy of Mecklenburg-Schwerin, and of the Principality of Ratzeburg, which is separated from it by Mecklenburg-Schwerin (Map: Germany, E 2). Total area, 1131 square miles. In the formation of its surface the grand duchy proper resembles Mecklenburg-Schwerin. It is watered chiefly by the Havel, and contains numerous lakes. The Principality of Ratzeburg is watered by the Stepenitz.

Agriculture is the chief occupation, and the system of land tenure does not differ from that prevailing in the Grand Duchy of Mecklenburg-Schwerin. The trade is naturally less developed than in Mecklenburg-Schwerin on account of the absence of harbors, but there is considerable inland traffic, and the railway facilities are good. Mecklenburg-Strelitz is governed by the same constitution as Mecklenburg-Schwerin (q.v.). The executive power is vested in a Minister of State and a small council. The seat of government is at Neustrelitz. The financial system also resembles that of Mecklenburg-Schwerin. Mecklenburg-Strelitz is represented by one member in the Bundesrat, and returns one Deputy to the Reichstag. Population, in 1890, 97,978; in 1900, 102,602, almost exclusively Protestant. For history, see Mecklenburg-Schwerin.

MECON′IC ACID (Gk. *μηκωνικός*, *mēkōnikos*, pertaining to the poppy, from *μήκων*, *mēkōn*, poppy), $C_7H_4O_7+3H_2O$. An acid existing in opium, which, when good, yields from 6 to 8 per cent. of it. Both the acid and its salts assume a characteristic blood-red tint with ferric salts; and this test, which is very sensitive, is employed by the toxicologist in searching for traces of opium. As, however, the alkaline sulphocyanides which exist normally in the saliva give a precisely similar tint with the ferric salts, it is necessary to be able to distinguish the meconate of iron from the sulphocyanide of iron. A solution of chloride of gold or of corrosive sublimate removes all doubt by discharging the color of the sulphocyanide, but not affecting the color of the meconate of iron. The constitution of meconic acid is represented by the formula $C_5HO_2(OH)(COOH)_2$, showing it to be chemically a monohydroxy-dibasic acid. The alkaloids morphine, codeine, narcotine, thebaine, papaverine, and others exist in opium in combination partly with meconic, partly with sulphuric acid.

MECO′NIUM (Lat., from Gk. *μηκώνιον*, *mēkōnion*, poppy-juice, from *μήκων*, *mēkōn*, poppy). The earliest matter discharged from the bowels of a new-born infant. It is of a brownish-green or almost black color, acid, devoid of odor, and rapidly putrefying on exposure to air. It is usually regarded as a product of the fœtal liver, but it contains neither biliary acids nor bile-pigment. It consists of an abundance of cylinder epithelium of a green tint, of mucus corpuscles, and of fat, with which there is a good deal of cholesterine.

MEDAL (OF. *medaille*, Fr. *médaille*, from Lat. *metallum*, from Gk. *μέταλλον*, metal). A piece of metal, more or less of the form of a coin, stamped on one side or both with image and inscription, with the object of commemorating an event or of honoring a person, and not intended for circulation as money. This use of the word excludes all ancient and modern coins, even those which, like the American Columbian half-dollar, are commemorative pieces struck only for a special occasion, but designed for circulation as money. The coins of the Greeks and Romans have so many medallic, i.e. commemorative, characteristics, that the belief that they were really medals rather than coins was a natural one. There is hardly any event of popular interest, whether public or private, in ancient times, especially under the Roman Empire, that is not recorded on the coins. The term *medallion* is for convenience still used of certain classes of ancient coins that surpass the rest in size and technique; but the strictly monetary character of even these is now sufficiently proved. Though objects of real art, often designed for royal gifts or for ornament, they were still multiples of the regular coins, and as such could be entered into circulation. Such were the magnificent ‘medallions’ of Syracuse, real gems of the die-engraver's art signed with the artist's name, and the ‘medallions’ in gold, silver, and copper of the Roman Emperors, coined under their special control, and hence lacking the usual S. C. (*Senatus consulto*, ‘by order of the Senate’) of the senatorial bronze money. Sometimes these Roman medallions are found set in a circlet of fine metal. This was not the work of the coiner, however, but of the jeweler who adapted the coin to artistic use. If we are to seek anything approximating the medal in ancient times, it may perhaps be found in certain pagan talismans and in the little Christian medals of devotion.

Modern medals begin in the period of the Renaissance. The earliest bear the portraits and inscriptions (in Latin) of rulers and potentates. The subjects are at first drawn exclusively from classical art; hence their value as documents of contemporary history, though not of art, is materially lessened. The most famous Italian medalist of the fifteenth century was Vittorio Pisani of Verona, whose splendid works are signed “Opvs Pisani Pictoris.” It became the custom for rulers to inaugurate their reign and celebrate its chief events by striking medals. The series of the popes begins with Paul II. (1464-71), and continues without a break to the present time. Medals of the earlier popes are the work of a later period. A medallic mint is connected with the Vatican, where the best artists are employed. Some of the medals of Julius II., Leo X., and Clement VII. have an especial interest, as having been designed by Raphael and Giulio Romano, and engraved by Benvenuto Cellini. A sixteenth-century medal of Sicily is probably the first instance in modern times of the use of a medal as a vehicle of political satire: it is directed by Frederic II. against his adversary, Ferdinand of Spain. Satirical medals were afterwards common in the Low Countries. Some of the Dutch medals are noted for the elaborate views, maps, and plans engraved on them. Of many reigns a complete medallic history can be written, as, for example, of that of Napoleon Bonaparte. American Presidents, beginning with Washington, are commemorated in a series of portrait medals. But it is no longer merely kings and rulers and great military and naval events that are commemorated in medals. Events of general interest in science, art, or literature, movements for the amelioration of conditions, learned societies, are all found recorded in these artistic little documents of history.

Besides the purely commemorative medals, there is another class—that of ‘decorations’—which, beginning at the end of the eighteenth century, has attained an enormous development. These are conferred by the sovereign or the State as marks of distinction for eminent services, particularly in the army and navy. Such medals of honor are seldom of much intrinsic value, their worth depending mainly on the associations connected with them. They have ribbons attached, with clasps or small bars, each of which often bears the name of a battle. Such medals are intended to be worn on the breast. They are of very varied form, the cross being the most common.

Bibliography. Snowden, *Description of National and Miscellaneous Medals* (Philadelphia, 1861); Sandham, *Coins, Medals, and Tokens of the Dominion of Canada* (London, 1869); Loubat, *Medallic History of the United States* (New York, 1878); Hawkins, *Medallic Illustration of History of Great Britain and Ireland* (London, 1885); MacSherry, “The National Medals of the United States,” in *Maryland Historical Fund Publications*, No. 25 (Baltimore, 1887); Heiss, *Les médailleurs de la Renaissance*, vol. viii. (Paris, 1890); Leduc, *Histoire des déco-*

rations en France (Le Mans, 1890); Long, *British Navy Medals and How They Were Won* (London, 1895); Irwin, *British War Medals and Decorations* (2d ed., London, 1899). There is a series of articles by Marvin on Masonic medals in the *American Journal of Numismatics*, vols. x.-xiv., xxii.-xxxvi. (Boston, 1876-80; 1888-1902).

MEDALLION (Fr. *médaillon*, augmentative of *médaille*, medal). In architecture, a circular or oval panel carved in bas-relief with a head, bust, figure, ornamental design, etc. The term is also used of a similar design in color.

MEDAL OF HONOR, United States. The medal of honor of the United States, given for bravery on the field of battle, was first instituted in 1862 by a law approved July 12th of that year. It is a five-pointed star of bronze tipped with trefoil, each point containing a crown of laurel and oak; in the middle, within a circle of thirty-four stars, America, personified as Minerva, stands with her left hand resting on the fasces, while with her right, in which she holds a shield emblazoned with the American arms, she repulses Discord, represented with two snakes in each hand; the whole suspended by a trophy of two crossed cannons, balls, and a sword surmounted by the American eagle, which is united by a ribbon of thirteen stripes, palewise, gules and argent, and a chief azure, to a clasp composed of two cornucopias and the American arms. On March 25, 1776, before even independence had been proclaimed, Congress ordered that a gold medal be struck and presented to General Washington. Benjamin Franklin, who at the time was in Paris, was instructed to employ the greatest artists in France to execute a suitable design. Although this was the first medal voted, the first one struck was a silver medal presented to Lieutenant-Colonel Fleury, a volunteer officer from the French regular army, who, entering the United States Army in 1777 as a private, distinguished himself so greatly and rendered such valuable services, that Congress promoted him to be lieutenant-colonel. For his gallantry in the assault upon Stony Point, July 15, 1779, Congress voted him a silver medal, and afterwards a vote of thanks. It was not until the institution of the medal of honor that the United States possessed a military equivalent to the Victoria cross (q.v.) of England, or the iron cross (q.v.) of Prussia. Like the former decoration, it is bestowed on both commissioned and non-commissioned ranks alike, the decoration being the same in every instance. Medals of honor are only awarded to officers or enlisted men for distinguished bravery or conspicuous gallantry, which has been manifested in action, by conduct distinguished above the others, and that involved risk of life, or duty more than ordinarily hazardous. An interesting account of the deeds by which the medal of honor has been won will be found in Rodenbough, *Uncle Sam's Medal of Honor* (New York, 1886).

MEDAL OF HONOR LEGION. A patriotic society whose membership comprises officers and enlisted men who have received the medal of honor (q.v.). The society was originally organized to admit those who had participated in the Civil War, but the membership was subsequently extended to those who took part in the war with Spain (1898) and in the fighting in China (1900). The number of members on the rolls in 1903 was about 600.

MEDANO, mȧ-dä′nȯ. A Spanish term applied to the curious traveling, crescent-shaped sand hills which occur in numbers on the elevated pampa of Islay near Arequipa, Peru. They move across the desert from south to north in the direction of the prevailing day wind. They are composed of a white sand apparently quite different from that which makes up the rest of the desert surface.

MED′ARY, Samuel (1801-64). An American editor and politician. He was born in Montgomery County, Pa., and had an academic education. In 1825 he removed to Ohio, and in 1828 became editor of the *Ohio Sun*, a Democratic paper. After serving in both Houses of the Ohio Legislature, he was editor from 1836 to 1857 of the *Ohio Statesman*, which became a great power in the West and Southwest. He was high in the confidence of President Jackson and the succeeding Democratic Presidents, and is said to have originated the phrase "Fifty-four forty or fight" during the Oregon boundary dispute. In 1853 he declined the position of United States Minister to Chile. He was the last Territorial Governor of Minnesota in 1857-58, was postmaster of Columbus, Ohio, in 1858, and was Governor of Kansas Territory from 1858 to 1860, when he resigned to found *The Crisis*, which he continued to edit until his death. The Democrats of Ohio erected a handsome monument to his memory at Columbus.

MEDE′A (Lat., from Gk. Μήδεια, *Mēdeia*). In Grecian legend, a famous sorceress, the daughter of Æetes, King of Colchis, and of the Oceanid Idyia, or of Hecate, and niece of Circe. On the arrival of the Argonauts (q.v.) at the Court of Æetes, in search of the Golden Fleece, she fell in love with Jason, aided him by her magic arts to perform the tasks set him, and finally to carry off the fleece. Pursued in her flight with the Argonauts by her father, she killed her brother Absyrtos and scattered the fragments of his body on the sea. Her father pausing to give burial to the remains, the Argonauts gained time for their escape. On the return of Jason to Iolcus, she aided him to take vengeance on Pelias, who had murdered her husband's parents. Having cut up an old sheep and boiled the pieces with magic herbs, she brought forth from the caldron a young lamb, an incident represented not infrequently on Greek vases. She then easily persuaded the daughters of Pelias to cut their father in pieces, that he might regain his youth; but when they had yielded, she refused to employ her art. For this she and Jason were forced to flee to Corinth, where Jason repudiated Medea to marry Glauce, or Creusa, the daughter of the King. Medea sent her rival a poisoned robe and crown, whereby both the princess and her father were destroyed. To complete her revenge, she then slew the children she had borne Jason, and fled on her dragon-chariot to Athens, where she was received by King Ægeus, to whom some said she bore a son, Medos. On the arrival from Trœzen of the son of Ægeus, Theseus, she plotted against his life, but was discovered, and with her son fled back to Asia, where Medos gave his name to the Medes. As a sorceress she seems, like Circe, immortal in some of the writers, while others regarded her as a heroine and united her to Achilles in the Elysian fields. These outlines of the legend were often very variously filled in, and it is clear that in the story many elements are combined. Much points to an original divinity sunk to heroine, as is so often the case, and much also to an original good sorceress, a counterpoise to the wicked Circe. The attempts to interpret the myth in the light of natural phenomena cannot be regarded as successful. The figure of Medea was a favorite one in art, especially with the vase-painters. The Corinthian episode is common on Roman sarcophagi. It attained especial prominence through the great tragedy *Medea*, by Euripides.

MEDEA. (1) A tragedy by Euripides represented in B.C. 431, when it obtained only the third prize. The delineation of the passionate heroine makes it one of the most famous of Greek tragedies. Euripides's *Medea* was translated into Latin by Ennius. (2) A play of considerable power by Seneca, 1027 lines in length. It is only occasionally like the play of Euripides. It is distinguished by the beauty of its choral odes. (3) A tragedy by Richard Glover (1761).

MÉDECIN MALGRÉ LUI, må'd'săɴ' mål'-grå' lwė, Le (Fr., the physician in spite of himself). A three-act farce-comedy in prose by Molière, produced at the Palais Royal in 1666. The plot is taken from an old fabliau of the thirteenth century, *Le médecin de Bray* or *Le vilain mire*. Martine, the wife of Sganarelle, who has been beaten by her husband, seeks to revenge herself, and informs the servants of Géronte, who are in search of a physician for his daughter Lucinde, that Sganarelle is a wonderful doctor. He has, however, the peculiarity that he will not use his art unless beaten. The servants follow her suggestion, and Sganarelle works a cure on Lucinde, whose only illness is the desire to marry Léandre. The comedy was set to music by Gounod and presented at the Opéra Comique in 1858. It was given in London as "The Mock Doctor" in 1865.

MÉDECIN VOLANT, vô'läɴ', Le (Fr., the flying doctor). A comedy by Molière (1659), in which Sganarelle, the valet of Valère, appears disguised as a physician, engaged by Gorgibus to treat his daughter Lucile, whom Valère loves, and who, to escape another marriage, feigns illness. Sganarelle directs Gorgibus to transfer his daughter to a room from which she can readily elope, and distracts his attention by appearing alternately as the physician and as the valet. In the performance of his double rôle Sganarelle is obliged to leave and enter the house by the window, whence the title of the play.

MÉDÉE, må'då' (Fr., Medea). The title of several French tragedies inspired by the *Medea* of Euripides. (1) A play by Jean de la Péruse (1553), a translation of Seneca's version of the tragedy. (2) A tragedy by Pierre Corneille (1635), based on Euripides with an admixture of Seneca, but with a number of new minor characters and with variations in the details of the plot. (3) A play by Clément (1779) which eliminates the supernatural features. (4) A play by Catulle Mendès, produced at the Renaissance in 1898 with Sara Bernhardt in the title rôle. It is based on Euripides and Seneca, with modifications ingeniously introduced.

MEDELLÍN, mā'ᴅå-lyēn'. The capital of the Department of Antioquia, Colombia, situated between the ranges of the central and western Cordilleras (Map: Colombia, B 2). It is a beautiful town, and its elevation being about 5000 feet above sea-level, the climate is pleasant. Its streets are broad and straight, and it has several parks and squares adorned with handsome buildings, among which are a high school, a museum, and a public library. The manufactures of the town are chiefly shoes, clothing, locks, and chemicals, and it has some trade in gold and silver. Population, 20,000. Medellín was founded in 1674.

MED'FORD. A city, including the villages of Hillside, Glenwood, South Medford, Wellington, and West Medford, in Middlesex County, Mass., five miles north by west of Boston; on the Mystic River, and on the southern and western divisions of the Boston and Maine Railroad (Map: Massachusetts, E 3). The city, which extends four miles in length and breadth and occupies an area of about nine square miles, is a popular residential suburb of Boston, and the seat of Tufts College (q.v.). It has a public library; several historically interesting buildings, of which the old Cradock House, built in 1634, is said to be the oldest structure retaining its original form in the United States; Middlesex Fells Park, Mystic Valley Parkway, Brooks Playstead, Salem Street Common, and several smaller parks; and three cemeteries, the largest of which, Oak Grove, contains about 34 acres. The principal manufactures include carriages, bricks, machinery, chemicals, dyes, calico, rum, etc. The government is administered under the charter of 1892, which provides for a mayor, elected every two years; a bicameral council, the board of aldermen being elected at large for terms of two years, and the common council, annually by wards; and subordinate administrative officials. The last are elected either by the aldermen and common council, or appointed by the Mayor with the confirmation of the board of aldermen or of the city council. The school board is independently chosen by popular vote. Population, in 1890, 11,079; in 1900, 18,244. Founded as Meadford by a company from Salem in 1630, Medford became a town in the following year and was chartered as a city in 1892. Consult Usher, *History of the Town of Medford, Mass.* (Boston, 1886).

MEDFORD. A city and the county-seat of Taylor County, Wis., 119 miles south of Ashland; on the Black River, and on the Wisconsin Central Railroad (Map: Wisconsin, C 3). It has saw and flouring mills, a foundry, a tannery, cheese factories, etc.; and is the centre of a lumbering district. Population, in 1890, 1193; in 1900, 1758.

MED'HURST, Walter Henry (1796-1857). An English missionary. He was born in London, and went, by appointment of the London Missionary Society in 1816, to Malacca as a missionary printer. His fitness for the ministry induced the missionaries to ordain him in 1819, and he did good service in various Eastern fields, Malacca, Penang, Batavia, Parapattan, Java, and, from 1842 to 1856, at Shanghai. For six years he performed mission work in the interior of China amid much peril. In 1847 delegates from several stations convened in Shanghai for the revision of the New Testament. In this work he was engaged until 1850, when he devoted his time to the Old Testament. In 1857 he returned to England in impaired health, and died three days after his arrival. He was well versed in the Chinese, Japanese, Javanese, and other languages, besides Dutch and French, in all of which he wrote. His special works are: *China, Its State and Prospects, with Especial Reference to the Diffusion of the Gospel* (1838); *Dissertation on the Theology of the Chinese* (1847); *A Chinese Dictionary* (1842-43); *An English and Japanese Vocabulary* (1830); *Dictionary of the Hokkien Dialect* (1832); *Chinese Dialogues* (1844); *English and Chinese Dictionary* (1847-48).

ME'DIA (Lat., from Gk. *Μηδία*, from *Μῆδος*, *Mēdos*, from OPers. *Māda*, Mede). In ancient times, the name of the northwestern part of Iran, bounded by the Caspian Sea on the north, by Persia on the south, by Parthia on the east, and by Assyria on the west. The northern portion of the country is very mountainous; the south is a rich and fertile tract. Media at present forms the Persian provinces of Azerbaijan, Ghilan, Mazanderan, and Irak-Ajemi, and the northern portion of Luristan.

The Medians were in language, religion, and manners very nearly allied to the Persians. After they had shaken off the yoke of the Assyrians, their tribes united about B.C. 708 under Deioces, whom later Persian tradition seeks to identify with Kai Kobod. Deioces made Ecbatana (q.v.) his capital. He was succeeded by his son Phraortes (B.C. 647-625), whose name has been brought into possible connection with the early history of Zoroastrianism. The King who followed was his son Cyaxares, who reigned B.C. 625-585. (See CYAXARES I.) This monarch, in alliance with Nabopolassar, King of Babylon, overthrew the Assyrian Empire about B.C. 604, spread the terror of his arms as far as Egypt and the farthest bounds of Asia Minor, and vanquished the brigand hordes of Scythia, who had extended their ravages to Syria. He was succeeded by his son Astyages, in whom the later tradition apparently wrongly seeks to recognize the tyrant Azh-dahak, or Azhi-dahaka, of Babylon, who was overthrown by Cyrus (q.v.). Persia now became the mistress instead of the vassal of Media; and from this time the two nations are spoken of as one people. After the death of Alexander the Great (B.C. 323) the new portion of Media became a separate kingdom, *Media Minor*, and existed till the time of Augustus, the other portion, under the name of *Media Major*, forming a part of the Syrian monarchy. Media was on several occasions separated from Persia. In B.C. 152 Mithridates I. took Great Media from the Syrians and annexed it to the Parthian Empire, and about B.C. 36 it had a king of its own, named Artavasdes, against whom Mark Antony made war. Under the Sassanian dynasty the whole of Media was united to Persia. It became, during the fourteenth and fifteenth centuries, the stronghold of the Turcoman tribes Kara-Koinlu, or 'Black Sheep,' and Ak-Koinlu, or 'White Sheep.'

In early times the Medes were a warlike race, possessed of an enthusiastic love of independence, and distinguished for their skill with the bow. They were also celebrated for their horsemanship, and it was from them that the Persians adopted this and other favorite exercises and acquirements. Media played an important part in the early religious history of the East, when we consider that the Magi sprang from Media and Zoroaster probably arose there, although part of his activity is located in Bastria. Consult: Justi, "Das Medische Reich," in Geiger and Kuhn, *Grundriss der iranischen Philologie* (Stuttgart, 1897); Ragozin, *Media, Babylon, and Persia* (New York, 1888).

MEDIA. A borough and the county-seat of Delaware County, Pa., 14 miles west of Philadelphia; on the Philadelphia, Wilmington and Baltimore Railroad (Map: Pennsylvania, F 4). It is finely situated in a fertile and picturesque region and is a popular residential suburb of Philadelphia. The Delaware County Institute of Science, founded in 1833, has a valuable scientific library of 5000 volumes, and there is a free library with about 3000 volumes. The water-works are owned by the municipality, also the street-lighting plant. Population, in 1890, 2736; in 1900, 3075.

ME'DIANT (It. *mediante*, from Lat. *mediare*, to divide in the middle, from *medius*, middle). The third degree of the musical scale. The chord of the mediant is the triad built upon the third degree. In mediæval music, the tone lying midway between the final and dominant. See MODE.

MEDIATE (Lat. *mediatus*, p.p. of *mediare*, to divide in the middle). Under the feudal system, and especially in Germany, a term applied to those lordships or possessions which were held by feudal tenure under one of the greater vassals, and so only *mediately* under the Emperor as the supreme feudal lord. Many of the smaller States or lordships were gradually reduced to this condition, as the neighboring greater States increased in power, and amid the changes caused by the wars of the French Revolution, in 1803 and 1806, many small States were thus mediatized, the greater States thus finding some compensation for their losses in other quarters.

MEDICAL ASSOCIATION, THE AMERICAN. An association incorporated in 1897, and having in 1903 a membership of over twelve thousand. Its annual sessions are held in the different large cities of the United States, but the present office of the secretary and editor is at Chicago, Ill. The object of the association is to form into one compact organization the medical profession of the country for the purpose of fostering the growth of medical knowledge. The association publishes the record of its proceedings with original papers and monographs upon medical topics.

MEDICAL CODE. A body of laws adopted by a medical association regulating the conduct of the profession. Such codes forbid the public advertising of specific medicines and gratuitous cures, and condemn patent and secret nostrums. The codes of both chief schools of practice require the professional attendance of one physician upon the family of another to be made without charge, except under circumstances involving unusual trouble and expense; they explain the proper relations which should exist between patient and physician, and they carefully define the relative positions of the attending and the consulting physician, forbidding the latter to infringe upon the peculiar rights of the former. The medical code of ethics in England was prepared in 1803 by Thomas Percival, and on it is founded the code established in the United States. Prior to 1847 the codes of medical ethics which existed in this country were instituted by State and local societies, and there were none in many of the States. At its annual convention in that year the American Medical Association adopted a code which was recognized as the national code throughout the United States for thirty-five years. The code of the American Medical Association excludes all physicians other than 'regular' from consultations; and the action of the New York County Medical Society, in 1882, in giving their members the right to consult with 'all legally qualified practitioners,' has been the cause of a serious difference between the national and the State organizations, delegates from the New York Society having been refused admittance to the annual meetings of the American Medical Association. Consult Flint, *Medical Ethics and Etiquette* (New York, 1883).

MEDICAL DEPARTMENT, UNITED STATES ARMY. This department, under the direction of the Secretary of War, is charged with the duty of investigating the sanitary condition of the army and making recommendations in reference thereto, with the duty of caring for the sick and wounded; making physical examinations of officers and enlisted men; the management and control of military hospitals; the recruitment, instruction, and control of the Hospital Corps and of the Army Nurse Corps (female); and furnishing all medical and hospital supplies, except for public animals. In 1903 the department consisted of 1 brigadier-general, 8 colonels, 12 lieutenant-colonels, 60 majors, 43 captains, 197 first lieutenants, 300 hospital stewards (non-commissioned officers), 400 acting hospital stewards, and in the Hospital Corps, which is under the command and control of the Medical Department, there were 3300 enlisted men; making a total of 321 commissioned officers and 4000 enlisted men. The Army Medical School is at Washington, D. C., and is organized with a faculty of four or more professors selected from the senior officers of the Medical Department stationed in or near the city of Washington, and such associate professors as may be required. The senior officer acts as president, and the junior as secretary of the faculty. Student officers are selected by the Surgeon-General from those medical officers who have been appointed since the last preceding term of the school and such others as may be authorized to attend. The course of instruction is of five months' duration annually, and includes lectures and practical instruction in the duties of medical officers in war and peace; military surgery, the care of the wounded in time of war, and hospital administration; military hygiene; military medicine; microscopy, sanitary and clinical; pathology, histology, bacteriology, and urinology; hospital corps drill; and first aid to wounded. Civilian physicians and dentists are employed whenever necessary, under contracts entered into by or with the authority of the Surgeon-General of the army. (See CONTRACT SURGEON.) See SURGEON, MILITARY; HOSPITAL CORPS; HOSPITAL, MILITARY.

MEDICAL DEPARTMENT, UNITED STATES NAVY. The medical corps of the United States Navy, in 1902, consisted of a Surgeon-General (ranking as rear-admiral), a number of medical directors (ranking as captains), medical inspectors (ranking as commanders), 55 surgeons (ranking from lieutenant to lieutenant-commander), and 110 past assistant and assistant surgeons (ranking from lieutenant, junior grade, to lieutenant, senior grade). By an enactment of Congress the relative grades in the navy and army have been made to correspond as nearly as possible. Candidates for surgeonships in the navy must be between twenty-one and thirty years of age, and must apply to the Secretary of the Navy for permission to take the required entrance examination.

MEDICAL EDUCATION. The earliest institutions for the teaching of medicine were situated in temples and groves dedicated to the worship of the deities who were supposed to preside over the health of their worshipers. Thus in Egypt the god Osiris and his wife Isis were the tutelary deities of the medical arts, and in Greece the god of health was Æsculapius. The temples were situated in the neighborhood usually of streams and springs which were supposed to possess healing properties. One of the most famous of these ancient temples was that situated on the island of Cos; its most celebrated disciple was Hippocrates, who flourished early in the fourth century B.C., and whose teachings ruled medical science even to the close of the eighteenth century. Throughout Italy the same methods prevailed, the Romans deriving most of their medical lore from Greek teachers. Thus Galen was a native of Pergamum, where there was a famous medical school in which he was educated. His great work as a teacher, however, was done in Rome. Greek teachers were also responsible for the rise of the Arabian school of medicine. In the sixth century A.D. the Nestorians, being driven out of Syria because of their heretical opinions, settled largely among the Arabs, and transmitted to them their medical knowledge. By this time the teacher of medicine was practically divorced from his religious functions, although even down to the mediæval period much of the medical learning of the world appertained to the priesthood.

Until the time of the Renaissance the teaching of medicine in the mediæval medical schools consisted almost solely in dissertations and lectures upon the writings of Hippocrates and Galen. The dissection of the human body was only intermittently practiced. In 1315 Mondino dissected in Bologna the cadavers of two women. Master Albert, a lecturer in the same institution, dissected, in 1319, a body stolen from the cemetery by the students. Bertucci and Pietro de Angela, a little later, made systematic dissections. But on the whole, anatomical science had made little advance.

Clinical teaching was on no better basis. The only way in which the student received bedside instruction was through apprenticing himself to some practitioner and accompanying him on his rounds, or by acting as his servant and assistant. Although the great universities conferred degrees in course, there were, nevertheless, enormous numbers of quacks and charlatans who flourished in the absence of any efficient laws regulating the right of persons to practice the healing art.

In the Middle Ages the most famous of all the medical schools was that of Salerno, near Naples, which was organized in connection with a monastery of Benedictine monks. Its graduates were to be found teaching in all quarters of the globe, and its influence was widespread, not only at the period in which it flourished, but for many years subsequent. Another celebrated medical school was that of Montpellier, in France. The University of Paris was founded in 1205 and graduated enormous classes. Its graduates were held in high esteem. They were not allowed to practice surgery, and held practitioners of that art in the greatest contempt. France, however, was the pioneer in recognizing the necessity for a higher education of surgeons, and for their elevation to a rank corresponding to that of physicians. In surgical teaching the French were always greatly in advance of other nations. It was in the University of Paris, likewise, that midwifery was first taught to classes of male students.

Among the most famous centres for medical teaching in the sixteenth century were the schools of Bologna, Padua, and Pisa in Italy. At the present time Italian physicians are doing an enormous amount of scientific research work. The facilities offered to students in their medical colleges, however, are not to be compared with those afforded by the other Continental medical schools. In Germany there were numbers of universities with flourishing medical departments at a very early period, among which may be mentioned Erfurt, Wittenberg, and Vienna. With the nineteenth century a new era dawned in German medicine. To it more than to any other single nation is due the credit of the wonderful achievements of the present day medicine. Virchow, Koch, and the other distinguished occupants of professorial chairs have had in their classes and laboratories eager students from all over the world. A more general education and a larger acquaintance with the various branches of the natural sciences are required of the German medical student than is customary elsewhere; a term of five years is requisite to obtain the degree of M.D.

In England the teaching of medicine was established upon a scientific basis chiefly by the efforts of Thomas Linacre, who founded chairs for the teaching of medicine in the universities of Oxford and Cambridge. As physician to Henry VIII. he possessed an enormous influence at Court, and this he wielded to great advantage, inducing the King to take the power of licensing persons to practice medicine out of the hands of the bishops, and rendering it necessary for the candidates to pass an examination and receive a degree from one or the other of the two universities. In England, as in France, it was many years before the education of the surgeon was considered as of equal importance with that of the physician. Until 1745 the surgeons were associated with the barbers in the corporation of the barber surgeons. In that year they separated, although it was not until more than fifty years later that the Royal College of Surgeons was incorporated.

The medical profession in England consists of three classes: first, physicians, who have received their degree from one of the universities; second, surgeons, who have graduated from one or another of the medical schools which exist in connection with the hospitals; and third, apothecaries, who dispense their own drugs and are generally considered as family physicians. Dispensers like American apothecaries are in England called chemists. The large hospitals in London have, in many instances, medical schools connected with them. Of the more prominent may be mentioned Saint Thomas, Saint Bartholomew, Saint George, and Guy's. The course of instruction at these hospitals is three years; the teachers are the physicians and surgeons who serve the hospitals. After passing the examinations at his medical school, in order to obtain authority to practice the graduate is obliged to pass an examination before a board composed of representatives of some of the leading medical societies, such as the Royal College of Physicians, the Royal College of Surgeons, or the Society of Apothecaries, or of the faculty of one of the universities.

The medical schools of Scotland are of great antiquity. That of Saint Andrews was founded in 1411, and the University of Edinburgh dates back to the year 1582, although it was many years subsequent to this before medical teaching there was placed on a scientific basis. The latter university exerted an incalculable influence on medical teaching in the United States, owing to the large number of American students who attended its courses.

From a very early period in the history of North America public lectures on medical topics were given in various parts of the country. To Dr. Cadwallader Colden is ascribed the credit of the first attempt to establish a systematic course on medicine in the Colonies. He tried to have the Assembly in the Province of Pennsylvania pass an act imposing a tax upon every unmarried man for the purpose of supporting a 'public physical lecture in Philadelphia.' His efforts were fruitless. In 1750 Dr. Thomas Cadwallader lectured on anatomy in Philadelphia, and in 1752 Dr. William Hunter, a cousin of the great John Hunter, lectured on anatomy at Newport, R. I. Dr. Charles F. Wiessenthal, of Baltimore, delivered lectures on surgery in that city prior to the Revolution.

The first medical school in the United States was founded by Drs. John Morgan and William Shippen, Jr., in 1765, when they established a medical department of the College of Philadelphia, which institution subsequently became the University of Pennsylvania. This was shortly followed by the organization, in 1767, of the medical department of King's College, New York, the lineal ancestor of Columbia University. Harvard University established its medical department in 1782, and in 1798 a medical department was established by Dr. Nathan Smith at Dartmouth College. Previous to the foundation of medical schools, the education of physicians in this country had been entirely by means of the apprenticeship system, except when a young man possessed sufficient means to go abroad and study in the medical schools of Edinburgh, London, or the Continent. It has been estimated that at the outset of the War for Independence there were upward of 3500 practitioners in the Colonies, of whom not more than 400 had received medical degrees. Most of the early teachers in American medical schools had been educated at the University of Edinburgh. This led to a close perpetuation of the traditions of the medical school of Edinburgh on this side of the Atlantic. In the early part of the nineteenth century it became customary for American physicians desirous of studying abroad to take their post-graduate work in France. In this way the teaching of Laennec, Trousseau, and above all of the great Louis, became familiar to the American profession, and served to give an immense impetus to scientific medical work in the United States. The most prominent medical colleges of the United States now require candidates for admission to possess a collegiate degree, or to pass examinations practically equivalent to those customary at the termination of the sophomore year of the collegiate course.

According to the report of the United States Commissioner of Education for 1898-99, there were at that time in the United States a total of 157 medical colleges; of these, 122 were classed as regular, 21 as homœopathic, 6 as eclectic, 2 as physio-medical, and 6 as post-graduate. There were 23,778 students in these institutions, and 4389 instructors. In almost every State of the Union there are now examining boards which hold biennial examinations, which it is necessary for a physician to pass before he can establish himself in practice in the State. In 1875 there were no medical schools in the United States which required even so much as a three years' course. In 1899 a four years' course was compulsory in 141 medical schools.

Medical Education of Women. The proposition to admit women into the medical profession met with bitter opposition, which has gradually given way. Although the Boston Homœopathic School for Women was opened as early as 1848, the Association for the Advancement of the Medical Education of Women, organized some time afterwards, first brought the subject clearly to public attention. The Woman's Medical College at Philadelphia was opened in 1850, and graduates about 20 physicians every year. The Woman's Medical College of the New York Infirmary was opened in 1868 by Dr. Elizabeth Blackwell (q.v.) and her sister Emily, the Infirmary for Women and Children having been in successful operation since its establishment by Dr. Blackwell in 1853. The college was closed in June, 1898, having fulfilled its mission. The New York Free Medical College for Women was founded in 1870. There are at present, besides these, colleges at Baltimore, San Francisco, and Chicago, and a homœopathic institution in New York. At the University of Michigan female students are admitted to the regular courses in medicine, which are for three years, attending certain lectures separately. The College of Physicians and Surgeons at Boston and Omaha Medical College are open to both sexes, and the Meharry medical department of the University of Central Tennessee was founded for colored male and female students. In the large cities the dispensaries are now open to women, and candidates for degrees in the Woman's Medical College of New York were received as residents of the New York Infirmary to receive special instruction in obstetrics and pharmacy. A bequest of $10,000 was left the medical department of Harvard University, with the condition that women should be admitted to the full course of instruction; and although the bequest with this proviso was not accepted by the authorities, there was a noticeably strong vote in its favor. In 1890 the trustees of Johns Hopkins University, Baltimore, accepted from ladies of that city and elsewhere $100,000 for the endowment fund of the university medical school, with the understanding that it should admit women on the same terms as men. Medical schools for women have been founded by American women in Turkey, and fifteen graduates of the Woman's Medical College of Philadelphia in 1884 were especially prepared for missionary work in foreign lands. One of the first female practitioners in England was Dr. Elizabeth Blackwell, who settled in London in 1868 and became connected with the Women's Medical College there. As late as 1867 the Apothecaries' Society passed resolutions excluding women from examinations for degrees. The admission of women to the University of Edinburgh led to open riots among the students. The 'enabling bill,' giving permission to medical schools and societies to grant qualifications for the registration of physicians without regard to sex, was passed by Parliament in 1876; King's and Queen's College of Physicians, Dublin, and the London University threw open their doors to women soon afterwards; and a preparatory medical school in London annually recruits the number of female matriculates in these institutions. There are dispensaries at London, Leeds, and Bristol superintended by female physicians; and Queen Victoria during her reign interested herself in behalf of medical missions carried on by Englishwomen in the East. The faculty of medicine at Paris has given a number of diplomas to women, as have the universities of Bern, Zurich, and Geneva. The first woman medical graduate in Germany was Mrs. Dorothea Christiana Erxleben, who received the medical degree from the University of Halle in 1754, upon recommendation by Frederick the Great in a royal decree. But medical colleges in Germany were closed to women till 1900, when by a decision of the German Federal Council female medical students were entitled to be admitted to the State examinations in medicine. Heidelberg University opened its doors to women in 1900. There are medical courses for women at the Carolinian institutions at Stockholm and at Upsala. The Spanish universities of Madrid, Valladolid, and Barcelona extend the same privileges. The War Department of the Russian Government founded a medical school for women at Saint Petersburg; a similar institution is now open at Moscow. All the medical societies in the United States and many in foreign countries admit female physicians to their congresses and discussions.

MEDICAL ELECTRICITY. See Electricity, Medical Uses of.

MEDICAL JURISPRUDENCE, or Forensic Medicine. The application of medical science to the elucidation of legal questions which have a medical aspect. The questions included in modern medical jurisprudence are divided by Godkin into five general classes: (1) Those arising out of sex relations, as impotence and sterility, pregnancy, legitimacy, and rape; (2) injuries inflicted on the living organism, as infanticide, wounds, poisons, injuries, and death from violence; (3) questions arising out of disqualifying diseases, as the different forms of mental alienation; (4) those arising out of deceptive practices, as feigned diseases;

(5) questions of a miscellaneous nature, as age, identity, presumption of seniority, and life assurance.

In criminal trials in the United States each side hires its own experts, and, owing to the use of hypothetical questions and the advocate's eliciting only part of the truth, the spectacle is often presented of equally competent medical experts flatly contradicting each other. The effect which this has had in casting doubt upon the value of expert opinion, and the dissatisfaction to which it has given rise in the minds of judges, juries, and experts themselves, have led to numerous plans for remedying this defect in the present system of calling expert witnesses by establishing a class of official experts; but most of these plans conflict with one or all of the fundamental principles of the common law relating to the conduct of criminal trials: that the court shall be the sole judge of the law, that the jury shall pass upon facts, and that the defendant shall have the right to present any proper evidence on his own behalf.

In France experts are generally selected from a list of official specialists, termed *experts assermentés*, and if the parties cannot agree upon the experts, the court appoints them. The court may order an investigation and report by experts whenever necessary, and the order contains a statement as to the exact object of the investigation, and appoints a referee or *juge commissaire.* Barristers or *avocats* do not appear before the experts; but the parties are represented by solicitors or *avoués*, or sometimes by persons specially skilled in the matter under investigation. The report must be signed by all the experts (who are three in number), the reasons for any dissenting opinion being embodied in the report. The judges, however, are not bound by the report if it is contrary to their convictions.

In Germany, after the issues are determined upon which expert testimony is sought, the parties may agree upon the experts, and the court may appoint them. The court may limit the number of experts, or may submit to the parties the names of a number of experts, permit each side to challenge a certain number, and appoint those remaining. There is a class of officially appointed experts on certain subjects, and these have the preference in trials which concern those subjects, unless there is some special reason to the contrary.

The plan suggested by Sir James Stephen in his *History of the Criminal Law of England*, and used for some years in Leeds, has given much satisfaction. Under this plan, which requires a high standard of professional honor and knowledge, medical men refuse to testify unless before doing so they can meet in conference with the experts of the opposing side, and have an exchange of views. As a result, it is stated that at Leeds medical witnesses are rarely cross-examined, and often they are called on one side only.

See EVIDENCE; BLOODSTAINS; HOMICIDE; INFANTICIDE; INSANITY. Consult: Hamilton and Godkin, *A System of Legal Medicine* (New York, 1900); and Reese, *Textbook of Medical Jurisprudence and Toxicology* (Philadelphia, 1902).

MEDICAL SCHOOL. See MEDICAL EDUCATION.

MEDICAL SCHOOL, NETLEY. An establishment at Netley, near Southampton, England, for the technical education of medical officers for the British and Indian military service. Candidates are examined competitively in the ordinary subjects of professional knowledge; and, passing satisfactorily through that ordeal, are then required to attend, for six months, at the Military Medical School, where they go through practical courses of military hygiene, military and clinical-military surgery and medicine, and pathology with morbid anatomy. There is a training school for army nurses in connection with the hospital at Netley, where women enlist for life or during competency for work in army hospitals, in the field, or in foreign lands in care of the sick soldiery.

MEDICAL STATISTICS OF THE UNITED STATES. In the United States of America, including the Philippines, Porto Rico, and Hawaii, there were, in 1901, 115,222 physicians to a population of 84,332,610. The last complete data we have concerning the number of and attendance upon medical schools are for 1899. In this year there were, excluding graduate schools, 156 medical schools in the United States, with 24,119 students. The growth in the number of medical students in twenty-one years has been 142 per cent. Of the 156 schools, 125 are 'regular' (21,619 students), 21 are homœopathic (1,833 students), 7 eclectic (582 students), and 3 physio-medical (85 students). In addition to these undergraduate schools there are 8 graduate medical schools, which had (in 1898) 624 instructors and 1813 students, of whom 59 were women. In 1899 these schools had 1916 students, of whom 73 were women.

The ratio of physicians to population is less than 1 to 600 in the United States, while in foreign countries it varies from 1 to about 1100 in the British isles to 1 to about 8500 in Russia. We are said to have in proportion to our population four times as many physicians as France, five times as many as Germany, six times as many as Italy.

MEDICI, mä'dē-chē, THE. The most celebrated family of the Florentine Republic. The Medici owed their earliest distinction to the success with which they had pursued various branches of commerce, and the liberal spirit in which they devoted their wealth to purposes of general utility. From the thirteenth century the Medici took part in all the leading events of the Republic. From the time when Salvestro de' Medici attained the rank of gonfaloniere in 1378 the family rose rapidly to preëminence, the foundation of its greatness being especially due to Giovanni, who died in 1429, leaving to his sons, Cosimo and Lorenzo, a heritage of wealth and honors hitherto unparalleled in the Republic. With Cosmo (1389-1464), on whom was gratefully bestowed the title of 'Father of his Country,' began the glorious epoch of the Medici; while from Lorenzo was descended the collateral branch of the family, which in the sixteenth century obtained absolute sway over Tuscany. Cosmo's life, except during a short period, when the Albizzi and other families reëstablished a successful opposition against the policy and credit of the Medici, was one uninterrupted course of prosperity. At once a munificent patron and a successful cultivator of art and literature, he did more than any sovereign in Europe to revive the study of the ancient classics, and to foster a taste for mental culture. He assembled about him learned men of every nation, and gave liberal support to numerous Greek scholars; and by his foundation of an academy for the study of the philosophy of Plato, and of a library of Greek, Latin, and Oriental manuscripts, he inaugurated a new era in modern learning and art. But, though he retained the forms of the Republic, and nominally confided the executive authority to a gonfaloniere and eight priori or senators, he totally extinguished the freedom of Florence.

His grandson, **Lorenzo the Magnificent** (1449-92), became the virtual head of the Florentine State in 1469. In 1478 the conspiracy of the Pazzi nearly succeeded in overthrowing the Medici. Lorenzo's brother Giuliano was slain, and he himself barely escaped. The result of the conspiracy was to give Lorenzo a firmer hold upon the State. He pursued with signal success the policy of his family, which was to win the favor of the lower classes, and thereby make absolute their own power. He encouraged literature and the arts, employed learned men to collect choice books and antiquities for him from every part of the known world, established printing presses in his dominions, founded academies for the study of classical learning, and filled his gardens with collections of the remains of ancient art. When, however, his munificence and conciliatory manners had gained for him the affection of the higher and the devotion of the lower classes, he lost no time in breaking down the forms of constitutional independence that he and his predecessors had hitherto suffered to exist. Some few Florentines, alarmed at the progress of the voluptuous refinement, which was smothering every spark of personal independence, tried to stem the current of corruption by an ascetic severity of morals, which gained for them the name of *piagnoni*, or weepers. Foremost among them was the Dominican friar Girolamo Savonarola (q.v.), whose eloquent appeals to the people in favor of a popular and democratic form of government and a life of asceticism threatened for a time the overthrow of the Medici. Lorenzo achieved some reputation in belles-lettres. We have from him poems of many kinds, lyric, moral, dramatic, and descriptive. His *Canzoni* and *Sonetti* are love poems, to which he added a prose commentary. A true feeling for nature appears in the *Caccia col falcone*, and a rather pleasing picture of rural life is to be found in his *Nencia da Barberino*. A dramatic composition of a kind held in favor at the time is the *Rappresentazione di Santi Giovanni e Paolo* (performed in 1489). Like so many writers of the period, he cultivated the form of the *ballata* or dance-song. He wrote also a number of *Canti carnascialeschi* or carnival songs. The religious spirit prevails in his *Laudi spirituali*. His love poetry is the best of all that he produced, and the most distinctive characteristic in it is the note of melancholy.

Pietro (born in 1471), who succeeded his father Lorenzo in 1492, possessed neither capacity nor prudence; and in the troubles which the ambition of her princes and the undue use of the temporal power of the popes brought upon Italy, by plunging her into civil and foreign war, he showed himself treacherous and vacillating, alike to friends and foes. When Charles VIII. of France, in 1494, marched into Italy in order to achieve the conquest of Naples, Pietro, in hopes of conciliating the powerful invader, hastened to meet the troops on their entrance into the dominions of Florence, and surrendered to Charles the fortresses of Leghorn and Pisa, which constituted the keys of the Republic. The magistrates and people, incensed at his perfidy, drove him from Florence, and formally deposed the family of Medici from all participation in power. Pietro lost his life in the battle of the Garigliano in 1503 while fighting in the French ranks. In 1512 the Medici were reinstated in Florence, and the elevation of Giovanni de' Medici to the Papal chair, under the title of Leo X. (1513-21), completed the restoration of the family to their former splendor. The accession of Giulio de' Medici to the pontificate as Clement VII. (1523-34), the marriage of Catharine, the granddaughter of Pietro, to Henry II. of France in 1533, and the military power of the cadet branch (descended from a younger brother of the 'Father of his Country') widened the rôle which the Medici were enabled to play.

Expelled from Florence in 1527, they were reinstated, and this time permanently, in 1530, by the combined forces of the Emperor Charles V. and Pope Clement VII. The Florentines were forced to accept as their ruler a worthless prince, Alessandro de' Medici, a natural son of Lorenzo II. (the father of Catharine), who in 1532 was invested with the ducal dignity. On his death by assassination without direct heirs, in 1537, Cosimo I., the descendant of a collateral branch, was raised to the ducal chair. Cosimo, known as the Great, possessed the astuteness of character, the love of elegance, and taste for literature that had distinguished his great ancestors; but none of their frank and generous spirit. He founded the academies of painting and of fine arts, made collections of paintings and statuary, published magnificent editions of his own works and those of others, and encouraged trade, for the protection of which he instituted the ecclesiastical Order of Saint Stephen. He was implacable in his enmity, and did not scruple to extirpate utterly the race of the Strozzi (q.v.), the hereditary foes of his house. His acquisition of Siena gained for him in 1569 the title of Grand Duke of Tuscany from Pius V. He died in 1574, leaving enormous wealth and regal power to his descendants, who, throughout the next half century, maintained the literary and artistic fame of their family. In the seventeenth century the race rapidly degenerated, and after several of its representatives had suffered themselves to be made the tools of Spanish and Austrian ambition, the dynasty of the Medici became extinct with Giovanni Gastone, who died in 1737. In accordance with the stipulation of the Peace of Vienna, the Grand Duchy of Tuscany passed to the House of Lorraine. The name of the Medici family was kept alive by a house which pretended to have emanated from it in the thirteenth century, and which acquired the Principality of Ottajano toward the end of the sixteenth century. To this house belonged Luigi de' Medici (1760-1830), Duke of Sarto, known as the Chevalier de' Medici. He was a minister of Ferdinand I. and Francis I. of the Two Sicilies, and died while visiting Madrid in 1830. Consult: Fabroni, *Vita Magni Cosmi Medicei* (Pisa, 1788-89); Armengaud, "Cosme des Medicis et sa correspondance inédite," in the *Comptes-rendus de l'académie des sciences morales et philosophiques* (Paris, 1876); Galluzi, *Storia del granducato di Toscana* (Florence, 1871); Perrens, *Histoire de Florence depuis la domination des Médicis jusqu'à la chute de la république* (Paris, 1888-90); Roscoe, *The Life of Lorenzo de' Medici* (London, 1784), ed. by W. Hazlitt (London, 1890); Reumont, *Lorenzo de' Medici* (2d ed., Leipzig, 1883); Roscoe, *Life and Pontificate of Leo X.* (5th ed., London, 1846). See Catharine de' Medici; Marie de' Medici; Tuscany.

MEDICI, Tombs of the. The burial place of the Medici family in the new sacristy of the Church of San Lorenzo, at Florence. It contains Michelangelo's statues of Giuliano and Lorenzo de' Medici, the former represented as a general of the Church, the latter in deep meditation. The sarcophagus of Giuliano is adorned by the famous sculptures of Day and Night, and that of Lorenzo by those of Evening and Dawn. The work was left unfinished in 1534.

MEDICI, Villa. A villa, south of the Pincian Hill at Rome, built in 1540 for Cardinal Ricci da Montepulciano, acquired at a later period by the Medici in 1600. In 1801 it became the home of the French Academy of Art, founded by Louis XIV., formerly in the Palazzo Salviati. The façade incloses ancient reliefs and an important collection of casts is contained in the wing.

MEDICINA, mā'dē-chē'nȧ. A town in the Province of Bologna, Italy, 15 miles east of the city of Bologna (Map: Italy, F 3). It is situated in a low-lying region which is extensively cultivated. It has some manufactures, and trades in grain, wine, and mineral waters. Population, in 1901 (commune), 12,535.

MEDICINAL PLANTS. Plants of which some part or product is used in medicine. Consult Potter, *Materia Medica, Pharmacy and Therapeutics* (Philadelphia, 1902).

MEDICINE, American Academy of. An association organized in 1876, holding annual meetings in the different large cities of the United States: (1) to bring together physicians who are also alumni of some academic or scientific college; (2) to urge the importance of a thorough mental training before studying medicine; and (3) to investigate and discuss problems of medical sociology. The society has a membership of nearly 900, and its publication is *The Bulletin*, appearing at Easton, Pa.

MEDICINE, Forensic. See Medical Jurisprudence.

MEDICINE (OF. *medicine*, Fr. *médecine*, from Lat. *medicina*, medicine, from *medicinus*, relating to a physician, from *medicus*, physician, from *medere*, Av. *mad*, to heal), History of. While medical practice, in an elementary form, is probably as old as man, the oldest records of medical matters extant are those of Egypt. Most of our knowledge of Egyptian medicine is derived from the Greeks, but recent discoveries of ancient papyri and better methods of deciphering inscriptions have yielded much original information. The Papyrus Ebers dates from about the sixteenth century B.C., and much of the learning therein recorded had been traditional for centuries. Certain facts concerning Egyptian medicine are well established. This art, as most others, was vested in the priests; there was an extensive formulary, combined with many ceremonial rites; practice was widely specialized—there were physicians, gynecologists, veterinarians, and military surgeons; but there was nothing like progress from one age to another. Egyptian medical lore was preserved in the last six volumes of the Sacred Book. These treated of anatomy, general diseases, instruments, remedies, diseases of the eye, and diseases of women, and in completeness and arrangement rival the Hippocratic collection, which they antedate by a thousand years.

The Hebrews derived their medical knowledge from Egypt, and are chiefly remarkable for their thorough conception of the value of public hygiene and sanitation, of which systems they may be considered the originators. In the early days of the existence of the Hebrew nation, disease was looked upon as a punishment for sin, and the Levites were the sole practitioners. Later in their history the Jews received the impress of Assyrian, and later still of Greek thought. After two captivities we find a class of temple physicians and special surgeons, and in the centuries immediately preceding the Christian Era there were communal or city physicians who were held in high esteem. Jewish medical records embraced in the Talmud (q.v.) show that the Jewish physicians had, like the Egyptian, little knowledge of human anatomy, that their surgery was crude, and that no operations in midwifery were performed.

The Vedas (q.v.), the sacred books of India, show that medicine as a separate science was in that country very ancient. The Indian physicians combined a close observation of pathological phenomena with a genius for misinterpretation, so that their study availed them little. Demonology played a large part in their practice and belief. Physicians were drawn from the highest caste (the Brahmins), and long training, decorum, and piety were required of them. Their therapeutic methods embraced diet, bathing, and innumerable drugs.

The origin of Chinese medicine is lost in tradition and fable. The Chinese attributed the invention of medicine to the Emperor Hwang-ti, who was supposed to have lived about B.C. 2687. They had elaborate rules for noting the pulse, and a portentous array of curious remedies, drawn from the animal, vegetable, and mineral kingdoms. They knew no anatomy, and their surgery was of a barbarous type. No bloody operations were performed, but cupping, acupuncture (q.v.), plasters, and fomentations were used. Medical practice was entirely unregulated.

It is Greece that furnishes us with the most interesting and significant remains of the history of medicine during antiquity. Chiron (q.v.), the Centaur, is fabled to have introduced the art of healing into Greece, and to have been the preceptor of Æsculapius (q.v.), who was as eminent among the Greeks as was Hermes in Egypt. Some scholars consider them identical. The followers of Æsculapius early formed a separate cult or worship. They had temples situated in groves and near springs, where healing was practiced and instruction given. Treatment consisted of the interpretation of dreams, propitiatory sacrifices, the offering of votive tablets, etc., but dieting, pure air, temperate living, and bathing also had their part in the cure, together with frictions, emetics, and purgatives. The system finally degenerated into mere mysticism, and by the time of Hippocrates only the superstitious resorted to it. Besides the temple medicine there were gymnasia, older even than Æsculapius, each of which had its *gymnasiarch* or director; a *gymnast,* under him, who directed the treatment of the sick; and *iatroliptes,* who anointed, gave massage, bled, and dressed wounds and ulcers.

The period prior to the dispersion of the followers of Pythagoras (q.v.) (c.500 B.C.) is sometimes called the *sacred period* of medicine. It was followed by the *philosophical period,* inseparably linked with the name of Hippocrates (q.v.) (B.C. 460-c.357), the first great apostle of rational medicine. He classified diseases into epidemic, endemic, and sporadic; he wrote extensively on surgery (though ignorant of dissection), on obstetrics, hygiene, regimen, and on climatic influences; and his works display an immense range of knowledge and high powers of description.

From the time of Hippocrates, for several centuries, we find medical beliefs crystallizing about several schools or systems. The *Dogmatic* or rationalistic school of Hippocrates, founded by his sons, Thessalus and Draco, and his son-in-law, Polybius, based its principles of practice on theories derived from known facts and observations, and regarded maladies as units from their beginning to their termination; that is, they recognized diseases as distinct entities. The *Empirics,* on the other hand, taught that remedies could only be suggested by experience. Their school was founded, according to Celsus, by Serapion, a pupil of Hierophilus, mentioned later in this article. The *Methodists* occupied a position somewhere between the Empirics and Dogmatists, and the *Eclectics* chose, or pretended to choose, from each system what suited them, and adhered to none.

The philosophic period ended and the *anatomic period* began with the foundation of the Alexandrian Library, after the death of Alexander the Great, by Ptolemy, one of his lieutenants. This was in B.C. 320, and the centre of medical thought and teaching was now shifted to Alexandria. Here the Ptolemies gathered about them the learned men of the day. Although Egyptian prejudice was strong against it, Ptolemy encouraged dissection of the human body. Among the famous teachers of Alexandria were Hierophilus and Erasistratus (q.v.). The former is supposed to have been the first to dissect a human body, and between them they made many notable discoveries concerning the structure of the brain, eye, heart, and intestinal canal. Erasistratus died about B.C. 280. During this period medical thought was practically divided into two schools, the Dogmatist and the Empiric.

The first native Roman writer on medicine was Celsus (q.v.), born at about the time of Christ. His work, *De Medicina,* gives a sketch of the history of medicine up to his time, and the state in which it then existed. He followed the teachings of Hippocrates and exercised a dominant influence until Galen (q.v.) (130-c.201) totally supplanted him. Galen wrote over a hundred works, some of them on anatomy. He described every bone in the human body, and the functions of the muscles; he recognized two kinds of nerves—those of sensation, which he thought came from the brain, and those of motion, which he believed to originate in the spinal marrow. He divided the body into the cranial, thoracic, and abdominal cavities, whose proper envelopes he described. Galen strove to popularize the study of anatomy, with but little success, and with his death came the end of the anatomical period and the end for several centuries of medical progress.

The first names of any renown that occur after the death of Galen are those of Oribasius, Alexander of Tralles, Ætius, and Paulus Ægineta, who flourished between the fourth and seventh centuries. They were all zealous Galenists. With the death of Paulus the Greek school may be said to have ended, for after his time no works of any merit were written in this language.

Arabian medicine was an offspring of the Greek, through the Nestorian monks, who settled in Persia and Arabia in the sixth century, and established many schools of learning. Fragments of the sect still remain in these countries. By the seventh century Arabian physicians were in high repute. The earliest Arabic writer on medicine was Ahrum, who was contemporary with Paulus, but the most celebrated physicians of this school were Rhazes, who lived in the ninth century and was the first to describe smallpox; Avicenna (q.v.), of the eleventh century, whose *Canon Medicinæ* embraced all that was then known of medicine and the collateral sciences; Albucasis, whose works on surgery were the standard for several centuries; Avenzoar; and Averroës, who lived in the twelfth century and was equally celebrated as a physician and a philosopher. The works of Hippocrates and Galen, which, together with those of Aristotle, Plato, and Euclid, were translated into Arabic in the ninth century, formed the basis of their medical knowledge; but the Arabian physicians did good service to medicine by introducing new articles from the East into the European materia medica, for example, rhubarb, cassia, senna, and camphor, and in making known the first elements of pharmaceutical chemistry, such as distillation, and the methods of obtaining various metallic oxides and salts. During this period that part of Europe not in the hands of the Saracens was subjected to successive invasions of northern barbarians, and medicine, as other arts, was at a standstill. There was a brief period of quiet during the reign of Charlemagne, when medical practice seems to have again passed into ecclesiastical control, and from the ninth until the thirteenth century the Jews (who acquired their learning from the Saracens) shared with the clergy the art of healing.

Upon the decline of the Saracenic universities of Spain, which may be dated from the death of Averroës, the best medical teaching was to be found in Italy, where the School of Salerno became celebrated. It was gradually eclipsed in its turn by the rising fame of other medical schools at Bologna, Vienna, Paris, Padua, and elsewhere. Contemporary with Mondino lived Gilbert, the first English medical writer of note; and the prior century gave birth to Linacre (q.v.), who studied at the Continental universities and subsequently founded the London College of Physicians. It was in the fifteenth century that the sect of chemical physicians arose, who maintained that all the phenomena of the living body may be explained by the same chemical laws as those which rule inorganic matter. The chemical school, with Paracelsus (q.v.) at their head, did nothing to advance medicine except to introduce into the materia medica several valuable metallic preparations. During this period many new diseases were recognized and described.

In the sixteenth century the study of human anatomy was first fairly established by the labors of Vesalius (q.v.): and in this century and the following we meet with the names of many physicians whose anatomical and physiological studies materially advanced medical science. This was the epoch of Eustachio (q.v.), Fallópius (q.v.), Asellius, Harvey (q.v.), Rudbeck, Bartholin, Glisson, Sylvius, Willis, Bellini, and others. Ambroise Paré (1517-90) made important additions to surgical knowledge and technique. The Cæsarian operation, which had been known among the Greeks and Romans, was revived. Malpighi (q.v.) and Grew founded the cell doctrine. Besides many discoveries in minute anatomy, made possible by the invention and gradual improvement of the microscope, the materia medica was enriched by the addition of Peruvian bark or cinchona by the Countess Chinchon in 1632. The seventeenth century is also marked by great advance in obstetrics; medical jurisprudence had its beginning about this time: and bedside or clinical teaching was introduced. Chemistry was now becoming distinct from alchemy, and advancing to the dignity of a science, and an alliance between its principles and those of physiology was formed, which resulted in a new sect of chemical physicians, quite distinct, however, from the sect represented two centuries previously by Paracelsus. These chemical physicians believed that diseases were referable to certain fermentations which took place in the blood, and that certain of these *humors* were naturally acid and others alkaline, and that when one or the other of these predominated certain specific diseases were the result, which were to be removed by the exhibition of remedies of an opposite nature to that of the disease. They were soon succeeded by the Iatro-mathematical school, of which Borelli, Sauvages, Kneill, Jurin, Mead, and Friend were among the best known. Another sect was that of the Vitalists, which originated with Van Helmont, and which, with some modification, was adopted by Stahl and Hoffmann. Among other physicians whose names stand out prominently in the annals of the seventeenth century are Sir Thomas Browne and Sydenham (q.v.), both Englishmen, the latter the greatest clinical physician of his time; Wharton, who discovered the submaxillary duct; Schneider, who described the Schneiderian mucous membrane of the nose; Stenson, Peyer, Brunner, Pacchioni, Havers, and Cowper.

The most eminent teacher of medicine in the early part of the eighteenth century was Boerhaave (q.v.), elected to the chair of medicine at Leyden in 1709. Among the pupils of Boerhaave was Van Swieten, whose comments on the aphorisms of his master formed a valuable collection of practical observations: and Haller (q.v.), who has been called the father of modern physiology and who first enunciated the theory that irritability and sensibility are specific properties of muscular and nervous tissues. Most of the distinguished physicians of the latter part of the eighteenth century belonged to the Cullenian school of medicine. (See CULLEN.) Cullen's views were attacked with great acrimony by his former assistant, John Brown (q.v.), who became the founder of the Brunonian system of medicine. In Great Britain the views of Brown were regarded as too purely theoretical, and did not attain any great popularity; but in some parts of the Continent, and especially in Italy, they found acceptance, and became for a considerable time the prevailing doctrine in the leading medical schools. Among the medical curiosities of the later years of this century were the doctrine of animal magnetism or mesmerism (q.v.) and homœopathy (q.v.). The latter was founded by Hahnemann (q.v.) and served a useful purpose in protesting against the enormous dosage of medicines and the excessive bloodletting then in vogue. The eighteenth century witnessed a steady progress in all branches of medicine and surgery, the social status of the practitioner was raised, and medicine became a conscientious vocation and not a mere trade. The greatest single discovery of the age, and that which conferred the most benefit on mankind, was vaccination (see JENNER), and next to this, perhaps, a reform in the methods of treating the insane. To supplement this outline of the progress of medicine in the eighteenth century, the reader is recommended to consult the biographical sketches of Monro, the Hunters, and others.

The nineteenth century was one of epoch-making discoveries, only a few of which can even be mentioned within the limits of this article. In the early years of the century Laennec (q.v.) invented the stethoscope and thereby instituted a complete revolution in the methods of physical diagnosis; Virchow (q.v.) founded modern cellular pathology; Pasteur (q.v.), by his studies in fermentation and putrefaction, prepared the way for the germ theory of disease; and Lister (q.v.), stimulated by Pasteur's discoveries, gave to surgery the antiseptic treatment of wounds. Laveran (q.v.) in 1880 discovered the plasmodium of malaria (q.v.), and Koch (q.v.) in 1882 the bacillus of tuberculosis. Since then it has been proved that anthrax, Asiatic cholera, and most of what are called the specific infectious diseases are due to minute vegetable organisms. (See BACTERIA.) The discovery of general anæsthetics was no less important and remarkable. Morton (q.v.), of Boston, demonstrated the anæsthetic properties of sulphuric ether in 1846; and Simpson, of Edinburgh, introduced chloroform in 1847. The introduction of cocaïne as a local anæsthetic in 1884 by Koller made possible the performance of painless operations on the eye and in the nose and throat and other parts of the body. The materia medica has been enriched by the addition of quinine, morphia, strychnine, iodine and the iodides, the bromides, hydrocyanic acid, and cod liver oil, and, more interesting than these, of antitoxic serums. (See ANTITOXIN; SERUM THERAPY.) Diphtheria antitoxin especially has saved thousands of lives. Among the more important instruments invented during the nineteenth century are the ophthalmoscope and the laryngoscope. The Röntgen rays (q.v.) and the Finsen rays (see PHOTOTHERAPY) are of too recent introduction to have proved their worth. For a complete review of the medical progress of the nineteenth century, consult the *International Year Book* for 1900. Consult: Baas, *History of Medicine* (New York, 1899): Park, *An Epitome of the History of Medicine* (New York, 1899); and Bennet, *Diseases of the Bible* (London, 1887).

MEDICINE DANCE. A popular name applied to a Cheyenne Indian ceremony attended with fearful personal mutilation and torture. It is identical with the sun dance (q.v.) practiced by the Sioux and other Northern tribes.

MEDICK (OF. *medique*, from Lat. *medica*, from Gk. *μηδική*, *mēdikē*, median grass, from Μηδικος, *Medikos*, median, from Μῆδος, *medos*, OPers. *Māda*, Mede), *Medicago*. A genus of plants, natives of temperate and warm climates of the Old World, of the natural order Leguminosæ, distinguished from the closely related genus Trifolium (clover) by the sickle-shaped or spirally twisted legume. The species, which are very numerous, are mostly annual and perennial herbs with leaves of three leaflets like those of clover. A number of them are found in Europe, and have also been introduced into the United States. The most important species is the purple medick, lucerne, or alfalfa (q.v.); other important species are bur clover (*Medicago denticulata*), distributed in California and the grazing regions of the Southwest; yellow lucerne (*Medicago falcata*), which grows wild in Northern Europe; black medick (*Medicago lupulina*), widely grown as a pasture plant; and spotted medick (*Medicago maculata*), introduced into the Eastern and Southern States. They are generally valuable as forage and pasture plants.

MEDICO DE SU HONRA, mā′dė-kȯ dȧ s͞oo ōn′rȧ, El (Sp., the physician of his own honor). One of the strongest dramas of Calderon, in which a husband, Don Guttiére, surprises his wife in the act of writing a letter to the King's brother, who had tried to corrupt her before marriage. Although the wife is pure, she consents to a cruel punishment, and her husband kills her by excessive blood-letting, in order that her death may appear natural. Don Guttiére marries again, warning his new wife that an instant's suspicion will subject her to the same fate as satisfaction for his sensitive conjugal honor.

MEDICO-PSYCHOLOGICAL ASSOCIATION OF GREAT BRITAIN AND IRELAND, The. An association founded in 1841, with headquarters in London, England. Its objects are the study and promotion of mental pathology and the improvement of the treatment of the insane. The membership, which is over 600, is made up of registered medical practitioners and of honorary corresponding members. The regular publication of the association is *The Journal of Mental Science*.

MEDILL′, Joseph (1823-99). An American journalist. He was born in New Brunswick, Canada, but at the age of eight removed with his parents to Massillon, Ohio. He studied law at Canton, and was admitted to the bar in 1846, but in 1849 entered journalism, and took charge of the Coshocton *Republican*, a Free-Soil paper. Two years later he established the Cleveland *Forest City*, a Whig organ, but in 1852 united it with the *Free Democrat*, the new paper being called the *Leader*. A little later he left the Whig Party, and in 1854 was an organizer of the Republican Party in Ohio. In 1856, with two partners, he bought the Chicago *Tribune*. In 1870 he helped frame a new State constitution for Illinois; in 1871 was appointed a member of the first Civil Service Commission, and in 1872 was elected Mayor of Chicago. In 1874 he became chief proprietor and editor-in-chief of the *Tribune*, and he continued in that position until his death.

MEDI′NA (Ar. *al-Medinah*, the city; or more fully *Medinat al-Nabi*, the city of the Prophet; called also *Tayyibah*, the perfumed, or *al-Munawwarah*, the illumined; before the time of Mohammed, known as *Yathrib*, whence it is mentioned by Ptolemy as *Jathrippa*). One of the sacred cities of Islam, the scene of Mohammed's labors after his flight from Mecca (see Mohammed; Hejíra), and the place of his tomb. It is situated about 250 miles north of Mecca, and 140 north by east of the port of Yambu on the Red Sea. The population was estimated by Burton at the time of his visit (1852) at 16,000; a later estimate places it at 40,000. The city originally contained a large Aramean population; but in the third century A.D. the tribes of *Aus* and *Khazraj* emigrated thither from Yemen, and gave it an Arabic character; later they became the 'helpers' (*Anṣār*) of Mohammed when he fled from Mecca. Medina also contained a large Jewish population, who were influential in the early days of Islam, but whom the Prophet severely repressed. It was the capital of the new Mohammedan power until Moawiyah exchanged it for Damascus. It consists of three principal parts—a town, a fort, and suburbs of about the same extent as the town itself, from which they are separated by a wide space. Medina forms an irregular oval within a walled inclosure, 35 to 40 feet in height, and flanked by thirty towers—a fortification which renders the city the chief stronghold of Hejaz. Two of its four gates, viz. the *Bab al-Jum'ah* (Assembly Gate, in the eastern wall), and the *Bab al-Miṣri* (Egyptian Gate), are massive buildings with double towers. The streets, between fifty and sixty in number, are narrow and paved only in a few places. The houses are flat-roofed and double-storied, and are built of a basaltic scoria, burned brick, and palm-wood. Very few public buildings of any importance are to be noticed except the mosque, erected near the spot where Mohammed died. It is of smaller dimensions than that of Mecca, being a parallelogram, 420 feet long and 340 feet broad, with a spacious central area called *al-Ṣahn*, which is surrounded by a peristyle, with numerous rows of pillars. The Mausoleum, or *Ḥujrah*, itself behind the mosque proper, is an irregular square, 50 to 55 feet in extent, situated in the southeast corner of the building, and separated from the walls of the mosque by a passage about 26 feet broad. A large gilt crescent above the 'green dome' springing from a series of globes, surmounts the Hujrah, a glimpse into which is only attainable through a little opening, called the Prophet's Window; but nothing more is visible to the profane eye than costly carpets or hangings, with three inscriptions in large gold letters stating that behind them lie the bodies of the Prophet of Allah and the two caliphs (Abu Bekr and Omar), and an empty tomb for Jesus. These curtains, changed whenever worn out, or when a new Sultan ascends the throne, are supposed to cover a square edifice of black marble, in the midst of which stands Mohammed's tomb. Its exact place is indicated by a long, pearly rosary (*Kaukab al-Durrī*) suspended from the curtain. The Prophet's body is supposed to lie (undecayed) stretched at full length on the right side with the right palm supporting the right cheek, the face directed toward Mecca. Outside the drapery is the tomb of Fatima, the daughter of

Mohammed. Close behind him is placed, in the same position, Abu Bekr, and behind the latter Omar. The fact, however, is that when the mosque, which had been struck by lightning, was rebuilt in 892, three deep graves were found in the interior, filled only with rubbish. Many other reasons make it more than problematic whether the particular spot at Medina really contains the Prophet's remains. Of the fabulous treasures which this sanctuary once contained, little now remains. As in Mecca, a great number of ecclesiastical officials are attached in some capacity or other to the mosque, as ulemas, imams, khatibs, etc.; and not only they, but the townspeople in general, live to a great extent on the pilgrims' alms, the city having little trade. The mosque was destroyed by fire in 1257, and was rebuilt 1258-88; it was restored in 1487 by Khaid Bey, of Egypt. The city was conquered by the Turkish sultans in the sixteenth century. It fell into the power of Saud, the Wahhabite general, in 1803, and was reconquered by Tussun Pasha in 1815. There are few other noteworthy spots to be mentioned in Medina, save the minor mosques of Abu Bekr, Ali, Omar, etc. The private houses, however, surrounded by gardens, fountains, etc., have a very pleasing appearance; and the city, although in its decay, is yet busy and agreeable. A number of medreses, or endowed schools, represent what learning there is left in Medina, once famed for its scholars. As is the case with Mecca, non-Mohammedans are rigorously excluded from the sacred city, yet it has been visited by Burckhardt (1811) and Burton (1852). Consult: Burckhardt, *Travels in Arabia* (London, 1829); Burton, *Journal of a Pilgrimage to El-Medinah and Mecca* (London, 1855); Soubhy, *Pélerinage à la Mecque et à Médine* (Cairo, 1894); Wellhausen, *Medinah vor dem Islam*, in his *Skizzen*, iv. (Berlin, 1889).

MEDI'NA. A village in Orleans County, N. Y., 41 miles west of Rochester and equally distant to the northeast from Buffalo; on Oak Orchard Creek, the Erie Canal, and the New York Central and Hudson River Railroad (Map: New York, B 2). It is in a fertile agricultural region and derives good water power from the creek, where a storage dam is being (1902) constructed, designed to yield 2000 horse-power, which will be utilized to generate electricity for industrial purposes. There are valuable sandstone quarries, foundries, iron works, pump works, flouring mills, and manufactories of furniture, shoes, shirts, vinegar, cigars, and extracts. Medina Falls are visited for their scenic interest. Settled about 1830, Medina was incorporated in 1832. The present government is administered under a charter of 1874, which, as subsequently amended, provides for a president, annually elected, and a board of trustees who act with the executive in electing subordinate officials. Population, in 1890, 4492; in 1900, 4716.

MEDINA. The sister of Elissa and Perissa, in Spenser's *Faerie Queene.* She represents the golden mean.

MEDINA, mȧ-dē'nȧ, JOSÉ MARIA (c.1815-78). A Central American politician, born in Honduras. After acting as President of Honduras in 1862 and 1863, he was elected to that office in 1864, 1866, and 1870. His administration was fortunate and tranquil until 1871, when war broke out with Salvador. Medina was defeated and was deposed by Arias at the head of the Liberal Party. Against Leiva, who became President in 1874, Medina revolted in 1875-76 and again in 1877. As a result of the later attempt Medina was arrested, court-martialed, and shot.

MEDINA DE RIO SECO, dȧ rē'ȯ sā'kȯ. A small town of Spain, in the Province of Valladolid, 20 miles northwest of the city of that name (Map: Spain, C 2). Here, on July 14, 1808, a Spanish army of 50,000 was defeated by 12,000 French.

MEDINA SERIES. A subdivision of the Upper Silurian system. The rocks are conglomerates, sandstones and shales. They are abundant in the Eastern United States. At Medina, N. Y., large quarries of building stone occur in the formation. See GEOLOGY; SANDSTONE.

MEDINA SIDONIA, sė-DŌ'nė-ȧ. A town of Southern Spain, in the Province of Cadiz, situated on a steep eminence, 20 miles southeast of Cadiz (Map: Spain, C 4). It has a picturesque appearance, contains a beautiful Gothic church and the ruins of a palace of the dukes of Medina Sidonia. It was founded as a fort by the Moors. Population, in 1900, 11,003. The dukes of Medina Sidonia played an important part in the internal political life of Spain, and to one of them was intrusted the command of the Armada for the invasion of England in 1588. See ARMADA.

MEDINET-EL-FAYUM, me-dē'nĕt el fī-o͞om'. The capital of the Egyptian Province of Fayum (q.v.), situated on the Bahr-Yusuf, 55 miles south of Cairo (Map: Egypt, D 3). It is a well-built town, with an interesting mosque and a fine bazaar. The chief industry is the manufacturing of woolens; there is a considerable trade in grain, woolens, and roses. The town is the seat of an American mission. Population, in 1900, 40,000.

MEDÎNET HABU, me-dē'nĕt hä-bo͞o'. The modern Arabic name of a ruined Coptic village, built in early Christian times, on the west bank of the Nile in about latitude 25° 50′ N. It stood around and upon the ruins of a group of temple buildings in the western quarter of ancient Thebes. These ruins include a small temple built by Queen Hatasu and King Thothmes III., with additions by several later monarchs, and a large temple built after the model of the Ramesseum (q.v.) by Rameses III. The larger temple originally stood within an inclosure surrounded by a wall of which considerable traces yet remain. The main entrance to the inclosure is through a gateway in a massive pavilion built in imitation of a Syrian fortress and containing several chambers whose walls are beautifully decorated with reliefs. Within the inclosure a great pylon gate faces the pavilion, and gives entrance to a colonnaded court 115 feet in length and about the same in breadth. A second pylon gate forms the entrance to a second colonnaded court (125 feet long and 138 feet broad) which in Christian times was converted into a church. At the upper end of this court is a terrace from which a door leads to the hypostyle hall, supported by twenty-four columns. To the rear of the hall are two smaller halls and a number of chambers, most of which are in a ruinous condition.

Close to the temple of Rameses III. lie the buildings of the smaller temple. Between two pylons—the outer built by Ptolemy X., the inner by Taharka—is a small chapel (32 feet long), built by Nectanebo. The inner pylon forms the entrance to a court, at the upper end of which is the temple built in the Eighteenth Dynasty by Hatasu and Thothmes III. It consists of a chamber surrounded by a colonnaded portico, and adorned with reliefs and inscriptions. To the rear lie six smaller chambers, in one of which is a shrine for a divine image. Consult: *Description de l'Egypte* (Paris, 1809-29); Wilkinson, *Topography of Thebes* (London, 1835); Dümichen, *Geschichte des alten Aegyptens* (Berlin, 1878). See also THEBES.

MEDING, mā'dĭng, OSKAR (1829—). A German novelist, whose pseudonym is 'Gregor Samarow.' He was born in Königsberg, Prussia, studied law, and in 1870 retired from the civil service. From 1873 to 1879 he lived in Berlin, and then at Castle Wohldenberg, and in 1900 settled at Charlottenberg. His novels deal mostly with modern history. He wrote, under the pseudonym of 'Samarow,' *Um Scepter und Kronen*, a cycle (1872-76); *Die Römerfahrt der Epigonen* (1874; 4th ed. 1887); *Höhen und Tiefen* (1879-80); *Krieg oder Frieden* (1897); and *Ein Gespenst* (1902). He also wrote under his own name and the pseudonym 'Leo Warren.' More purely historical and biographical are his *Memoiren zur Zeitgeschichte* (1881-84); *Erinnerungen aus der Zeit der Görung und Klärung* (1896); and *Aus vergangenen Tagen* (1896).

ME'DIOLA'NUM. The Latin name of Milan.

MEDITERRANEAN FEVER. See MALTA FEVER.

MEDITERRANEAN RACE (Lat. *mediterraneus*, midland, from *medius*, middle + *terra*, land). That portion of the white or Caucasian division of mankind dwelling now or formerly about the Mediterranean Sea, characterized by long heads and faces, dark brown or black hair, dark eyes, medium stature, slender bodies, and broad noses. It is called Iberian by English ethnologists, Ligurian by the Italians, Ibero-Insular or Atlanto-Mediterranean by Deniker, and Ibero-Pictish by Rhys.

There are four subraces of the Mediterranean race. In the southwestern portion of Europe, including Spain and Portugal, and moving onward as far as Iceland and Scotland, were the Iberians (q.v.), who left their name on the Iberian peninsula. In the middle projection into the Mediterranean were the Ligurian subrace, whose territory stretched westward into Southern France. The eastern peninsula and the isles of Greece were the home of the Pelasgians (q.v.), who moved northwestward through ancient Illyricum into Italy and are supposed to have been of one race with the Hittites (q.v.) of Asia Minor. The Northeastern and North African subrace may be called in general terms Hamite (q.v.), to which belonged among others the Egyptians and Libyans. Consult Sergi, *The Mediterranean Race* (London, 1901), with references to his numerous writings and the best authorities.

MEDITERRANEAN SEA. A great inland sea of the Eastern Hemisphere, almost entirely inclosed by the continents of Europe, Asia, and Africa, and communicating with the Black Sea by the Dardanelles, the Sea of Marmora, and the Bosporus (Map: Europe, D 5). It extends from longitude 5° 21′ W. to 36° 10′ E., a distance of 2320 miles. Its breadth differs widely in different parts, the maximum breadth being 1080 miles. It is connected with the Atlantic by the Strait of Gibraltar. The southern or African coast is comparatively smooth and unindented. The northern or European coast, on the other hand, is extremely broken, with several long peninsulas, deep bays and gulfs, and many islands. It abounds in good harbors, which early conduced to extensive commerce. The Balearic Isles, Sardinia, Corsica, Sicily, Crete, and Cyprus are the largest islands. The Italian peninsula, with Sicily and the extended shallows that lie between Sicily and Tunis, divide the Mediterranean into two parts.

The depth of the Mediterranean differs greatly in different parts, the maximum depth being 14,400 feet in the eastern basin south of the Morea, and 12,200 feet in the western basin east of Sardinia. The depth at the Strait of Gibraltar is less than 1000 fathoms, while fifty miles outside the water shoals to 200 fathoms. The specific gravity and salinity of the water is slightly greater than that of the Atlantic, the proportions being 1.029 to 1.028. The temperature of the surface water in summer is commonly a few degrees higher than that of the Atlantic in the same latitudes, and the temperature at depths is much higher, as is often the case in partly inclosed seas. While the temperature in the greater depths of the Atlantic is very near the freezing point, in the Mediterranean it reaches only 54° to 56° F. In winter the surface temperatures do not differ materially. The tides are very slight, at most places being only a few inches in height. In the summer the northeast trades blow over the Mediterranean, while in the winter, with the shifting of the trades, the prevailing winds are westerly. Specially designated winds are the Bora, in the Adriatic, and the Sirocco, blowing over from the African desert.

The great rivers which flow into the Mediterranean are few in number, the principal ones being the Ebro, Rhone, and the Po from Europe, and the Nile from Africa. Into the Black Sea flows much more water, hence there is a constant current from the Black Sea into the Mediterranean. From the Atlantic flows a constant surface current into the Mediterranean, due probably to the excess of evaporation over supply in the latter body of water, while there is a lower current flowing in the contrary direction. The chief divisions of the Mediterranean are known as the Levantine Sea (in the east), the Ægean Sea, Ionian Sea, Adriatic Sea, Tyrrhenian Sea (immediately west of the peninsula of Italy), and Balearic Sea.

Of the European sea fishes over 400 species inhabit the Mediterranean Sea, some of which are peculiar to it. It has a greater number of species than the British and Scandinavian seas, but does not nearly so much abound in useful kinds. The sponge, tunny, and sardine fisheries are important on some parts of its coasts. It is rich in red coral, which is procured in great quantity on the coasts of Provence, of the Balearic Isles, and of Sicily, but particularly on the coasts of Tunis and Tripoli in Africa.

The shores of the Mediterranean Sea are in many parts subject to frequent earthquakes. Besides the existing active volcanoes of Etna, Vesuvius, and Stromboli, there are many evidences of recent volcanic action, and instances have occurred of islands suddenly upheaved by it, where volcanic fires have appeared for a short time. Consult: Playfair, "The Mediterranean, Physical and Historical," in *Smithsonian Institution Report, 1890* (Washington, 1891); Smyth, *The Mediterranean, Memoir Physical, Historical, and Natural* (London, 1854).

MEDITERRANEAN SUBREGION. In zoögeography, that subdivision of the Palearctic Region which includes the basin of the Mediterranean Sea, Asia Minor, Persia, and the south coast of Asia as far as the Indus. The Canary, Azores, and Madeira islands are also included. It is bounded on the north by the line of mountains which extend from the Pyrenees to the Himalayas, and on the south by the Atlas Mountains, the deserts of Northwestern Africa and Central Arabia, and east of that by the Indian Ocean. It is a region of subtropical warmth, and except along the north shore of the Mediterranean is largely treeless, arid, and elevated. Within recent times the Mediterranean has been of much less extent, enabling animals to pass freely across its basin at two or more places; and much of the country now barren was formerly wooded. It is not surprising to find, therefore, a general similarity and great variety of life throughout the entire area. Among the possible indigenes of this subregion were the horse, camel, and some other now wholly domesticated animals. Of the few remaining or recently extinct mammals of the larger sort, the Barbary ape, fallow deer, aoudad, moufflon (of Sardinia), and civets are most prominent. Several gazelles and antelopes, which do not range south of the Sahara, the Asiatic wild ass, and many small animals are peculiar. Most of the North European birds pass across it in their migration to and from their winter homes; but it has many resident species of its own, especially among the birds of prey and the game birds. See Distribution of Animals; and consult the accompanying maps, and the authorities there cited.

MEDJIDIE, mĕ-jĭd'ĭ-ȧ (Turk. *majīdī*, from Turk., Ar. *majīd*, glorious, from Ar. *majd*, glory, from *majada*, to be glorious). A Turkish order of distinction, first instituted in 1852. The Order of Medjidie has five classes, each differing in size, the decoration on which is a silver sun of seven triple rays, the crescent and star alternating with the rays. In the centre of the decoration, on a circle of red enamel, is the legend signifying 'zeal, honor, and loyalty,' and the date 1268, the Mohammedan calendar year corresponding to 1852. The Sultan's name is inscribed on a gold field within this circle. The first three classes of the order are worn suspended from the neck, and the fourth and fifth on the left breast. A star closely resembling the badge is worn on the left breast by the wearers of the first-class order, and on the right breast by those of the second class. The ribbon is red with green borders. See Plate of Orders.

MEDLAR (OF. *medler*, *mesler*, *meslier*, medlar-tree, from *mesle*, *mesple*, *neple*, Fr. *nèfle*, It. *nespila*, medlar-fruit, from OHG. *mespila*, *nespela*, Ger. *Mispel*, medlar, from Lat. *mespilus*, Gk. μέσπιλον, *mespilon*, μεσπίλη, *mespilē*, medlar; probably connected ultimately with Heb. *shāpēl*, to be low), *Mespilus*. A genus of trees or shrubs of the natural order Rosaceæ sometimes combined with the genus Pyrus by botanists. The common medlar (*Mespilus* or *Pyrus germanica*), a large shrub or small tree, spiny in a wild state, but destitute of spines in cultivation, is a native of and in general cultivation in the south of Europe and the temperate parts of Asia, seldom seen in America. It has lanceolate leaves, not divided nor serrated, solitary large white flowers at the ends of small spurs, and somewhat top-shaped fruit, of the size of a small pear or larger, according to the variety. The fruit is very astringent, even when ripe, and is not eaten until its tough pulp has become soft and vinous by incipient decay.

MEDLEY, Samuel (1738-99). Baptist pastor in Liverpool, England, from 1772, and favorite hymn-writer. In early life he was in the navy, but was obliged to retire on account of wounds in 1759. He then taught school, till in 1767 he became a preacher. Two of his hymns, "Oh, could I speak the matchless worth," and "Awake my soul to joyful lays," are well known.

MÉDOC. See Wine.

MEDOWS, mĕd'ōz, Sir William (1738-1813). An English soldier. In 1756 he entered the British Army, in which he served for many years, first in Germany, then in the war with the American colonies, in which he commanded the Fifty-fifth Regiment. He was soon placed at the head of the First Brigade of Grenadiers and distinguished himself by his bravery at the battle of Brandywine and in the expedition of 1778 against Saint Lucia. He afterwards lived in India from 1781 to 1793, occupied several posts of responsibility there, and served as Governor of Madras from 1790 to 1792. His military renown was greatly increased by gallant conduct at the siege of Seringapatam, and in 1793 the rank of lieutenant-general was conferred upon him. For some time after his return to England he was Governor of the Isle of Wight, and afterwards, as the successor of Cornwallis, was commander-in-chief in Ireland (1801-03).

MEDRANO, mȧ-drä'nȯ, Francisco de. A Spanish poet of the seventeenth century, born at Seville. It is known that he visited Rome, but no other details of his life are authenticated. He is one of the best of Spanish lyric poets, and is especially noted for his odes in the manner of Horace. His works were first published in the *Sestinas* of Pedro Venegas de Saavedra, a poet of Seville (1617). They are reprinted in Rivadenera's *Biblioteca de autores españoles*, vols. xxxii., xxxv., and xlii. (1854).

MEDUL'LA OB'LONGA'TA. See Nervous System and Brain.

MED'ULLARY RAY (Lat. *medullaris*, pertaining to marrow, from *medulla*, marrow). The radiating vertical plates of tissue in stems, the primary ones extending from the pith to the cortex; also called 'pith-rays.' Rays of less extent are called 'secondary.' See Wood.

MEDULLARY SARCO'MA. One of the synonyms for that variety of cancer which is also known as encephaloid, cellular cancer, medullary cancer, fungus medullaris, etc. It grows more quickly, distributes itself more rapidly, and attains a more considerable bulk than any other form of cancer, tumors of this nature being often as large as a man's head, or even larger. Of all forms of cancer, it runs the quickest course, soonest ulcerates, is the most malignant, and causes death in by far the shortest time, often destroying life in a few weeks, or, at furthest, in a few months after its first appearance, unless it has been removed by an operation at an early stage.

When it ulcerates, fungoid growths form upon the surface; they are extremely vascular, and bleed on the slightest provocation. In this state, the disease has received the name of *fungus hœmatodes*. See TUMOR.

MEDUL′LA SPINA′LIS. See NERVOUS SYSTEM AND BRAIN.

MÊDÛM, mȧ-dōōm′. A village in Egypt, on the western side of the Nile, some 40 miles south of Cairo, in about latitude 29° 30′ N. Near it, on the edge of the desert, is the pyramid of King Snefru (q.v.), the first King of the Fourth Dynasty and the immediate predecessor of King Cheops (q.v.). From a great mass of rubbish, which covers its base, it rises in three stages to the height of about 122 feet, the upper stage being almost entirely destroyed. The outer walls consist of finely polished blocks of Mokattam stone, beautifully joined together. The pyramid was opened in 1881 by Maspero, who discovered a long passage leading from the north face into the sepulchral chamber, which is built upon the surface of the underlying rock. The chamber had, however, been robbed as early as the time of the Twentieth Dynasty, and in it were found only some broken fragments of the wooden coffin and a wooden jar. Flinders Petrie, who later made a careful examination of the pyramid, found against its eastern face a funerary chapel consisting of an open court and two small chambers. Ancient visitors to the chapel had left upon its walls numerous graffiti, in five of which Snefru is mentioned as the King to whom the pyramid was attributed. Petrie's researches showed that the present peculiar form of the pyramid resulted from the removal of its outer layers in order to obtain stone for building purposes.

Near the pyramid are the tombs (mastabas, q.v.) of a number of high personages of Snefru's Court. The most important of them are the mastabas, richly adorned with mural paintings, of Prince Rê-hotep and Nofret, his wife, and of Prince Nofer-ma't and his spouse, Yetet. The statues of Rê-hotep and Nofret, found in their tomb, are now in the Museum of Cairo. In the cemetery of Medum have been found a number of graves exhibiting a peculiar mode of burial. The bodies lie upon the left side, with the face toward the east and the knees drawn up; coffins and the usual accessories of Egyptian graves are absent. Consult Petrie, *Mêdûm* (London, 1892).

MEDUSA. See GORGO.

MEDUSA (Lat., from Gk. Μέδουσα, *Medousa*, name of one of the three Gorgons, from μέδειν, *medein*, to rule). A general name applied to the disk-like, umbrella-shaped jelly-fish, with long marginal feelers, and so called from their resemblance to the fabled Medusa's head. (See Plate.) While the term medusa is now generally applied to the sexual free-swimming adult stage of any hydroid, it is particularly applicable to our common North Atlantic *Aurelia flavidula* of the class *Scyphozoa* (the group formerly called Discophora). Another general name is acaleph.

Our most abundant medusa is *Aurelia flavidula*, which late in summer abounds along the coast from New York northward. It grows to the diameter of from eight to ten inches, becoming fully mature in August. Its rather tough jelly-like disk is moderately convex and evenly curved, while four thick oral lobes depend from between the four large genital pouches; the edge of the disk is minutely fringed to the ends of the tentacles. On the fringed margin are eight eyes, each covered by a lobule and situated on a peduncle, and occupying as many slight indentations, dividing the disk into eight slightly marked lobes. The subdivisions of the water-vascular canals or tubes are very numerous and anastomose at the margin of the disk, one of them being in direct communication with each eye-peduncle. When in motion the disk contracts and expands rhythmically, on the average twelve or fifteen times a minute. On the approach of danger the animal sinks below the surface. Though it has lasso-cells, it is not poisonous to bathers, while the great *Cyanea arctica* is very much so.

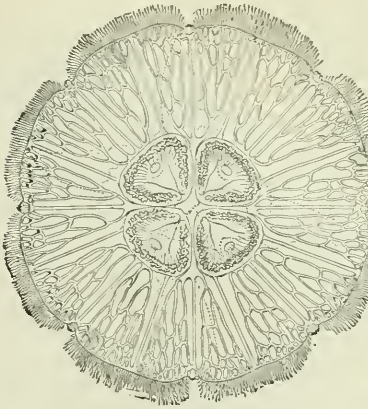


FIG. 1. AURELIA FLAVIDULA.
Adult, natural size, seen from above.

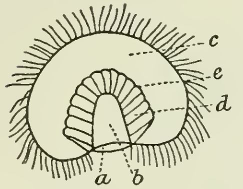


FIG. 2. GASTRULA OF AN AURELIA-LIKE MEDUSA.
a, Primitive mouth; *b*, gastro-vascular cavity; *c*, ectoderm; *d*, endoderm; *e*, mesoderm layer.

The Aurelia spawns in late summer, the females being distinguishable by their yellow ovaries, the corresponding male gland being roseate, while the tentacles of the female are shorter and thicker than in the males. The eggs pass out of the mouth into the sea along the channeled arms, and in October the ciliated gastrula (Fig. 2) becomes pear-shaped and attached to rocks, dead shells, or seaweeds, and then assumes a hydra-shaped Scyphistoma stage (Fig. 3), with often twenty-four very long tenta-

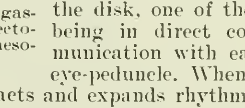


FIG. 3. SCYPHISTOMA OF *Aurelia flavidula*, AT DIFFERENT AGES. Magnified. (After Agassiz.)

cles; in this stage it remains about eighteen months. Toward the end of this period the body increases in size and divides into a series of cup-shaped disks. These saucer-like disks are scalloped on the upturned edge, tentacles lead out, and the animal assumes the Strobila stage (Fig. 4). Finally the disks separate, the upper one becomes detached and with the other disks swims away in the Ephyra form (Fig. 5). When about a fifth of an inch in diameter, and toward the middle or end of the summer, this young medusa becomes an adult Aurelia.

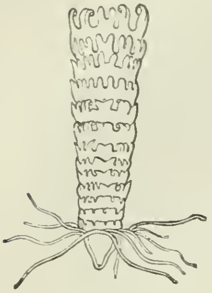


FIG. 4. STROBILA OF *Aurelia flavidula.*

Other forms of greater beauty occur in the Mediterranean and the tropics. A much larger kind of medusa than Aurelia, *Cyanea arctica*, is common on the Grand Banks and off the coast of Northern New England. It sometimes attains a diameter across the disk of from three to even five feet, though it is produced from a Scyphistoma not more than half an inch in height. Its tentacles stream behind, sometimes to the length of several fathoms, and poison the hands of fishermen. Species of Pelagia do not undergo an alteration of generations (see PARTHENOGENESIS), but grow directly from the egg, without passing through a Strobila stage.

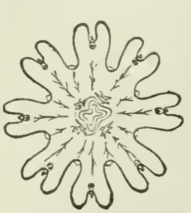


FIG. 5. EPHYRA OR EARLIEST FREE CONDITION OF *Aurelia.* (After Agassiz.)

For various Mediterranean and tropical forms, see Colored Plates of MEDUSÆ AND SIPHONOPHORE.

Medusæ shelter various kinds of animals, which live as fellow-boarders or commensals, viz. temporary non-attached parasites. Some of them live in or under the mouth-cavity or between the four tentacles of the larger medusæ. Such is the little amphipod crustacean, Hyperia, which lives within the mouth, while small fishes, such as the butterfish, swim under the umbrella of the larger jelly-fishes, Cyanea, etc., for shelter and protection. Besides small animals of various classes, the larger jelly-fishes kill by means of their nettling organs small cuttle-fishes and true fishes, the animals being paralyzed by the pricks of the minute barbed darts. See CŒLENTERATA; CTENOPHORA; NEMATOCYST.

FOSSIL MEDUSÆ. Because of the jelly-like nature of the body and the absence of any hard parts in medusæ, these animals would seem to present the most unfavorable conditions for fossilization. Indeed, they are rarely found in the ancient rocks, but there are some noteworthy exceptions, especially in the Cambrian and Jurassic formations. Impressions and also what have been considered to be casts of the medusoid bodies have been found in rocks of the Lower Cambrian in both Sweden and North America. The peculiar fossil called Dactyloidites found in the green roofing slates of Granville, Washington County, N. Y., is generally regarded as of this nature. Fine impressions of jelly-fish are found in the surfaces of the fine-grained lithographic limestones of Jurassic age at Solenhofen and other places in Bavaria.

Consult: Agassiz, L., *Contributions to the Natural History of the United States*, vols. iii., iv. (Boston, 1862-66); Agassiz, A., *North American Acalephs* (Cambridge, 1865); Haeckel, *System der Medusen* (Jena, 1880-81); id., "Report on Medusæ," in *Challenger Reports*, vol. iv. (London, 1881); id., "Ueber fossile Medusen," in *Zeitschrift für wissenschaftliche Zoologie*, vols. xv. and xix. (Leipzig, 1865-70); Von Ammon, "Ueber jurassische Medusen," in *Abhandlungen der Königlich baierischen Akademie der Wissenschaften*, vol. xvii. (Munich, 1883); Walcott, "Fossil Medusæ," in *Monographs of the United States Geological Survey*, vol. xxx. (Washington, 1898). See HYDROID; HYDROZOA.

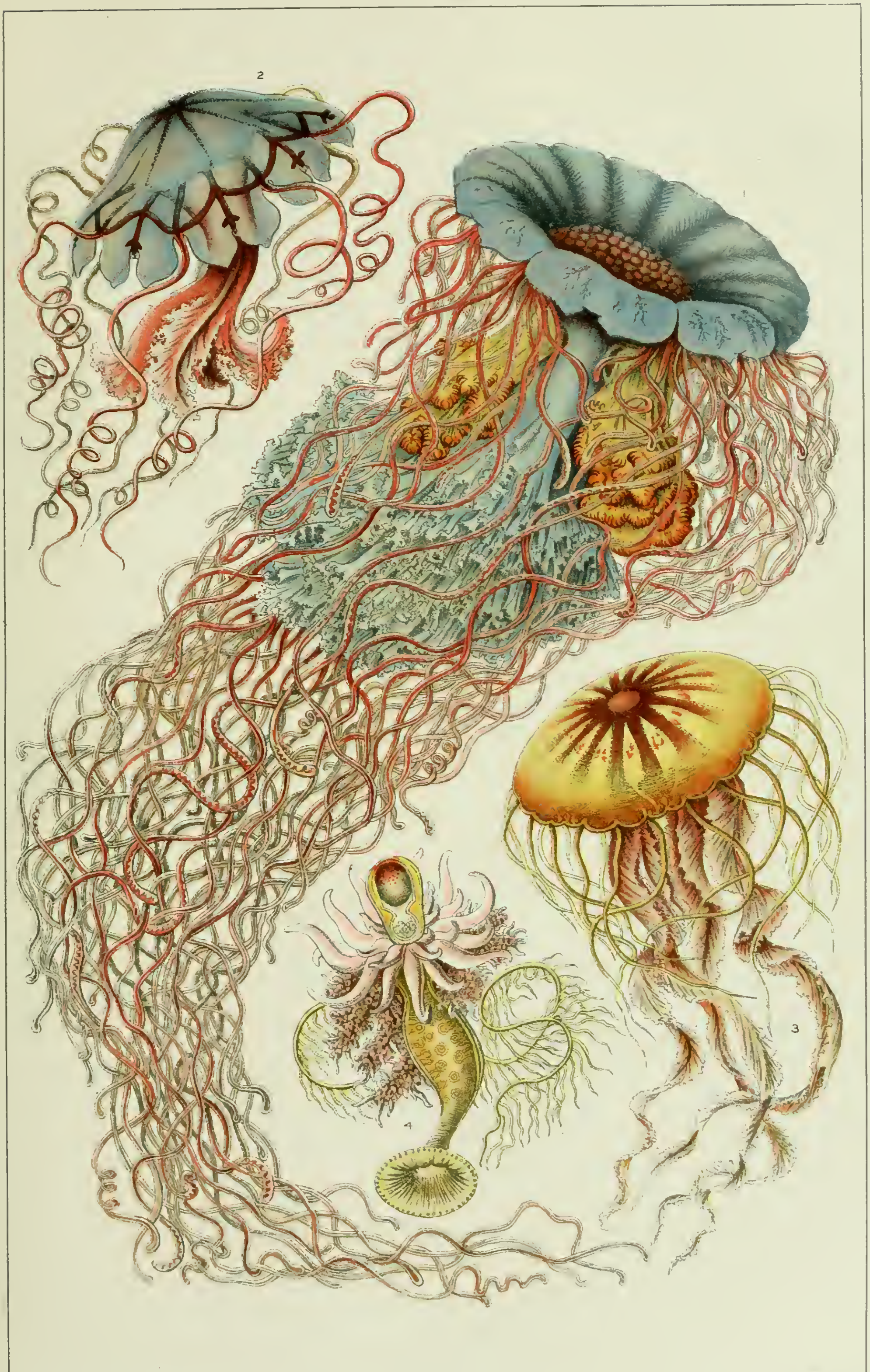
MEDUSA RONDANINI, rōn'dȧ-nē'nē. A noted marble, formerly in the Rondanini Palace in Rome, acquired in 1808 by the Crown Prince of Bavaria, and now preserved in the Glyptothek at Munich. It is of the later type which represents the Gorgon not with convulsed features, but with a fixed and calm expression.

MÉDUSE, mā'dụz', LA (Fr., the *Medusa*). A French vessel sent by the Government to resume possession of the colony of Senegal, which had been restored by the treaties of 1815. She was wrecked near the African coast on July 2, 1816, and 149 persons took refuge on a hastily constructed raft. After twelve days of horrible suffering, during which the castaways were reduced to eating their companions, the fifteen survivors were rescued by the brig *Argus.* The disaster forms the subject of a famous painting by Géricault, in the Louvre, exhibited in the Salon of 1819. The picture represents the raft just as the brig appears on the horizon, and is notable for its intense realism.

MED'WIN, THOMAS (1788-1869). The biographer of the poet Shelley, born at Horsham, in Sussex, England, March 20, 1788. His mother, Mary, a daughter of John Pilfold, was first cousin to Elizabeth Pilfold, the mother of Shelley. Medwin and Shelley were educated at Sion House School, Brentford, and they spent their vacations together at Horsham. Medwin entered the army, and became a lieutenant in 1813. With his regiment he passed some time in India. In 1819 he retired on half pay and soon quitted the service. In 1821 he went to Italy, where he associated intimately with Shelley and Lord Byron. He afterwards led an unsettled life. He died at Horsham, August 2, 1869. His *Journal of the Conversations of Lord Byron* (1824) created a sensation owing to its personalities. A *Memoir of Shelley* (1833) was afterwards expanded into *The Life of Shelley* (2 vols., 1847).

MEEHAN, mē'an, THOMAS (1826-1901). An American botanist and horticulturist, born at Potter's Bar, near London. In 1847 he came to America to manage Buist's nursery at Rosedale, near Philadelphia, and six years later started his own nurseries at Germantown. Meehan was prominent in Philadelphia, as a member of the council and 'father of the small parks.' As a vegetable biologist he obtained great fame, especially by his theory that sex is determined by the vitality of the branch bearing the flower. A member of the Philadelphia Academy of Natural Sciences and of the American Association for the

MEDUSAE AND SIPHONOPHORA



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1 DESMOMEMA ANNASETHE (HAECKEL) 3/5 NATURAL SIZE FROM SOUTH AMERICA
2 FLOSCULA PROMETHA (HAECKEL) 3/5 NATURAL SIZE. FROM INDIAN OCEAN
3 CHRYSAORA MEDITERRANEA (PERON) 1/6 NATURAL SIZE, FROM SMYRNA
4 CYSTALIA MONOGASTRICA (HAECKEL) MAGNIFIED FOUR TIMES, FROM CEYLON

Advancement of Science, he contributed to their *Proceedings;* edited the *Gardeners' Monthly* from 1859 to 1889, and *Meehan's Monthly* from 1892 to 1901. He wrote a *Handbook of Ornamental Trees* (1853), and *The Flowers and Ferns of the United States* (first series, 1878; second, 1880; third, 1887).

MEEK, Alexander Beaufort (1814-65). An American journalist and jurist. He was born in Columbia, S. C., was a graduate of the University of Alabama, and, having studied law, was admitted to the State bar in 1835. He served as a lieutenant of volunteers against the Seminoles in 1836, and was afterwards Attorney-General of the State. He was made county judge in 1842. In 1853 and 1859 he was a member of the State Legislature. There he distinguished himself by organizing and establishing the free-school system in Alabama. From 1848 to 1852 he was associate editor of the *Mobile Register.* He wrote and published several volumes of poems and sketches, besides compiling a history of Alabama.

MEEK, Fielding Bradford (1817-76). An American geologist and paleontologist, born at Madison, Iowa. In 1848 he assisted in the geological survey of Iowa, Wisconsin, and Minnesota, and after completing this work was attached to the New York State Geological Survey under the leadership of James Hall. He accompanied F. V. Hayden in 1853 on a geological expedition to Dakota. During the latter part of his life he was engaged in describing the fossil invertebrates collected by Government expeditions. His larger works are: *Paleontology of the Upper Missouri* (1865); *Check-List of the Invertebrate Fossils of North America* (1864); and *Report on the Invertebrate Cretaceous and Tertiary Fossils of the Upper Missouri Country* (1876).

MEEKS, Eugene (1843—). An American genre and historical painter, born in New York City. He studied there under Wust, at The Hague, and in Antwerp under Van Lerius, De Keyser, and Bource. Afterwards he settled in Florence, where he became a member of the Florence Academy in 1883 with the title of professor. His works include: "Little Nell and Her Grandfather" (1876); "Bridal Chamber in Palazzo Manzi-Lucca;" "Gondola Party—Venice;" and "Fishing Boats—Venice."

MEERANE, må-rä′ne. A flourishing industrial town in the Kingdom of Saxony, situated 27 miles by rail west of Chemnitz (Map: Germany, E 3). It is an important centre of the textile industry, and has a number of manufactories of woolen and semi-woolen materials, spinning and dyeing establishments, machine and boiler works, and manufactures of footwear. Its chief educational establishments are a realschule, a school of commerce, and a textile school. The products of Meerane are extensively exported to foreign countries. Population, in 1890, 22,446; in 1900, 23,797, chiefly Protestants.

MEER′KAT, or **SU′RICATE** (Dutch, sea-cat). A small, furry, diurnal, vegetable-eating and burrowing civet (*Suricata tetradactyla*) of South Africa, allied to the mongooses. It is gregarious, and a colony makes burrows close together, like a prairie-dog 'town.' In captivity it becomes an amusing and delightful pet.

MEERSCHAUM, mēr′sha̤m (Ger., sea-foam), or Sepiolite. A compact, earthy mineral hydrated magnesium silicate. It is grayish white or white with a faint yellowish or reddish tint. It occurs in stratified earthy or alluvial deposits on the plains of Eski-shehr and elsewhere in Asia Minor; also in Greece, at Hrubschitz in Moravia, and in Morocco. The deposits in Asia Minor are worked by pits and galleries at a depth of 24 to 30 feet. The mineral, when brought to the surface, is so soft as to be easily cut with a knife. It is scraped to remove any adhering material, dried in the sun for about a week, then again scraped and polished with wax. Meerschaum is used chiefly in the manufacture of bowls for tobacco pipes, and factories for their production exist in Austria and in France.

MEERUT, or **MIRAT,** mē′rŭt. The capital of the district and division of Meerut, Agra, India, 39 miles northeast of Delhi, on the Northwestern Railway (Map: India, C 3). The city is irregularly laid out with narrow, unclean streets; there are several mosques and temples, of which the Jumma Musjid, dating from 1019, is the most noteworthy. The military cantonment is one of the largest and most important in India. The first uprising of the Indian Mutiny of 1857 occurred here. Population, in 1891, 119,390; in 1901, 118,642.

MEES, Arthur (1850—). An American musical conductor, born in Columbus, Ohio. He was graduated from Concordia College, Fort Wayne, Ind., and after a course of thorough preparation under native instructors, he studied from 1873 to 1876 at Berlin under Kullak, Weitzmann, and Dorn (the latter for score-reading and conducting). He was conductor of the Cincinnati May Festival Chorus, assistant conductor of the Chicago Orchestra, and then he took up his residence in New York and became the conductor of important choral organizations. In 1898 he was elected, on the resignation of MacDowell, to the conductorship of the Mendelssohn Glee Club. He published in 1901 *Choirs and Choral Music,* which has been accepted as a standard authority. A book of piano studies has also obtained general recognition.

MEG′ABAR′IE (from Gk. *μέγας*, *megas*, great + *βαρύς*, *barys*, heavy). The practical unit of pressure on the C. G. S. system; it equals one barie × 10^6. See Barie.

MEG′ADAC′TYLUS (Neo-Lat., from Gk. *μέγας*, *megas*, great + *δάκτυλος*, *daktylos*, finger). A Triassic dinosaur. See Anchisaurus.

MEGÆ′RA. One of the Eumenides.

MEG′ALE′SIA, or **MEG′ALEN′SIA** (Lat., from Gk. *Μεγαλήσια*, from *Μεγαλή*, *Megalē*, epithet of the Great Mother, fem. sg. of *μέγας*, *megas*, great). A festival at Rome, instituted in honor of Cybele in B.C. 204, when her symbol was brought to Rome. The celebration included a stately procession of the eunuch priests of Cybele through the city carrying the sacred ensign, games held on the Palatine and in later times in the theatres, and a great carnival. The festival lasted for seven days, April 4th to 10th, and were originally under the charge of the curule ædile, later of the prætor.

MEG′ALICH′THYS. A genus of fossil ganoid fishes, characterized by their great size and formidable appearance. The body was covered by huge bony plates, and the teeth attained a length of four inches or more. The remains of Megalichthys are found in the Carboniferous rocks of Europe.

MEGALITHIC MONUMENTS (from Gk. μέγας, *megas*, great + λίθος, *lithos*, stone). Gigantic monuments, the materials of which in the earliest stages of industrial development were huge undressed stones, and also associated with tumuli. Megalithic monuments are found in both hemispheres, and in the progress of culture they marked the crude beginnings of larger coöperative effort as well as of engineering and of massive architecture. The most instructive limit as to the manner in which the stones were set on end is furnished by one of the Northern tribes of Hindustan visited by Wurmbrand. These people are in a region where megalithic monuments have had a long history. A slab weighing several tons rests on a number of stout poles laid parallel and just far enough apart to allow men to walk between them. The ends of these poles are lashed to end bars and a firm gridiron frame is made beneath the slab. The whole mass is then lifted by as many men as can get into the framework, and carried to the proper place, one man beating time for their steps. The point of destination reached, the framework is laid flat, the hole dug, and the gridiron set upright by lifting with the hands aided by shear poles, sliding props, guy ropes, and all other labor-saving devices known to them. As the angle between the gridiron and the earth increases, the labor of erection decreases, until the slab is let down carefully into its resting place.

Megalithic monuments really belong to two classes, monolithic and polylithic. The former is a simple great slab or boulder stood on end; the latter consists of several blocks put together to form a chamber. The differences between the two classes is not great, and there are mixed examples where both exist side by side.

Monoliths receive different names in the countries where they are found, and often the same name applies to quite different things in different countries. They receive names also from the manner of grouping. The single great stone, weighing perhaps hundreds of tons, set on end, is a menhir; if a number of these stand in rows, they become an avenue or an alignment; and a stone circle is a number of menhirs arranged about a centre. The final development of this simple beginning is seen in the Egyptian obelisk, in the memorial column or shaft, or in the gigantic statue. The enormous size of many of the rude monoliths is a matter of surprise. The largest one, in Brittany, at Locmariaquer, weighs 347 tons. Thousands have been counted in Brittany and other portions of France. See Plate of MEGALITHIC MONUMENTS.

The polylithic monument also receives different names from its associations. If a number of stones are built into a memorial pile, or over the dead, it is a 'cairn;' a tumulus containing a dead person is in Ireland a 'galgal;' and if a passageway be formed on one side allowing reëntrance to a vault, it becomes a chambered 'barrow;' a stone box in a barrow to hold cinerary urns and relics is a 'cistvaen.' The typical composite monument of great stones belonging to this class is the dolmen (locally termed 'quoit'), a slab of stone laid on the top of two or more upright slabs, forming a burial chamber from which the earth has been removed by the elements. The word 'cromlech' was at one time used to denote a dolmen, as it was originally covered with a tumulus and surrounded by a circle of standing stones. The term is out of use now in England, but the French apply it to one of the former elements of the complete dolmen, the stone circle. The essential part of all is the stone box or capsule, whether under ground, above ground, or covered with a tumulus.

The areas of greatest abundance of megalithic monuments, beginning in Asia, are to be found in Burma, Assam, and the Deccan; the Persian uplands; Asia Minor, the Crimea, Syria, Palestine, and Arabia; across Northern Africa to the Atlantic, and in some of the islands of the Mediterranean; in Spain, Portugal, Western France, and Belgium; in the British Isles and Scandinavia. Examples of huge monuments are found in Northeastern Asia also, and around the Pacific from New Zealand to Peru and Easter Islands, the great wooden totem posts of the North Pacific containing frequently the same motive.

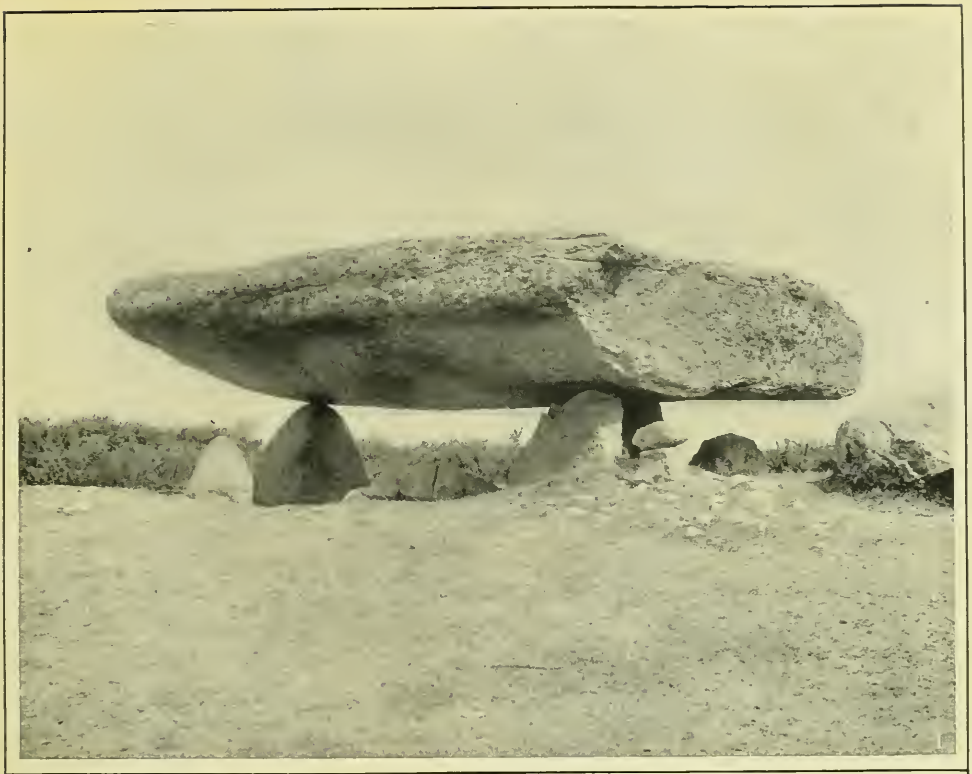
Stonehenge, on Salisbury Plain, near Amesbury, county of Wilts, Southern England, is one of the most important among the megalithic monuments of the world, since it not only is composed of immense pieces, but combines in itself a number of types. In the centre lies a great slab, 15 feet in length. Just outside of this are two oval rings, the larger one made up of five pairs of trilithons, which increase in height toward the west. The smaller oval, containing nineteen monoliths, is tapering in form; outside these ovals and inclosing them is a circle of standing stones, not massive in size; outside of all is the most interesting feature of Stonehenge, a circle 300 feet in circumference, made up of immense standing stones, varying in height from 18 to 22 feet, some of them six feet in diameter. On the top of them are blocks of similar size joining them and forming a series of doorways or trilithons. On the outside of this circle is a ditch and avenue, in which is a cromlech, called the 'Friar's Heel.'

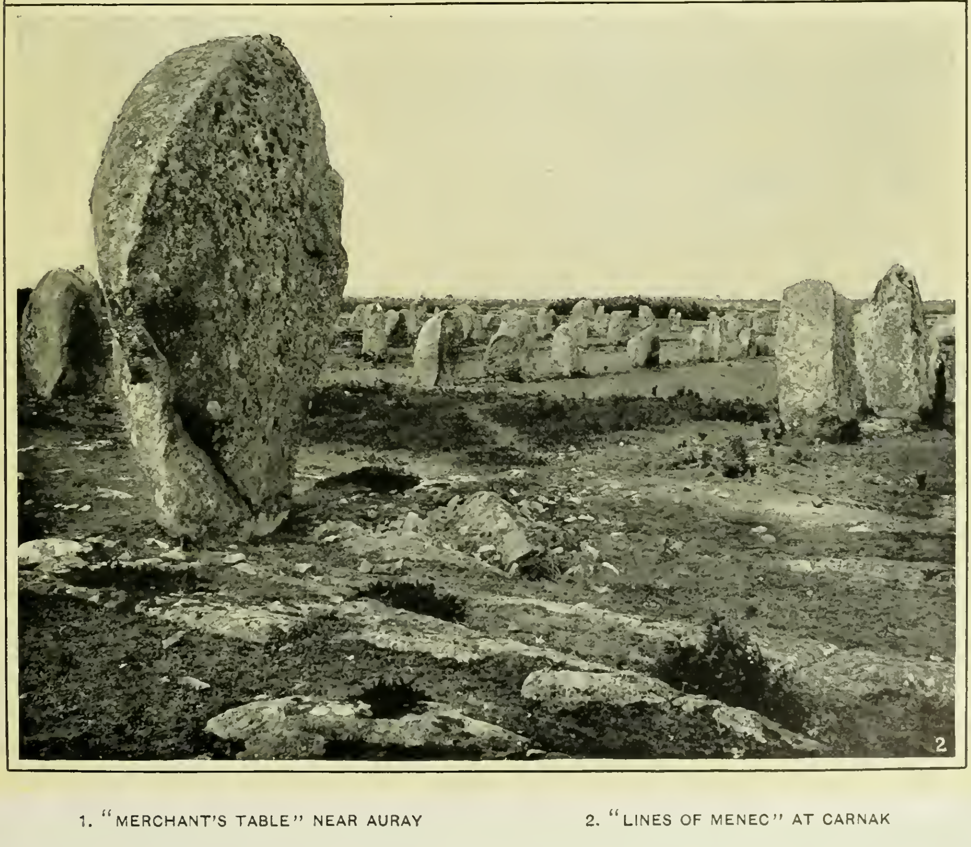
Not the least interesting feature about these remains is the veneration and folk-lore that has gathered around them. No doubt the belief that the ghosts of the dead hover about them aided in the preservation of many of them. Their authorship has puzzled the antiquaries as well as the folk, by whom they were attributed to the Druids, the Celts, and other historic peoples.

Consult: Meadows-Taylor, "Descriptions of Cairns, Cromlechs, and Kistvaens," in *Transactions of the Royal Irish Academy* (1862-65); Betrand, "De la distribution des dolmens sur la surface de la France," in *Revue Archeologique*, vol. x. (Paris, 1864); Clarke, "Stone Monuments of the Khasi Hills," in *Journal of the Anthropological Institute*, iii. (London, 1873); Broca, "Les peuples blonds et les monuments mégalithiques," in *Revue d'Anthropologie*, v. (Paris, 1876); Bertholon, "Notice sur l'industrie megalithique en Tunisie," in *Bulletin de la Société d'Anthropologie* (Lyons, 1888); Faidherbe, "Dolmens d'Afrique," in *Bulletin de la Société d'Anthropologie de Paris*, lxix., lxx. (Paris).

MEG'ALON'YX (Neo-Lat., from Gk. μέγας, *megas*, great + ὄνυξ, *onyx*, claw). An extinct edentate mammal, allied to Megatherium, found in the Pleistocene deposits of Kentucky and Tennessee. See MEGATHERIUM.

MEGALITHIC MONUMENTS





1. "MERCHANT'S TABLE" NEAR AURAY

2. "LINES OF MENEC" AT CARNAK

MEG′ALOP′OLIS (Lat., from Gk. Μεγαλόπολις, Great City). A town in Southwestern Arcadia, founded in B.C. 370, by Epaminondas, who desired to make it the capital of an Arcadian confederacy. The city was laid out on a very large scale, but it by no means fulfilled expectations. It maintained its independence against frequent Spartan attacks until B.C. 222, when it was sacked by Cleomenes III. Though rebuilt, it never seems to have regained its importance. It was the native town of Philopœmen, the great general of the Achæan League, and also of the historian Polybius. The city was situated in a fertile plain on both banks of the river Helisson, near its junction with the Alpheus, and was surrounded by a wall about five and one-half miles in length. Excavations which were conducted on the site by the British School at Athens from 1890 to 1893 laid bare the theatre and the Thersileion, or great hall where the Arcadian Assembly met, and on the other side of the river the temple of Zeus Soter, a long colonnade, and foundations of other buildings adjoining the market-place. Consult *Excavations at Megalopolis* (London, 1892).

MEG′ALOSAU′RUS (Neo-Lat., from Gk. μέγας, *megas*, great + σαῦρος, *sauros*, lizard). A carnivorous dinosaur allied to Ceratosaurus (q.v.), found in the Jurassic and Cretaceous deposits of Europe and India. The North American genus Lælaps of Cope from the Cretaceous formations is probably identical. The animal was from fifteen to twenty feet long with a medium sized head, the jaws of which were provided with formidable teeth. The skeleton is light and the bones are partly hollow. The fore limbs are five-toed and small, and were probably of little use in locomotion. The hind limbs, on the other hand, are large and strong, and terminate in three toes armed by heavy claws. The tail was long and heavy. See CERATOSAURUS; DINOSAURIA.

MEGANEURA, mĕg′ȧ-nū′rȧ (Neo-Lat., from Gk. μέγας, *megas*, great + νευρά, *neura*, sinew). A fossil dragonfly found in the coal measure beds of Commentry, France. It was perhaps the largest insect ever known, with a body about fifteen inches long and wings that had a spread of about twenty-seven inches. It is beautifully illustrated and described by Brogniart, in *Recherches pour servir à l'histoire des insectes fossiles des temps primaires* (2 vols., Saint Etienne, 1893).

MEGAPHONE (from Gk. μέγας, *megas*, great + φωνή, *phonē*, voice, sound). A form of speaking-trumpet used to render the voice audible at considerable distances. It consists of a large funnel of tin or papier-maché, in which the sound-waves are so reflected that they issue from its mouth in approximately parallel directions. Theoretically a megaphone of paraboiic section would act as the best form of megaphone, especially if the resonance of the cavity did not affect the propagation of sound by strengthening certain sounds and destroying others by interference. (See ACOUSTICS.) The size and shape of the megaphone, however, are so regulated that the usual tones of the voice undergo the largest possible amount of strengthening. For this reason a megaphone to be used with the best effect by a woman would be different in size from that suited to the deeper notes of a man's voice. The megaphone has succeeded the old speaking-trumpet for use at sea, and is generally employed by naval officers and mariners for communicating with the shore or with a distant vessel.

MEGAPODE. See MOUND BIRD.

MEG′APOLEN′SIS (Latinized form of *Van Mekelenburg*), JOHANNES (1603-70). The first Protestant missionary to the North American Indians. The first Patroon, Van Rensselaer, brought him to this country from Holland in 1642, so that he might be a missionary to the Indians on the frontier, near Albany, and in this capacity he antedated John Eliot by several years. He learned to preach in the Mohawk language and made converts among them. He also befriended the heroic Jesuit Fathers, Jogues, Bressani, and Poncet. From 1649 till his death, January 24, 1670, he was pastor in New Amsterdam, and it was he who urged Peter Stuyvesant to surrender without bloodshed in 1664. His Dutch account of the Mohawk Indians is translated in the New York Historical Society's *Collections*, vol. iii. (New York, 1870).

MEG′ARA (Lat., from Gk. Μέγαρα). The capital of Megaris (q.v.), on the Isthmus between the Peloponnesus and Northern Greece. It was built at the base of two hills, Caria and Alcathous, each defended by a citadel. Two walls, built by the Athenians during their protectorate over Megara, between B.C. 461 and 445, connected the city with its harbor, Nisæa. In the time of Pausanias the city contained many temples and public buildings, but of these only very scanty traces are now visible, of which the most interesting are perhaps the remains of the aqueduct and fountain built by the Tyrant Theagenes. The origin of Megara is lost in legend, but as early as the eighth century B.C. it was a flourishing commercial city, and sent out many colonies, of which the most famous were Byzantium, Chalcedon, and the Sicilian Megara. Near the end of the seventh century we find it engaged in a fierce and protracted struggle with the Athenians for the island of Salamis, of which it long retained possession. The government had originally been in the hands of the Dorian landed aristocracy, from whom it was usurped about B.C. 620 by Theagenes, who led the popular faction, and established himself as absolute ruler of the State. Upon his expulsion, soon after, a fierce contest took place between the democratic and the aristocratic parties. After the Persian wars Megara carried on hostilities with Corinth, against which she formed an alliance with Athens, B.C. 461. Later the Athenians were compelled to surrender their hold on the city, and under a strict oligarchy it became a member of the Peloponnesian League. It was easily open to the attacks of the Athenians, and was by the 'Megarian decree' of Pericles deprived of all markets in Attica. It was frequently ravaged during the Peloponnesian War, and almost captured at one time by the Athenians aided by the democratic party within. After this war the city plays but a small part in history. A democratic form of government was reëstablished in B.C. 357; after the death of Alexander the Great the city passed under the control of Demetrius Poliorcetes and Ptolemy Soter successively. Demetrius, the son of Antigonus Gonatas, captured and nearly destroyed it. It was afterwards partially rebuilt, and finally surrendered to the Romans under Metellus. Alone among the cities of Greece, it was not restored by Hadrian; Alaric still further reduced it, and in 1687 the Venetians completely destroyed it. Megara was celebrated in antiquity as the seat of the Megarian School of Philosophy, founded by Euclid, a native of the city. The site is now occupied by a prosperous Greek town, bearing the ancient name, with a population of about 6500.

MEGARIC SCHOOL. A school of Greek philosophers, who, as partial disciples of Socrates, expanded one side of their master's teaching. While the Cynic and Cyrenaic schools developed his ethical teaching, the Megaric devoted itself rather to dialectical investigations. Their principal leader was Euclid of Megara, who was probably one of the earliest disciples of Socrates. He united the ethical principle of Socrates with the Eleatic theory of one immutable substance.

MEG′ARIS (Lat., from Gk. Μεγαρίς). In ancient geography, a small district in Greece, lying between the Corinthian Gulf on the north and northwest and the Saronic Gulf on the southeast. It was bounded on the north by Bœotia, on the northeast by Attica, and on the southwest by the District of Corinth. The capital was Megara (τὰ Μέγαρα) (q.v.).

MEG′ASPORAN′GIUM (Neo-Lat., from Gk. μέγας, *megas*, great + σπόρος, *sporos*, seed + ἀγγεῖον, *angeion*, vessel, from ἄγγος, *angos*, jar), or MACROSPORANGIUM. The spore-case (sporangium) which produces the megaspores. For example, the ovules are the megasporangia of seed-plants. See HETEROSPORY; SPORANGIUM; MEGASPORE.

MEG′ASPORE (from Gk. μέγας, *megas*, great + σπόρος, *sporos*, seed). In the higher plants, two kinds of spores are produced, and the larger ones are called megaspores. In their germination they give rise to the very small female plants (female gametophytes). In seed-plants the megaspore germinates within the ovule, and has been called the 'embryo-sac.' 'Macrospore' is a synonym. See HETEROSPORY and SPORE.

MEG′ASPOR′OPHYLL (from Gk. μέγας, *megas*, great + σπόρος, *sporos*, seed + φύλλον, *phyllon*, leaf), or MACROSPOROPHYLL. In the higher plants, the two kinds of spores, microspores and megaspores, are usually borne upon distinct leaf-structures (sporophylls), those bearing the megaspores being called megasporophylls. The carpel of flowering plants is a megasporophyll. See HETEROSPORY; SPOROPHYLL.

MEGAS′THENES (Lat., from Gk. Μεγασθένης) (flourished c.300 B.C.) A Greek writer of the early Alexandrian period. He was assigned by Seleucus Nicator (B.C. 312-280) to the service of the Governor of Arachosia, by whom he was sent on several diplomatic missions to the Indian King Sandrocottus. He published a work called *Indica* (Ἰνδικά) in four books, in which he discussed the flora and fauna of India, as well as many of the customs of the Indians. Like Herodotus, Megasthenes admitted wonderful stories into his narrative, and tried to identify foreign myths with those of the Greeks. Recent investigations, however, have shown the general trustworthiness of the work, which was the most valuable account of India possessed by Europeans down to the time of the establishment of the Bengal Asiatic Society in 1784. Diodorus (ii. 35-42) gives an abstract of the contents of the *Indica*, and there are numerous fragments in Strabo and Arrian which have been collected by Schwanbeck, *Megasthenis Indica* (Bonn, 1846), and by Müller, *Frag. Hist. Græc.* (Paris, 1841-70), ii., pp. 397-439, and translated by McCrindle, *Ancient India as Described by Megasthenes and Arrian* (Calcutta, 1877).

MEG′ATHERI′IDÆ (Neo-Lat., nom. pl., from *Megatherium*, from Gk. μέγας, *megas*, great + θηρίον, *thērion*, diminutive of θήρ, *thēr*, wild beast). An American family of edentate mammals, of which the genus Megatherium is the type, comprising a number of fossil ground-sloths of gigantic size. It is intermediate between the modern anteaters (Myrmecophagidæ) and the true sloths (Bradypodidæ), and contains the genera Hapalops, Hyperleptus, and others of the Santa Cruz formation of Miocene age in Patagonia, and Megatherium, Mylodon, Megalonyx, and Scelidotherium of the Pleistocene of North and South America. See MEGATHERIUM.

MEG′ATHE′RIUM (Neo-Lat., from Gk. μέγας, *megas*, great + θηρίον, *thērion*, diminutive of θήρ, *thēr*, wild beast). A gigantic fossil edentate mammal, larger than a rhinoceros, which lived in comparatively recent geological time in South America, and of which skeletons are found in the Pampas deposits (Pleistocene) of Argentina, Chile, and Brazil. Its skeleton, which shows points of resemblance to both the anteaters and sloths, is of very massive construction, indicating a most powerful animal, about 18 feet in length. The head was small, the jaws of a form to support powerful chewing muscles, and the teeth, of which there are only ten upper and eight lower molars, are of a prismatic form and of such size as must have rendered them most effective grinding organs. The structure of the forward portion of the jaws shows the lips to have been elongated and prehensile, and the grooved inside of the lower jaw suggests a powerful prehensile tongue, which served to pull off the twigs and leaves upon which the animal fed. The neck was short and strong, the trunk heavy and round. The leg bones are extraordinarily massive and of peculiar form. The fore limbs are longer than the hind limbs, and the form of their joints indicates considerable flexibility; they probably served somewhat as arms. The very heavy hind-limb bones and the tail bones indicate that the greater portion of the weight of the animal was borne by these parts, and it is reasonable to conclude that the favorite position of the beast was that of resting upon its haunches. The surfaces of the bones are provided with ridges and rough places for the attachment of powerful muscles. The size of the animal, its evidently very great muscular power, and the structure of its hind quarters, indicate that it squatted beside a tree and with its mobile fore limbs, the middle fingers of which were armed with strong claws, pulled down and broke off the upper trunk and branches from which it derived its food. The body of the animal is thought to have been covered by tough hide and coarse hair. Megatherium was one of the first fossil mammals described. A nearly complete skeleton was found in 1789 near Buenos Ayres and sent to the museum of Madrid, where it was described and named by Cuvier, Megatherium Americanus.

Three other allied genera are Scelidotherium, Megalonyx, and Mylodon, all of Pleistocene age. Of these, Scelidotherium, from South America, in the structure of its skull, resembles closely a gigantic anteater. Megalonyx, differing slightly from Megatherium in the structure of its teeth, has been found in the cave deposits of Kentucky and Tennessee and in the Pleistocene beds of Cuba. The remaining form, Mylodon, remains of which have been found in Kentucky and South America, is the only member of the family Megatheriidæ in which the skin contains calcareous plates similar to those of the other group of gigantic edentates, the Glyptodontidæ; and in Mylodon these plates, though numerous, are small and not joined to each other. Consult Woodward, *Outlines of Vertebrate Paleontology* (Cambridge, 1898).

MEGERLE, Ulrich. See Abraham-a-Santa-Clara.

MEGGIDDO, me-gĭd′dō. A fortified city of great importance in ancient Syria, situated in the Valley of Esdraelon, probably at the modern El-Lejjun. It is mentioned as early as the reign of Thothmes III. (B.C. 1503-1449), in the Amarna letters (c.1400 B.C.), in a papyrus of the time of Seti I. (B.C. 1356-1347), and in an inscription of Shishak (B.C. 960-939), and is also referred to in Assyrian inscriptions. According to Joshua xii. 21, it was the residence of a Canaanitish king at the time of the Hebrew invasion. From Judges i. 27, it is evident that it did not fall into the hands of the tribes invading the plain. David possibly conquered it. Solomon fortified it (I. Kings, ix. 15). King Ahaziah of Judah found a refuge there when fleeing before Jehu of Israel in B.C. 843 (II. Kings ix. 27). In Roman times it was known as Legio, and was an important place. Jerome calls the Valley of Esdraelon 'the Plain of Megiddo.' The 'waters of Megiddo,' mentioned in Judges v. 19, probably refer to the river Kishon, the present Nahr el-Makatta. At Megiddo King Josiah was overpowered by Pharaoh Necho about B.C. 609. Consult: Müller, *Asien und Europa nach altägyptischen Denkmälern* (Leipzig, 1893); Buhl, *Geographie des alten Palästina* (Freiburg, 1896).

MEG MER′RILIES. A very tall, masculine gypsy woman in Scott's *Guy Mannering*. She was devoted in her half-crazy mind to the Bertrams, and died while establishing the identity of Harry Bertram, who was kidnaped in childhood. This character in the dramatized form of the novel was a favorite rôle of Charlotte Cushman.

MEG′NA, or **MEGHNA.** A deltaic estuary of Bengal, British India, forming the outlet of the Brahmaputra, of the easternmost channel of the Ganges (qq.v.), and of tributary streams (Map: India, F 4). It flows into the Bay of Bengal by four mouths, which inclose three large islands. It is navigable by steamers and large river craft, which, however, are often imperiled by the tidal bore, which ascends at the rate of 15 miles an hour, and often attains over 18 feet in height; the river is also subject to cyclonic storm waves, which at various times have caused great destruction of property and loss of life.

MEGRIM. See Migraine.

MEGRIMS (OF., Fr. *migraine*, It. *migrana*, *emigrana*, from Lat. *hemicranium*, from Gk. ἡμικρανία, *hēmikrania*, pain in one side of the head, from ἡμι-, *hēmi-*, half + κρανίον, *kranion*, head), Hyperæmia, or Engorgement. A disease of the horse. It is indicated by the following symptoms: The animal when at work reels, and then either stands for a minute dull and stupid, or falls to the ground, lying for a time partially insensible. The eyes are staring, breathing is hurried and stertorous, and the nostrils are widely dilated. Occasionally these symptoms are followed by coma, convulsions, and death. More frequently, however, the animal gains relief in a little while. The attacks come on suddenly, are often periodical, are most frequent during hot weather, and when the animal is drawing up a hill, or exposed during heavy work to the full rays of a hot sun. Liability to megrims constitutes unsoundness, and usually depends upon the circulation through the brain being temporarily disturbed by the presence of tumors. Horses subject to megrims are always dangerous; if driven at all, they should be used with a breastplate or pipe-collar, so as to prevent, as much as possible, pressure on the veins carrying the blood from the head; they should be moderately and carefully fed, and during hot weather have an occasional laxative.

MEHÁDIA, mĕ-hä′dē-ō (Lat. *Ad Median*). A small town of Transylvania, Hungary, magnificently situated among the Carpathians, six miles west of the frontier of Rumania (Map: Hungary, H 4). It is noted for its old cemetery with Greek and Roman inscriptions, and for its Roman ruins. In the vicinity are coal mines. Population, in 1890, 2480, mostly Rumanians. About three miles southeast of Mehádia is the bathing resort of Herkulesbad, with numerous hot springs (some of them containing sulphur), ranging in temperature from 106° to 143° F., which were known to the Romans as *Thermæ Herculis*. The place is visited by about 7000 guests annually.

MEHEMET ALI, mā′he-mĕt ä′lē (1769-1849). Viceroy of Egypt. He was born in 1769 at Kavala, a little town in Macedonia. Left an orphan, he was taken into the service of a captain of the Janizaries. He learned much of military matters and of intrigue, made a rich marriage in 1787, and was thus able to obtain a commission as an officer in the irregular troops of the Sultan. Through relations which he formed with a Marseilles merchant he amassed wealth in trade. He was given a command in Egypt to coöperate with the British against the French invaders, and at length became commander of the Albanian or Arnaut Corps. In 1805 he was recognized by the Porte as Viceroy of Egypt and Pasha of Three Tails, but was soon involved in disputes with the Mamelukes (q.v.), who had long practically ruled Egypt. The struggle was finally terminated in 1811 by the massacre of the greater number of these at Cairo. The rest fled to Upper Egypt, but were expelled by Mehemet in the following year. They then took refuge in Nubia, but in 1820 he followed them there and completely vanquished them. From 1811 to 1818 he carried on war against the Wahabis in Arabia, who were subjugated by his adopted son, Ibrahim Pasha. Shortly after he conquered Kordofan, added it to his dominions, and opened a great trade in slaves from the interior of Africa. About this time he began to reorganize his army on something like

European principles, built a fleet, and erected fortresses, military shop-works, and arsenals. He sent a strong force to assist the Sultan in suppressing the Greek revolt in 1824. but his new fleet was destroyed at Navarino in 1827. In 1830 the Porte conferred on him the Government of Crete, but this did not satisfy his ambition. He determined to annex Syria to his dominions, and in 1831 despatched an army under Ibrahim Pasha, who overran the country, defeating the Turks at Horas, July, 1832, and by his victory at Konieh (December 20, 1832) brought the Turkish Government to the brink of ruin. Russia now stepped in, and a treaty was concluded (May 4, 1833) by which Syria was handed over to Mehemet. Neither of the belligerents was satisfied, and Mehemet continued to plot till Sultan Mahmud II. declared war in 1839 against his dangerous subject. At Nisib, June 24, 1839, the Turkish army was crushed by the forces of Mehemet Ali, but the European powers again interfered, and Mehemet was compelled to give up Syria and Crete and to content himself with the hereditary vice-royalty of Egypt (1841). Mehemet was at once a remorseless tyrant and an able, progressive administrator, and did much to develop Egypt. He cleared his dominions of robbers, executed great public works, and may be said almost to have introduced the cultivation of cotton, indigo, and sugar into the country. He also established a system of national education in Egypt. He died August 2, 1849. See Egypt.

MEHEMET ALI PASHA, pȧ-shä′ (1827-78). A Turkish soldier. He was born in Prussia, and his name originally was Karl Detroit. In 1843 he ran away to sea and embarked for Turkey. Aali Pasha, later Grand Vizier, took an interest in him, and in 1846 sent him to a military school. He received a commission in the Ottoman army in 1853, and fought against Russia. In 1865 he was made a brigadier-general and pasha; in 1875-76 he commanded in Bosnia, and in the war of 1877-78 against Russia he was at the head of the Turkish army in Bulgaria. He was successful in his operations on the River Lom (August-September, 1877), but was afterward forced back by the enemy. He failed to effect a junction with Suleiman Pasha and was superseded by the latter. He was second plenipotentiary at the Berlin Congress, and on his return was sent to Albania, where he was mobbed and killed by insurgents at Diakova, September 7, 1878.

MEHER′RIN. A small tribe of Iroquoian stock, formerly living on the lower course of the river of the same name, on the Virginia-Carolina border. For a long time they were a subject of contention between the two colonies, each claiming them as within her own jurisdiction. They were said to have been a remnant of the Susquehanna or Conestoga, who fled southward after their expulsion from the head of Chesapeake Bay by the Iroquois about the year 1676. They made some trouble during the Tuscarora War of 1711-12, but soon afterward disappear from notice, having apparently been absorbed by that tribe or by the Tutelo.

MÉHUL, mȧ′ụl′, Etienne Nicholas (1763-1817). A French operatic composer, born at Givet. At the age of ten he was organist of his native village; in 1778 he went to Paris, where he gained the interest of Gluck. After several unsuccessful efforts in composition his *Euphrosine et Corradin* finally achieved fame (1790), and other compositions previously written were then brought to light. *Stratonice* appeared in 1792; and this was followed by patriotic national hymns for the Army of the Republic, entitled "Le chant du départ," "Le chant de victoire," "Le chant du retour," which won him high popularity. Other works appeared in rapid succession; in 1806 *Uthal*; previously, *Une folie, ou les aveugles de Tolede* (1802); and in 1807 *Joseph*, his most esteemed composition. In 1795 he was elected a member of the Academy, and also appointed an inspector of the Conservatory, which had but recently been established. His works comprise every form of music, but it is wholly by his operas that he is known to fame. They are marked by dramatic truth, noble melodies, and, though his work constantly shows a lack of thorough training, he was one of the first French composers adequately to express the meaning of the words in music. Consult Pougin, *Biographie* (Paris, 1889).

MEI, mā, Lev (or **MAY**, Lyoff) Alexandrovitch (1822-62). A Russian poet. He was born in Moscow and was educated at the Institute of Tzarskoi Selo. He attracted a great deal of attention by his drama *Tsarskya Neresta* (The Bride of the Czar) (1849), which was followed by the dramas *Servilia* and *Pskovitianka* (The Woman of Pskov). Besides publishing several minor poems on classical and biblical subjects, he also considerably enriched Russian literature by his translations from Milton, Byron, Schiller (*Wallensteins Lager* and *Demetrius*), Goethe, Heine, Béranger, and Victor Hugo.

MEIBOM, mī′bōm, Victor von (1821-92). A German jurist, born at Cassel. He studied law at Marburg and Berlin, and was for several years assistant judge at tribunals of Rotenburg and Marburg. In 1858 he was appointed professor of German law at the University of Rostock, and from 1866 to 1873 held a similar appointment at Tübingen, then going to Bonn, where he remained till 1875, when he became a member of the Supreme Court of the Empire in Leipzig. His chief work is *Das deutsche Pfandrecht* (1867), a thorough and historically reliable discussion of the laws and regulations relating to mortgage before the introduction of Roman law.

MEIDERICH, mī′dẽr-ĭK. An industrial town in the Rhine Province, Prussia, situated 15 miles northeast of Krefeld (Map: Prussia, B 3). It contains the Rhine Steel Works, employing over 2000 persons, and a number of other iron and steel works, machine shops, phosphate works, etc. In the vicinity are extensive coal mines and saline springs. The trade in cattle is important. The industries of Meiderich date from 1850, but the place was not raised to the rank of a town until 1894. Population, in 1890, 20,416; in 1900, 33,684, largely Protestants.

MEIER, mī′ẽr, Moritz Hermann Eduard (1796-1855). A German classical philologist, born at Glogau. When twenty-four years of age he became professor extraordinarius at the University of Greifswald, and in 1824 he was made professor ordinarius at Halle, where he remained until his death. Friedrich August Wolf, and especially Wolf's great pupil, August Boeckh, whose classic work on the public economy of

Athens appeared in 1817, had a great influence on Meier. His own first important publication dealt with a question in the legal antiquities of Athens, *Historia Juris Attici de Bonis Damnatorum*, etc. (Berlin, 1819); but his greatest work was written in collaboration with G. F. Schoemann (q.v.), *Der Attische Process* (Berlin, 1824), and was crowned by the Berlin Royal Academy. This treatise, now revised by J. H. Lipsius (Berlin, 1883-87), remains the standard work on Athenian legal procedure to the present day. Meier also prepared an edition of Demosthenes, *Against Meidias*, and published many opuscula on subjects relating to classical antiquity. Much of his energy, however, while resident at Halle, was spent on editorial duties, as he was an editor of the Halle *Allgemeine Zeitung* for many years, and also co-editor of the *Allgemeine Encyclopädie der Wissenschaften und Künste* from 1830 to 1855.

MEIGGS, mĕgz, HENRY (1811-77). An American contractor. He was born in Catskill, N. Y., was engaged in the lumber business in 1835, and failed in the commercial crisis of 1837. It was not until the outbreak of the gold excitement in California that he again became prosperous. He then shipped lumber in large quantities to the Pacific Coast, and his trade so increased that he was encouraged to build a large number of vessels. At length a financial stringency in the San Francisco money market drove him to borrowing, and eventually, his business collapsing, he fled to South America. He settled in Chile and entered into the business of bridge-building contractor. Later he devoted himself to railroad construction, and in Peru accomplished engineering works which are objects of general admiration. He made contracts for the construction of six railroads in that country—one of which, the Callao, Lima and Oroya Railroad, over the Andes, ranks among the first public works of the kind in the world.

MEIGS, FORT. See FORT MEIGS.

MEIGS, MONTGOMERY CUNNINGHAM (1816-92). An American soldier and military engineer. He was born in Augusta, Ga., studied for a short time at the University of Pennsylvania, graduated at West Point in 1836, and immediately afterwards became second lieutenant in an artillery company. In 1837 he was transferred to the Corps of Engineers, in which he became a lieutenant in 1838 and captain in 1853. From 1836 to 1852 he was employed by the War Department on various important engineering works. Between 1852 and 1860 he superintended the construction of the Potomac Aqueduct from the Great Falls in Maryland to Washington, D. C., the erection of the Capitol extension in Washington, the Post-Office extension, and the great iron dome of the Capitol. In the winter of 1860-61 he was engaged in placing Fort Jefferson, Fla., in a condition for defense, and in April, 1861, organized and conducted the Fort Pickens relief expedition. On May 15th he was appointed Quartermaster-General of the United States Army, with the rank of brigadier-general. In this important position he had the direction of the supply and equipment of the United States forces in the field during the continuance of the war. Though generally stationed at Washington, he frequently made personal inspections of the quartermaster's departments of the various armies during siege and field operations. On July 5, 1864, he was brevetted major-general for 'distinguished and meritorious services during the Rebellion.' After the war until his retirement in 1882, he was a member of many important boards and commissions in connection with the War Department. After his retirement until 1887 he was employed as architect on the construction of the Pension Bureau Building in Washington.

MEIGS, RETURN JONATHAN (1734-1823). An American soldier and pioneer, born in Middletown, Conn. He joined the Continental troops before Boston shortly after the battle of Lexington, and later in the same year, as a major of militia, accompanied Benedict Arnold on the latter's expedition against Quebec. He became a colonel in 1777, and participated in Anthony Wayne's storming of Stony Point in 1779. After the close of the war he became interested in schemes of Western colonization, was one of the promoters of the 'Ohio Company,' and crossed the Alleghanies himself in 1788 to settle at Marietta, Ohio. Later he was interested in the Muskingum settlement. In 1794 he was commissary-general of the troops in General Wayne's expedition against the Indians, and distinguished himself at the battle of Fallen Timbers. In 1801 he was appointed Indian agent, and took charge of the Cherokee agency in Georgia, where he remained until his death. His *Journal of the Expedition to Quebec* was published in 1864.

MEIGS, RETURN JONATHAN (1765-1825). An American politician, born in Middletown, Conn., son of Return Jonathan Meigs, the elder. He graduated at Yale in 1785, and studied law. In 1788 he removed with his father to Ohio Territory, and from 1803 to 1804 was Chief Justice of the State. He was judge of the United States Court for Michigan Territory in 1807 and 1808; served as United States Senator from Ohio in 1808-10; and from 1810 to 1814 was Governor of Ohio. His services during the War of 1812 were particularly efficient. In 1814 he was appointed Postmaster-General by President Madison, and he was continued in this office until 1823 by President Monroe.

MEIKTILA, mīk-tē′lȧ. A central division of Upper Burma, comprising the districts of Meiktila, Kyauske, Myingyan, and Yamethin. Area, 10,854 square miles. Population, in 1901, 994,432. Capital, Meiktila. See BURMA.

MEILHAC, mâ′yȧk′, HENRI (1831-97). A French dramatist, who worked chiefly in collaboration with Ludovic Halévy (q.v.). He was born February 23, 1831, in Paris, where he studied at the Lycée Louis-le-Grand. From working in a book shop he turned to writing for the stage. *Satania* and *Garde-toi, je me garde*, pleased the critics, who discerned Meilhac's cleverness and technical knowledge. He succeeded not only in vaudeville, but in higher and more delicate comedy. It is, however, impossible to tell what belongs to Meilhac and what to Halévy, so well did these two men blend their genius. Meilhac and Halévy excelled in operetta and opera bouffe, as well as in more dramatic, less musical composition. Together they wrote *Frou-frou*, and the librettos of *La belle Hélène* and *La grande duchesse* for Offenbach's music. Of Meilhac's work before 1861, *La vertu de Célimène* is most significant; of that since 1881, *Décoré* (1888); and *Grasse fortune* (1896). He was made a member of the French Academy in 1888, and died in Paris, July 6, 1897.

MEINARDUS, mī-när′dụs, LUDWIG SIEGFRIED (1827-96). A German composer and writer on musical topics, born at Hooksiel, Oldenburg. He studied at the Leipzig Conservatory, and as a pupil of Riccius at Leipzig, of Liszt at Weimar, and of Marx at Berlin; was director of the Glogau Singakademie from 1853 to 1865; and from 1865 to 1874 a professor in the Dresden Conservatory. Subsequently at Hamburg, and from 1887 at Bielefeld, he was a composer and critic. His musical works include the oratorios *Gideon* and *König Salomo*, the *Wanderlied* for chorus and wind instruments, a sonata for violoncello and pianoforte, sonatas for violin and pianoforte, a quintet and three trios for pianoforte and strings, songs, and pianoforte music. He also published *Kulturgeschichtliche Briefe über deutsche Tonkunst* (1872), and *Mozart, ein Künstlerleben* (1882).

MEINEKE, mī′ne-ke, AUGUST (1790-1870). A distinguished German philologist. He was born at Soest, in Westphalia, and was educated at Leipzig, where he studied under G. Hermann. He was director of the Joachimsthal Gymnasium at Berlin from 1826 to 1857. His numerous works, which are chiefly critical editions of the Greek authors, include: *Fragmenta Comicorum Græcorum* (1839-43); *Analecta Alexandrina* (1843), containing collections and admirable explanations of the fragments of Euphorion, Rhianos, Alexander Ætolus, and others; the lexicon of *Stephanus Byzantius* (1849); and text-recensions of Strabo (1852-53); of Horace (1834), in which the so-called four-line strophe law, discovered by Meineke and Lachmann, is applied; of Stobæus (1855-64); of Athenæus (1859); and of Aristophanes (1860). Consult: Ranke, *Albert Meineke* (Leipzig, 1871); and Sauppe, *Zur Erinnerung an Meineke und Bekker* (Göttingen, 1872).

MEININGEN, mī′nĭng-en. The capital of the little Duchy of Saxe-Meiningen, in Central Germany. It is situated on the right bank of the Werra, and is the seat of the provincial courts (Map: Germany, D 3). Meiningen consists of the old town surrounded by several well-built suburbs. Its chief ornament is a park known as the 'English Garden.' The town's theatre has a European reputation for its excellent actors. There is a library of 30,000 volumes. Population, in 1900, 14,518.

MEISSEN, mī′sen. An interesting old town of the Kingdom of Saxony, Germany, situated on the left bank of the Elbe, 16 miles by rail northwest of Dresden (Map: Germany, E 3). It lies in an exceptionally picturesque region, and has retained its ancient appearance. Above the town rises the Schlossberg (160 feet), with the Cathedral and the Albrechtsburg. The former, a notable specimen of Gothic architecture, was erected in 1260-1450. It is surmounted by a fine spire of openwork, contains many monuments and tombs of Saxon rulers, and a notable altar-piece by an unknown German painter. The Albrechtsburg, an extensive castle erected in 1471-83 and occupied by the electoral, afterwards royal, porcelain factory from 1710 to 1864, has been restored since 1873, and some of the halls have been decorated with fine frescoes by modern artists. The most noteworthy educational institution is the Fürstenschule on the Afraberg, founded in 1543. Lessing and Gellert attended school here. There are also a 'real' school and schools of commerce and agriculture.

Meissen has played a prominent part in the porcelain industry of Saxony. It was here that Böttger established in 1710 the first porcelain factory in Europe and produced the famous Meissen ware. (See BÖTTGER and POTTERY.) The factory was transferred in 1863 from the Albrechtsburg to Triebischthal, a short distance from Meissen, and now employs over 700 persons. Meissen has a number of other porcelain manufactories, also foundries and machine works, textile mills, and manufactures of sewing machines, pianos, furniture, etc. In the vicinity the cultivation of fruit is carried on extensively. The chief articles of commerce are local manufactures of wine.

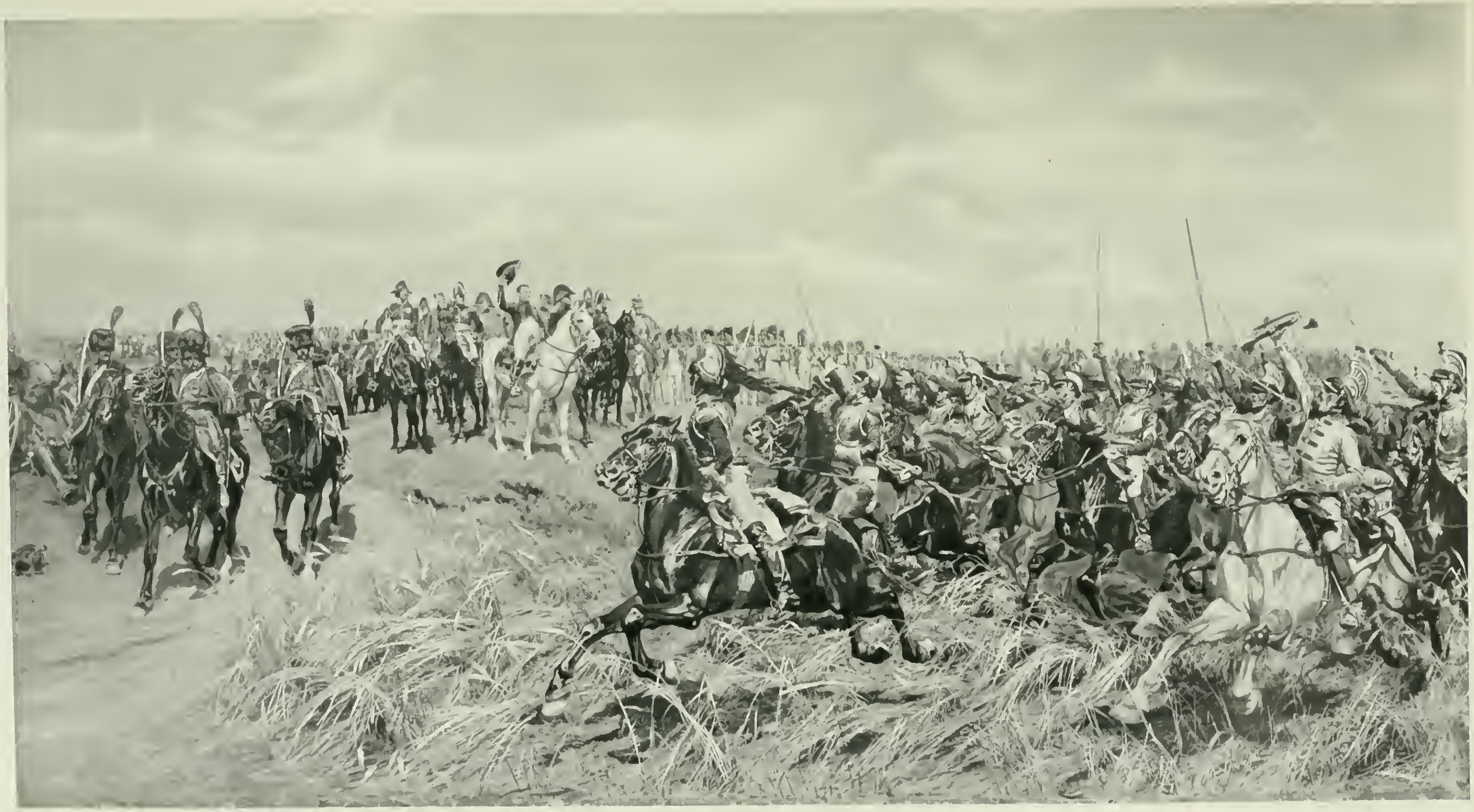
Meissen was founded in 928 by the Emperor Henry I., and rose to great importance as the residence of the margraves of Meissen, the direct ancestors of the present Royal House of Saxony. The bishops of Meissen had until 1581 the rank of princes of the Empire. Population, in 1890, 17,875; in 1900 (including Cölln, annexed in 1901), 20,123, chiefly Protestants.

MEISSEN, HEINRICH VON. A German minnesinger. See FRAUENLOB.

MEISSNER, mīs′nẽr, ALFRED (1822-85). An Austrian poet, born at Teplitz, grandson of the following. His *Gedichte* (1845) attracted much attention, and the lyrical epic *Ziska* (1846) shows the influence of Byron and Lenau. During a stay in Paris he wrote his *Revolutionäre Studien aus Paris* (1849). His tragedies, *Das Weib des Urias* (1850) and *Reginald Armstrong, oder die Welt des Geldes* (1853), were not very successful. Better are his novels, chief among which are: *Sansara* (1861); *Neuer Adel* (1861); and *Zur Ehre Gottes*. The last named is an interesting narrative of the events which took place in Austria during the reactionary period of 1850-54. Consult his autobiography, *Geschichte meines Lebens* (Teschen, 1884).

MEISSNER, AUGUST GOTTLIEB (1753-1807). A German miscellaneous writer, born at Bautzen. He studied law at Wittenberg and Leipzig, and in 1785 was appointed to the chair of belles-lettres in the University of Prague. For the last two years of his life he was director of the Fulda High School. Best known of his works are his *Skizzen*, a collection of miscellaneous stories, dialogues, anecdotes, and essays. He also wrote several romances and historical novels, such as *Alcibiades* (1781-88); *Bianca Capello* (1785); and *Epaminondas* (1798).

MEISSONIER, mā′sō′nyā′, JEAN LOUIS ERNEST (1815-91). A French military and genre painter, born at Lyons, February 21, 1815. In 1830 he went to Paris and worked for a short time in the studio of Cogniet, but he received his most valuable training in art from his study of the old masters in the Louvre, especially those of the Dutch School. At first he illustrated books and made etchings as a means of livelihood. His first painting, "The Visitors," was exhibited at the Salon in 1836. In 1843 and 1848 he received first-class medals from the Salon, and in the expositions of 1855, 1867, and 1878 the grand medal of honor. In 1848 he was cap-



JEAN LOUIS ERNEST MEISSONIER—"FRIEDLAND, 1807"
FROM THE PAINTING IN THE METROPOLITAN MUSEUM, NEW YORK

tain of artillery of the National Guards. He was with Napoleon at Solferino in 1859, and during the siege of Paris in 1870 he was lieutenant-colonel of infantry in the National Guards. He was made chevalier of the Legion of Honor in 1846 and grand officer in 1878; a member of the Institute of France in 1861, and a president in 1876 and 1891. He died in Paris, January 31, 1891.

His subjects are historical, military, and scenes from everyday life. Many of his pictures are on small canvases and studies of one or two figures. His characters are almost entirely men; in very few of his pictures do women or children appear. He is the chief of a school of genre painters, among the most prominent of whom are his son, Jean Charles (1848—), and Detaille (q.v.). Every detail in his pictures is as faithfully and carefully studied and portrayed as if it were of sole importance. His coloring is fresh and realistic, and his power over the effects of light and shade masterly. He excels in his drawing of the horse, in his portrayal of action, and in his power to depict the subtlest shades of expression on the faces of his characters. Of his military pictures, one of the most famous is "Friedland," or "1807" (1875), a large painting in the Metropolitan Museum, New York. Other famous military pictures are: "Cavalry Charge" (1867); "Napoleon III. at Solferino" (1864), in the Luxembourg; "The Retreat from Moscow;" "Napoleon Overlooking a Battle;" "Napoleon and His Staff in 1814" (1864). The Catherine Lorillard Wolfe collection, Metropolitan Museum, New York, contains three pictures by Meissonier, and the Vanderbilt collection in New York has seven. In the Luxembourg Museum are also the "Standard Bearer" (1862); "Musketeer" (1862); and a portrait of Alexander Dumas the younger. Among his best-known genre pictures are: "La Rixe" (1855); "Ball Players at Antibes;" "Amateurs of Painting" (1843); "The Laugher;" "The Halt" (1869); "The Chess Players" (1836); "Throwing Dice" (1836); "Mass Reading" (1840); "The Voyage" and "The Farrier" (1861). For his biography, consult: Claretie (Paris, 1884); Larroumet (ib., 1893); Gréard (ib., 1897); and Formentin, (ib., 1901).

MEISTERSINGER, mīs′tẽr-sĭng-ẽr. The name given to those artistic poets, usually not of noble birth, who, as the immediate followers of the minnesinger, cultivated artistic poetry in contradistinction from the folk song. The word meister (derived, like English 'master,' from Latin *magister*) means a poet who has studied, as all laymen did, in church schools. Accordingly the Meistersinger were distinguished from the common minstrels. They also formed a guild or caste. The meistersinger were wont to trace their origin back to 'the twelve old masters.' Various legends arose, explanatory of their origin. One Spangenberg even thought Moses was a meistersinger. David, also, was looked upon as a patron in whose time hundreds of meister were supposed to have taught 4000 scholars, and Solomon also was reckoned in. Furthermore, the minnesinger were reckoned as members of their caste, but, as a matter of fact, they were different in many ways. Individual meistersinger out of modesty called themselves 'lovers of art' (*Liebhaber der Kunst*), and the whole body of them named themselves the 'honorable' or 'praiseworthy society.' We may suppose that associations existed as early as 1200. Heinrich von Meissen, called Frauenlob, may have had a school of song at Mainz. We cannot be sure of a regular school till 1450 in Augsburg. But the meistergesang had flourished in the fourteenth century at Mainz, Strassburg, Colmar, and Frankfort; in the fifteenth, at Nuremberg; later still it flourished in Breslau, Görlitz, and Danzig. In 1492 Strassburg had the first school founded by written statutes, and Nuremberg had what became, thanks to Richard Wagner, best known to this generation. The last school died out at Memmingen in 1844.

Each school had for the head mastersinger a chair called *der Künste Stuhl* (chair of the arts), or, as in Nuremberg, the *Meisterstuhl* (master's chair). In England this was called 'the bard's seat.' Later the singer seems simply to have stood in the midst of his hearers. To enter the guild a candidate had to pass an examination before four markers, usually in a church. He must devise some new arrangement or a new melody (*Weise*) without infringing any rule. One of the markers determined whether the theme was right, another whether the versification was right, and the others looked to rhyme and melody. One need hardly add that, in a school whose whole attention was given to technicalities, the possible mistakes were limited by set rules. The success of a mastersong hung upon its conformity with these rules. Indeed, the very essence became a formula or a series of formulas. The *Tabulatur* or tablature, a term borrowed from music, and not found among the earliest documents, signified a bit of music written not with notes, but with letters or figures, designed to initiate the student into vocal or instrumental music. This code had to be mastered by whoever wished to be a meistersinger. In order to teach scholars more easily the content of the code, it was drawn up in short poems. In fine, it was a book of rules, the text-book of the meistergesang.

The school had inside and outside members, called by divers names. There were patrons, servants, and masters or companions, as well as learners or apprentices; often there was a director. Meetings were held on festivals, chiefly on Sunday after service and in the church. Very often the singers met at an inn. Prizes were awarded, and those who sang ill were fined. The prize was sometimes money, sometimes a crown, as at Nuremberg in the time of Hans Sachs. Flowers had also an important part in these competitions. Often in the older days one singer would hang up a wreath as a challenge and as a reward for victory. Finally may be mentioned the fact that the meistersinger often wore costume which was not seldom motley and often sumptuous.

The *Tabulatur* dealt with three matters: (1) The kinds of poems and the parts of a meistergesang; (2) permissible rhymes; (3) the mistakes, which are the main business, and have to do (a) with errors of delivery, of melody, of structure and of opinion; (b) chiefly, however, with errors of rhyme or mangling of words or cacophony.

The various songs were divided into three strophes, and each strophe was divided into two *Stollen* and a discant or *Abgesang*. Plate gives a long list of the various features of rhythm and rhyme in this complicated poetry, in all of which we observe a singular likeness to the technicalities invented or slavishly aped by the lesser, and indeed often enough by the better, poets two centuries earlier in Southern France. The best feature of the meistersinger's art was that it throve among the humbler folk, refined them, gave them a sense of nationality, opened the way for the artistic treatment of better themes, and spread widely the love of artistic music among those who needed most a sense of form. Consult: Grimm, *Ueber den altdeutschen Meistergesang* (Göttingen, 1811); Plate, "Die Kunstausdrücke der Meistersinger," in *Strassburger Studien*, vol. iii. (Strassburg, 1888); Martin, "Urkundliches über die Meistersänger zu Strassburg," in *Strassburger Studien* (ib., 1882); Streinz, "Der Meistergesang in Mähren," in Sievers's *Beiträge* (Halle, 1894); Cyriacus Spangenberg, *Von der Musica und den Meistersängern*, written in 1584, ed. by A. von Keller (Stuttgart, 1861); *Nürnberger Meistersingerprotokolle 1575-1869*, ed. by Drescher, in *Bibliothek des litterarischen Vereins in Stuttgart* (Stuttgart, 1898); Mey, *Der Meistergesang in Geschichte und Kunst* (Leipzig, 1901).

MEISTERSINGER VON NÜRNBERG, nụrn'bĕrK, DIE. A musical comedy in three acts by Richard Wagner; first produced in Munich, June 21, 1868. The scene of the play is Nuremberg in the sixteenth century. Walter von Stolzing, a young knight, loves and is loved by Eva, the daughter of the goldsmith Pogner. Her father, however, has offered her hand as a prize in the forthcoming meistersinger tournament, and to avoid losing her, Walter determines to qualify for and take part in the contest. He succeeds in being accepted as a candidate, and with the help of Hans Sachs, the famous cobbler meistersinger, defeats his rival, Beckmesser, and wins the girl. The play is indirectly a satire on Wagner's critics, the old and pedantic Beckmesser typifying the worst elements of musical conservatism, while Walter represents Wagner himself. See MEISTERSINGER.

MEITZEN, mīts'en, AUGUST (1822—). A German statistician, born in Breslau and educated at Heidelberg and Tübingen. He was a prominent member of the Statistical Bureau, and in 1875 was made professor of the science of statistics and of political economy at the University of Berlin. His contributions to the science of statistics include: *Die internationale land und forstwirtschaftliche Statistik* (1873) and *Geschichte, Theorie und Technik der Statistik* (1886); and he also wrote *Die Mitverantwortlichkeit der Gebildeten für das Wohl der arbeitenden Klassen* (1876).

MEJERDA, mȧ-jĕr'dȧ, or **MEJIRDA.** A river of northern Africa. It rises in the Great Atlas Mountains in Algeria, and after an eastern and northeastern course of over 200 miles, mainly through Tunis, flows into the Gulf of Tunis on the Mediterranean, 24 miles north of the capital. It was the ancient Bagradas, with its mouth at Utica, now Bu-Chateur, 7 miles to the south.

MEJIA, mȧ-Hē'ȧ, TOMAS (c.1812-67). A Mexican general, an Indian by race. He took a prominent part in the war with the United States, and served with Miramon (q.v.) and Zuloaga against Juarez in 1858 and 1859. On the occasion of the French intervention he did good service on the Imperialist side. He was present at the siege of Querétaro in 1867, was captured with other officers in Maximilian's army, and was with them court-martialed and shot. See MAXIMILIAN.

MEJIR'DA. A river of Northern Africa. See MEJERDA.

MEKHITARISTS, mĕk'ĭ-tȧr-ĭsts. A congregation of Armenian Christians who reside on the island of San Lazaro at Venice, but have also obtained a footing in France, Austria, Turkey, Russia, and elsewhere. They derive their name from Mekhitar (i.e. the Comforter) Da Petro (born 1676, died 1749), who in 1701 founded at Constantinople a religious society for the purpose of diffusing the knowledge of the old Armenian language and literature. In 1702 the society removed to the Morea, then under the rule of Venice, and founded a convent at Modon. Pope Clement XI. in 1712 confirmed the congregation, gave it the Benedictine rule, and made Mekhitar its abbot. The war between Turkey and Venice compelled its transference in 1715 to Venice, where, on the island of San Lazaro, the Mekhitarists held a convention in 1717. In 1773 a split in the congregation occurred, and a branch is now established in Vienna. The Mekhitarists acknowledge the supremacy of the Roman Pontiff. The most useful occupation of the Venetian branch is printing the classic writings of Armenian literature, including an Armenian translation of the Bible (1734); their editions are universally admitted to be the best and most correct. They also issue a journal, which is much read throughout the Levant. Those in Vienna conduct a German bookstore. For the history of those at Venice, consult: Boré, *Le couvent de Saint Lazare à Venise, ou histoire succincte de l'ordre des Méchitaristes Arméniens* (Paris, 1837); also Langlois, *Le couvent Arménien de Venise* (Paris, 1869); for those at Vienna, consult Scherer, *Die Mechitaristen in Wien* (5th ed., Vienna, 1892).

MEKLONG, mȧ-klông'. An important port on the south coast of Siam at the mouth of the Meklong River, 40 miles southwest of Bangkok (Map: Siam, C 4). The population is about 10,000, consisting chiefly of Chinese merchants and Siamese fishermen.

MEK'NEZ. A city in Morocco. See MEQUINEZ.

MEKONG, mȧ-kŏng', or **CAMBO'DIA.** The largest river of Indo-China. Its ultimate source has not been ascertained, but it is supposed to rise in the mountains of Central Tibet, not far from the sources of the Yang-tse-kiang (Map: French Indo-China, E 5). It flows in a general southeast direction, first through the Chinese Empire, where it is generally called Lan-tsang, and then through Indo-China, where it forms at first the boundary between Burma and Tongking, then between the latter and Siam. Its lower course is through Cambodia and Cochin-China. The course of the Mekong after it enters Indo-China becomes very crooked and interrupted by rapids and falls, which prevent the use of this great river as a waterway. It is only for the insignificant part of its length below Khong, a town in the southeastern corner of Siam, that the river becomes navigable. Here its flow becomes less turbulent as it enters its great alluvial plain. Finally it divides into a number of arms, forming a marshy delta which occupies almost the whole of Cochin-China, and through which the Mekong enters the China Sea after a total flow of about 2800 miles. At the town of Pnom Ponk, in Cambodia, an arm extends northwestward from the Mekong to the large lake Tonle Sap, which at one time discharges into the Mekong and at another is fed by it.

ME'LA, Pomponius. A Latin writer, the first to compose a strictly geographical work. He was a native of Spain, and is believed to have lived in the time of the Emperor Claudius, but nothing whatever is known concerning him. Mela's compendium is in three books, and is entitled *De Situ Orbis.* The text is greatly corrupted, on account of the abundance of proper names; but the style is good, and the author shows a very creditable diligence of research and discrimination in the use of his authorities. The *editio princeps* appeared at Milan in 1471, and there is an early translation by Arthur Golding (London, 1585). There are good editions by Tzschucke (Leipzig, 1807), Parthey (Berlin, 1867), and Frick (Leipzig, 1880).

MEL'ALEU'CA. A genus of plants. See Cajeput.

MELAM'PUS (Lat., from Gk. Μελάμπους, *Melampous*). In Greek legend, the son of Amythaon; his mother is said by different authors to be Aglaia, Rhodope, or Eidomene. He is represented as a physician and prophet, and is said to have acquired his powers of divination from Apollo, who imparted to him all the secrets of the art of medicine. Melampus appears in two groups of legends. In one he and his brother Bias came from Thessaly to Pylos, where Bias fell in love with Pero, daughter of Neleus. Her father, however, required her suitor to bring to him the herds of Iphiclos. Melampus went on this mission, was seized and thrown into prison, but overheard the worms in the beams predict the speedy fall of the building. He told his jailers, who believed, and with him escaped before the fall. The King, hearing of his gifts, secured his aid in curing a disease of long standing, and as his fee gave him the much-desired cattle. He was also said to have left Neleus and gone to Argos, where he cured the Argive women, or, according to others, the daughters of King Proetus, of madness sent by Dionysus or Hera. As a reward he received for himself the hand of one of the daughters, Iphianassa, and a third of the land of Argos, and another third for Bias. Thus their descendants, including the prophet Amphiaraos, ruled along with the descendants of Proetus. At Ægosthena in Megaris Melampus was worshiped as a god, having a temple and apparently games in his honor.

MELANCHOLIA (Lat., from Gk. *μελαγχολία*, black bile, from *μέλας*, *melas*, black + *χολή*, *cholē*, bile). A form of insanity characterized by depression both of emotional state and of nerve functions. The essential feature of this disorder is sadness, dejection, despondency. The melancholiac is gloomy, full of forebodings and fearful anticipations, convinced of physical inferiority and of moral worthlessness, and often contemplates, even if he does not commit, suicide. A number of delusions arise in almost all cases. He may even commit murder to save himself from his own expected fate. Disturbances of the sense organs may cause hallucinations of smell, taste, and sight. In some cases, overwhelmed by terror or by conviction of wrongdoing, the patient burns or mutilates himself in a paroxysm of fury and during a reduction of consciousness. This condition, really the outcome of terror, is called melancholic frenzy. This frenzy occurs in alcoholics as a result of the familiar hallucinations of frightful animals, fires, and of fearful forebodings. In melancholia there is more apparent bodily disorder during the attack than in mania. Constipation, dryness of tongue and throat, absence of appetite, and headache are prominent.

There are several varieties of melancholia. *Melancholia agitata* occurs when the patient is active and excited, restlessly running about, weeping and beseeching and wringing his hands. *Melancholia attonita* occurs when the patient is practically motionless, fastening his gaze on the floor, lethargic and relaxed with 'frozen expression.' It is difficult to arouse the atonic melancholiac to take food, or to answer questions. He must be dressed and undressed by an attendant. *Melancholia simplex* has been described. *Melancholia sine delirio*, less happily designated 'reasoning melancholia,' is a form of the disorder in which there is neither delirium nor delusion nor hallucination. This is also known as 'affective melancholia,' since the emotional or affective sphere is chiefly at fault.

There is a preliminary period during which the patient complains of inability to fix his attention, faltering memory, and slow intellection. An attack of melancholia rarely appears without this preliminary period except when it follows an emotional shock or an exhausting fever. An attack of melancholia lasts from a few weeks to about eight months in most cases. Some attacks continue for over a year. Accurate figures as to the percentage of cases of melancholia to the whole number of insane cannot be reached; but the proportion is about 14 per cent. Sixty per cent. of melancholiacs recover. The treatment of melancholia consists in constant surveillance, regular and ample nourishment, cardiac and general stimulants, hygienic measures, and interesting occupation. Travel benefits many, but unremitting vigilance is necessary to prevent accident or suicide. See Insanity.

MELANCHOLY JAQUES. A name used of J. J. Rousseau because of his morbid nature, and suggested by Jaques in Shakespeare's *As You Like It.*

MELANCHTHON, mė-lăŋk'thon, *Ger. pron.* mȧ-läŋk'tōn, Philipp (1497-1560). The associate of Luther in the Protestant Reformation, and the foremost teacher of his time, in the words of Hallam, "far above all others the founder of general learning throughout Europe." He sprang from the middle class, as did Luther from the lower. His father was an armorer in favor at Court, his mother the daughter of the burgomaster of Bretten in Baden, where he was born, February 6, 1497. By the advice of his granduncle, the learned Reuchlin, he changed his family name, when he entered the University of Heidelberg at the age of twelve, from Schwarzerd ('Black earth') into its Greek equivalent, Melanchthon, a common practice among scholars. Having taken the bachelor's degree when fourteen, he took the master's degree at Tübingen when seventeen and at once began to lecture on Terence, Vergil, and rhetoric: when nineteen he published an edition of Terence, which ran through seventy-three editions in the course of about a century.

His Latin and Greek grammars enjoyed still larger use even in Catholic schools.

Most opportunely for Luther, who had posted his theses the year before, Melanchthon was now called to the chair of Greek at Wittenberg, and in 1518 delivered his inaugural upon "Reform in the Studies of Youth." Those who had depreciated him for his boyish appearance immediately changed to admiration. The next year Melanchthon took the bachelor's degree in theology, but modestly declined the doctorate. Never ordained, never preaching, he remained, like Calvin, a lay theologian to the end of his days. His lectures were thronged, sometimes, as reported, to the number of two thousand, including even princes and noblemen.

From his classical studies, he was drawn by Luther's urgency and the prevailing ferment into the field of theology. By his *Loci Communes*, i.e. general outlines of theology, he made in 1521 his first great contribution to the Reformation. From Melanchthon's architectural and organizing spirit, according to Dorner's view, the truth born in Luther's heart received its objective form and the stamp of validity. Equally important was the aid he gave to Luther's Bible work, in which the accuracy is his, while its idiomatic force and beauty are Luther's. In 1526 he became professor of theology in name, as for years he had been in fact.

Among the Reformers, Melanchthon was characteristically the peacemaker. The Augsburg Confession, presented by the Protestants at the Diet in 1530, surprised even the Catholics by its moderate tone. The tone was Melanchthon's, who drafted it from articles drawn up by Luther. In 1531 Melanchthon published his *Apology*—a vindication of the Augsburg Confession, and the most learned of the Lutheran symbols. After this date he wrote his name 'Melanthon,' as easier to pronounce. His irenic spirit prompted him to issue a modified edition of the Confession, the *Variata* (1540), generalizing specific statements of the Lutherans objectionable to the Calvinists, with the design of removing impediments to the union of the two parties. But such efforts only brought bitter trouble upon Melanchthon. He had now reached the limit of his successes, and his remaining years were darkened by the failure of his efforts for a more ethical theology, and for the union of the Protestant factions.

Melanchthon's treatises on ethics, in which Aristotle was his master, became standard textbooks. These ethical studies revealed to him defects in his theological masterpiece, the *Loci Communes*, which he amended by successive revisions in 1535 and 1543. They also occasioned a serious breach between the 'Philippists' and the strict Lutherans, whose extreme denial of the freedom of the will made Christian ethics impossible. Cries of heresy arose, which no explanations could still. Another breach was caused by Melanchthon's slow but sure change from the Lutheran conception of the mode of Christ's presence in the Lord's Supper to the Calvinistic. A third ground of odium was Melanchthon's willingness, for the sake of avoiding civil war, to compromise with the Catholics by securing tolerance of evangelical doctrine, but retaining most of the Roman ceremonies, as 'adiaphora' (things indifferent). In the bitter controversy which ensued the Philippists were hounded as 'knaves, Samaritans, and Baalites.' Melanchthon's relations with Luther were strained, but to the last his gentle spirit held captive that fiery heart. He looked forward to death as "escape from the madness of theologians." His last prayer was "that the churches might be of one mind in Christ." He died April 19, 1560.

Melanchthon seems in one point of view to have been born before his time, and has been long in coming to his rights. In a period of fanatical strife, he earnestly strove to bring about Christian unity. But on the honor-roll of the Reformation his is conspicuously the historical, judicial, progressive spirit. His one great weakness was his consenting with Luther and others to the bigamy of Philip of Hesse, and his regret for it threw him into a dangerous illness. Declining invitations to other German cities, to France, to Denmark, to England, he stood unflinchingly to his post in stormy Wittenberg. The churches he found it impossible to reconcile now unite in honoring him. Lacking the dramatic element which draws the popular heart to Luther, his blending of progress and tolerance, of sweetness and light, attracts the cultivated mind.

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MEL'ANE'SIA (Neo-Lat., from Gk. μέλας, *melas*, black + νῆσος, *nēsos*, island). A name applied to that division of Oceanica in which the inhabitants have a dark skin, as distinguished from those of Micronesia and Polynesia, who are much lighter. (See MELANESIANS.) It comprises all the islands lying between New Guinea and the Fiji Islands, and between the Equator and the Tropic of Capricorn (Map: East Indies, H 4). It includes the following groups: Admiralty Islands, Bismarck Archipelago, Solomon Islands, Santa Cruz, New Hebrides, New Caledonia, Loyalty Islands, and Fiji Islands. The last are sometimes classed with the Polynesian Islands, while New Guinea is sometimes included in Melanesia. For details, see the articles on the separate groups.

MELANESIANS. The natives of that part of Oceanica known as Melanesia (q.v.). Some authorities consider them physically and linguistically a compound of the woolly-haired black Papuans, who may have been the aborigines of

Melanesia, with the smooth-haired, light-colored Malays, who came to the archipelago as adventurers and immigrants. Of all the islanders of these regions they present in individual cases the strongest likeness to the equatorial African negro. Other scholars recognize a 'Melanesian race,' divided into Papuans and Melanesians proper, the latter being taller and more dolichocephalic than the former, and having generally the large square or lozenge-shaped face with the straight or *retroussé* nose of the Melanesian race. The Melanesian is the most primitive form of Oceanic speech. The Melanesians are in general sedentary and devoted to agriculture, being only occasionally hunters and fishers, and they use the pig as a domestic animal. Many of the Melanesians make pottery, an art practiced by few of the Polynesians. They have double canoes and outriggers, but are not given, like the Polynesians, to long voyages. With most of them the characteristic dwelling is built on piles (see LAKE-DWELLINGS), and often artistically decorated, while communal houses are found all over the Melanesian area. The bow and arrow (sometimes poisoned) are in use, with the club and spear, which lend themselves to ornamentation. Some of the hafted stone axes of the Melanesians are very fine specimens of their kind. Kava, the characteristic drink of the Polynesians, is absent, but betel-chewing prevails generally except in New Caledonia. The Solomon Islands and a few other places still present examples of cannibalism, while head-hunting, together with the preservation of the skulls of the dead, is well known. Taboo assumes in Melanesia a less clear form than in Polynesia, amounting to simple interdiction without the intervention of mysterious forces. Tribes proper are rare in Melanesia. The regulation of 'group marriages' is very strict. Secret societies abound, including the famous *duk-duk* (q.v.), which corresponds in several curious respects to the modern club. The highest development of the Melanesian is to be found in the Fiji Islands, now a British colony, the lowest in some parts of New Caledonia and the Solomon Islands. Consult: Finsch, *Anthropologische Ergebnisse einer Reise in der Südsee* (Berlin, 1884); Imhans, *Les Nouvelles-Hébrides* (Nancy, 1890); Guppy, *The Solomon Islands and Their Natives* (London, 1887); Legrand, *Au pays des Canaques* (Paris, 1893); Codrington, *The Melanesian Languages* (Oxford, 1885); id., *The Melanesians: Studies in Their Anthropology and Folk-Lore* (ib., 1891); Parkinson, *Die Völkerstämme Neu-Pommerns* (Berlin, 1899); id., *Im Bismarcks-Archipel* (Leipzig, 1887); Haddon, *Head-Hunters, Black, White, and Brown* (London, 1902); Gaggin, *Among the Man-Eaters: Fiji and Solomon Islands* (London, 1900); Melching, *Staatenbildung in Melanesien* (Leipzig, 1897).

MEL'ANI'IDÆ (Neo-Lat. nom. pl., from Lat. *melania*, from Gk. *μελανία*, blackness, from *μέλας*, *melas*, black). An extensive group of freshwater gastropod mollusks characterized by the long spiral shell, with the whorls more or less knobbed or tuberculated, ribbed or striated, and a horny operculum. The animal has a broad foot or creeping disk, grooved in front; it is ovoviviparous. The species date from the Cretaceous period. They live in rivers, and the tubercles protect them from injury in rapid rocky streams. The species are distributed throughout North Africa, Syria, China, India, the Philippine Islands, Polynesia, and South America. In the Southern United States, mostly in a rough square formed by the Tennessee, the Mississippi, the Chattahoochee rivers and the Gulf of Mexico, occur in abundance the Pleuroceridæ, represented by the genus Io, which were formerly associated with the Melaniidæ.

MEL'ANIP'PE. (1) In Greek mythology, a daughter of Chiron. Being about to bear a child, she fled to Mount Pelion to conceal herself from her father, and was changed into a mare by Artemis and placed among the constellations. She is also called Evippe. (2) A sister of Meleager, who died with grief at her brother's fate. (3) A sister of Hippolyte and Queen of the Amazons.

MEL'ANIP'PUS. In Greek mythology, a Theban, the slayer of Tydeus in the expedition of the Seven against Thebes. He was himself killed by Amphiaraus.

MELANISM (from Gk. *μέλας*, *melas*, black), and **ALBINISM** (from Lat. *albus*, white). Melanism is a phenomenon due to excess of pigment, while albinism is due to its absence. Albinism is a pathological condition, while melanism is usually normal. Melanism occurs in insects, fishes, reptiles, birds, and mammals, and is noticeable in man. While in animals and man albinism is the result of disease, it may occur in nature as a sport; thus we have albino varieties. The absence of pigment is normal in such Arctic animals as the polar bear, the northern or white owl, etc.; others turn white in winter, as the Arctic fox, the American varying hare, the ptarmigan, etc. The change of color in such cases is apparently due to cold, and is associated with the development of numerous air-bubbles in the hair; in some cases there is no loss of pigment, which is merely concealed by the air-bubbles (Newbigin).

In man the dark races owe the color of their skin to a black pigment deposited in the deeper layers of the epidermis, this pigment in the blonde or white race being but slightly developed. As the darkest negroes inhabit the low torrid coast of West Africa, the pigmentation seems due to light, heat, and moisture combined. On the other hand, the cool damp climate of elevated or mountain regions and of the polar lands causes melanism. It is well known that the insects, more especially moths and butterflies, inhabiting Alpine slopes or mountain regions are darker than individuals of the same species, or of allied species, living on the drier and warmer lowlands. Packard has called attention to the melanotic moths on the summits of the White Mountains of New Hampshire and along the coast of Labrador. Leydig was the first, perhaps, to point out that variation toward greater darkness of coloring is connected with the action of moisture. The temperature experiments of Weismann, W. H. Edwards, and Merrifield have proved that besides moisture and elevation cold is an important agent in excessive pigmentation, at least, of Lepidoptera and beetles. But melanism is not entirely confined to northern animals. The black leopard of Southern Asia is a melanotic variety or sport of the common leopard. The varying hare is infrequently melanistic. It has been noticed that the butterflies on islands, which are always damper than the mainland, are inclined to be darker, whether in the East Indies or in Newfoundland, The prevailing coloring matters in the pigments of mammals are the dull-colored melanins. The origin of these melanins is wrapped in doubt. The dark coloring matter of silkworm moths and other insects is probably due to the waste products of the blood. It has been thought that in mammals the pigment is directly derived from the hæmoglobin of the blood. Floyd, however, has shown that the skin of the negro contains about twice as much iron as the white skin, apparently due to the proteid present in the pigment granules. Another physiologist (Delépine) thinks that the melanin is elaborated out of the plasma of the blood, and is not a derivative of the hæmoglobin, but that the latter may itself be manufactured from some antecedent variety derivative of melanin (Newbigin).

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MEL′ANITE (from Gk. *μέλας, melas*, black). A name given to the black or common garnet (q.v.).

MEL′ANORRHŒ′A (Neo-Lat., from Gk. *μέλας, melas*, black + *ῥοιά, rhoia*, a flowing, from *ῥεῖν, rhein*, to flow). A genus of trees of the natural order Anacardiaceæ. To this genus belongs the black varnish tree (*Melanorrhœa usitata*) of Burma and the northeast of India, called *Theet-see* or *Zitsi* in Burma, and *Khew* in Manipur, a very large tree, attaining a height of 100 feet, with large, leathery, simple, entire, deciduous leaves, and axillary panicles of flowers. It yields a viscid, rust-colored juice, which becomes black on exposure to the atmosphere, and is excessively acrid, causing swellings with much pain and fever if it touches the skin. It is much valued as a varnish for painting vessels intended to contain liquids, utensils, and also as a size-glue in gilding.

MELANOSIS. See TUMOR.

MELAPHYRE (from Gk. *μέλας, melas*, black + *πορ-φυρ-ίτης, por-phyr-itēs*, porphyry). A term formerly much employed for basalts of pre-Tertiary age. See BASALT.

MELAZZO, må-lät′sō. A city of Sicily. See MILAZZO.

MEL′BA, NELLIE (1865—). An Australian operatic soprano. Her family name is Mitchell, and Melba is an adaptation from Melbourne, in which city she was born. She studied under Marchesi, and made her first public appearance as Gilda in *Rigoletto* at Brussels in 1887. A brilliant coloratura singer and of a very attractive personality, she became known and admired in every great city of the world, being especially successful in grand opera in America. Her first appearance in this country was at the Metropolitan Opera House, New York, in 1893, in *Lucia di Lammermoor*. She gained unusual distinction in the rôles of Ophelia, Nedda in *I Pagliacci*, Juliette, Lucia, and Elisabeth.

MELBOURNE, mĕl′bŭrn. The capital of Victoria, Australia, situated chiefly on the north bank of the Yarra, about nine miles by water and two miles by land above its outlet in Hobson Bay (Map: Victoria, E 4). The bay is the northern bend of the spacious inlet near the southeastern extremity of the continent, known as Port Phillip, the entrance to which is 40 miles south of the city. Melbourne occupies the first rank among British colonial ports, and is the most important trading town of the Southern Hemisphere. It is the centre of a dozen converging lines of railway, several, however, being only suburban lines. It is the see of a Roman Catholic archbishop and of a Protestant bishop, and the seat of various consuls, including a United States consul-general. The city is laid out with straight, wide, and regular streets, well paved or macadamized, and supplied with gas, electric lighting, street railways, and fresh water. Melbourne University has an annual State endowment, and possesses valuable scholarships and exhibitions. Its building is large, in the shape of a parallelogram, surrounded by extensive grounds. The post-office, a magnificent structure, in the Italian style, elaborately ornamented, was built in 1859. The Parliament houses, erected in 1855-91, cost $5,000,000. The town hall is a fine building with a large assembly room equipped with a splendid organ. The chief institutions besides these are the hospital, the benevolent asylum, the immigrants' home, the servants' home, the orphan asylums, the lying-in hospital, treasury, county and city courts, public library, including the National Picture Gallery and Museum of Sculpture, custom-house, barracks, Scotch College, and many other educational establishments, literary and scientific institutions and societies. There are several theatres, public parks, and fine botanical and zoölogical gardens.

The Yan-Yean water-works, by means of which water is conveyed from a distance of 18 miles, were opened in 1857. Water-works and street railways are municipal property. The chief industrial establishments are flour mills, tallow-boiling works, tanneries, woolen and cloth factories, breweries, brass and iron foundries. The suburbs included in the metropolitan area extend for over 10 miles along the shores of the spacious and beautiful bay of Port Phillip, which is 35 miles long by about 25 miles broad. The entrance to Port Phillip, which is only two miles wide, is formed by two projecting and strongly fortified promontories, called the Heads. Vessels drawing 16 feet reach Melbourne at ordinary tides. About one mile of wharfage extends along the north side of the Yarra. In the outer harbor there are about 25,000 feet of berthing, ranging in depth from 6 to 27 feet at low tide. The chief exports are gold, silver, wool, hides, cattle, and sheep. Six-sevenths of the entire commerce of the State is carried on by Melbourne. For further information regarding trade, etc., see VICTORIA.

Melbourne was first colonized in 1835, and received its name in 1837 from Lord Melbourne, then the British Prime Minister. It became the see of a bishop in 1847, and in 1851 the capital of the newly formed colony of Victoria. The discovery of gold in Victoria in 1851 gave an extraordinary impetus to the material prosperity of Melbourne. The colonial centenary was commemorated at Melbourne in 1888 by an international exhibition. The first Federal Parliament of the Australian Commonwealth was opened in the Exhibition buildings on Wednesday, May 8, 1901, by the Duke of York, Melbourne being chosen as the temporary capital pending the choice of a seat on federal territory in New South Wales. Population, within municipal limits, in 1901, 68,379; including suburbs, which comprise sixteen municipalities, in 1890, 490,900; in 1901, 494,100. Consult Finn, *Chronicles of Early Melbourne* (Melbourne, 1889).

MELBOURNE, William Lamb, second Viscount (1779-1848). An English statesman. He was educated at Eton and at Trinity College, Cambridge, where he graduated in 1796, and at Glasgow (1799), where he studied jurisprudence and politics under Millar. One year after his admission to the bar (1804) he entered the House of Commons for Leominster and joined the Whig opposition, under the leadership of Charles James Fox. As a consequence of his favoring Catholic emancipation, he lost his seat in 1812, but when he returned, a few years later, he came back a follower of Canning, and in 1827 accepted the chief secretaryship of Ireland in Canning's Government. This partial alienation from the Whigs was increased when he not only took office under Lord Goderich, but remained for a short time in the Government of the Duke of Wellington. In 1828 the death of his father transferred him to the House of Lords. In 1830 he accepted the seals of the home office in the Government of Earl Grey, but his administration was by no means popular or successful. In July, 1834, Earl Grey retired and William IV. sent for Melbourne. In November, however, on a slight pretext, the King, who had become entirely alienated from the Whigs and Melbourne, invited Sir Robert Peel to form a conservative Ministry. On Peel's arrival in England he dissolved Parliament and appealed to the country, but was defeated; the new Commons, resenting the interference of the King, made Peel's task an impossible one, so early in 1835 Melbourne again became First Lord of the Treasury and Premier. On the accession of Queen Victoria in 1837, it became the duty of Melbourne to instruct the young sovereign in the various duties of her high station. In 1841 his Government was succeeded by that of Sir Robert Peel. Henceforward Melbourne took little part in public affairs. His administrations advocated reform of Church tithes, in both England and Ireland, of municipal corporations, taxation, criminal law, postal rates and education, yet he himself cared little for reform. Personally he was not interested in change of any kind. He had little of the oratorical faculty, and was ineffective as a speaker, but possessed a cheerful temper and cordial frankness of manner which made him many friends. He married (1805) a daughter of the Earl of Bessborough, who, under the title of Lady Caroline Lamb, attained some celebrity as a novel-writer and a correspondent of Lord Byron. For the life of Lord Melbourne, consult: Torrens, *Memoirs of Lord Melbourne* (London, 1875); Sanders, *Lord Melbourne's Papers* (London, 1889); Hayward, "Essay on Lord Melbourne," in *Celebrated Statesmen and Writers.*

MELCHERS, mĕlk′ērs, Paulus (1813-95). A German cardinal. He was born at Münster, Westphalia, studied law at Bonn, and afterwards theology at Munich and at the theological seminary of Münster. In 1841 he was ordained priest and in 1857 was made Bishop of Osnabrück. In 1865 he was nominated Archbishop of Cologne by Pius IX. At the Vatican Council Melchers at first opposed the doctrine of infallibility, but afterwards acknowledged it, when the majority decided in favor of it, and even excommunicated professors who were against its proclamation. He took a prominent part in the *Kulturkampf*, and thereby frequently came into conflict with the Government authorities, and was removed from his office in 1876. Among his published works are: *Eine Unterweisung für das heilige Altarsakrament* (1878); *Die katholische Lehre des Herrn* (1883); and *Das Leben der alierseligsten Jungfrau und Gottesmutter* (1884).

MELCHIADES, mĕl-kī′ȧ-dēz. See Miltiades.

MELCHITES, mĕl′kīts (MGk. *Μελχίτης*, *Melchitēs*, from Syr. *malkāyē*, royal, from *melek*, king). Originally a nickname given by the Monophysites in the fifth century to the Christians who remained orthodox in the patriarchates of Jerusalem, Alexandria, and Antioch—the name, in the sense of 'Court party,' implying that they did so under Imperial pressure. Since the thirteenth century, however, the name has been applied to the Christians of Eastern rite in Syria and Egypt who are in communion with Rome. They have had a patriarchate of their own, taking its title from Antioch, since 1744. Besides Damascus, which the patriarch rules immediately by a suffragan, there are twelve other dioceses subject to his authority, with between 300 and 400 priests and over 100,000 lay people. See Eastern Rite, Churches of; Uniats.

MELCHIZEDEK, or **MELCHISEDEC,** mĕl-kĭz′ė-dĕk (Heb. *Malkī-ṣedeḳ*, king of righteousness). A personage introduced in Gen. xiv. 18, as 'king of Salem' and 'priest of the most high God.' This chapter, while probably resting on some obscure reminiscences in which Babylonian history has been brought into artificial connection with tribal quarrels in Eastern Palestine, is regarded by many scholars as a late production in the manner of the post-exilic *Midrash*—i.e. a half homiletical and half legendary elaboration of an historical tradition. The narrative states that after Abraham's return from the successful pursuit of Chedorlaomer (q.v.), King of Elam, and his allies, which he had undertaken in order to rescue Lot, he was met by Melchizedek; the latter offered the patriarch bread and wine and blessed him; whereupon Abraham gave Melchizedek tithes from the spoil. The Midrashic character of the story is made evident by the names, which are symbolical. Salem—probably a disguise for Jerusalem, which, as the Tell el-Armarna tablets show, is to be interpreted as Ur-Salim ('city of Salim')—signifies 'peace' and Melchizedek means 'king of righteousness.' It is, therefore, quite natural to find that Melchizedek became a favorite personage for further elaboration, both with Jews and Christians. In the Haggada he is identified with Shem; the reference to Melchizedek in Psalm cx. 4 is late and obscure, but points to other conceptions current about this mysterious personage. In the Epistle to the Hebrews (vi. 20; vii. 1-21) he is taken as typifying Christ. Various other views arose with regard to Melchizedek. So Jerome records an old notion that the royal priest was an angel. A small sect in the fourth century called after his name, Melchizedekians, taught that he was a power or incarnation of God greater even than Christ. Others regarded him as the Holy Ghost. Epiphanius says that some in his day believed that Melchizedek was the Son of God in human form: to this opinion Ambrose seemed inclined, and this view harmonized with a Jewish belief that he was the Messiah. It is of some importance to note, as throwing perhaps some light on the origin of the 'Melchizedek' tradition, that in his famous code, King Hammurabi (q.v.) of

Babylon gives himself the title 'King of Righteousness,' as the lawyer of his people.

MELCHTHAL, mĕlk'täl, Arnold von. A legendary hero of the Swiss struggle for independence against Austria in the early part of the fourteenth century. He was called Melchthal from the village of his birth in the Canton of Unterwalden, but his name was Arnold an der Halden. Arnold killed the servant of an Austrian bailiff, who had come to Melchthal to seize the oxen of Melchthal's father, a well-to-do proprietor in Unterwalden. In revenge, the Austrian put out his father's eyes. When Melchthal heard of his father's blindness, he met his friends Fürst, of the Canton of Uri, and Stauffacher, of the Canton of Schwyz, on the banks of Lake Lucerne, and all three took an oath to do all in their power to liberate the three cantons from Austrian rule. This was in 1307, and the next year the mountaineers of the three cantons successfully waged war against the Austrians. The story is presumably a myth. It is found in the *Chronicon Helveticum* of Ægidius Tschudi (1505-72).

MELCOMBE, mĕl'kŭm, George Bubb Dodington, Baron. See Dodington.

MELCOMBE REGIS AND WEYMOUTH, mĕl'kŭm rē'jĭs ănd wā'mŭth. A seaport of England. See Weymouth.

MELDE'NIUS, Rupertus. The real or more probably pseudonymous author of the *Parænesis Votiva, pro Pace Ecclesiæ, ad Theologos Augustanæ Confessionis*, which appeared in Germany about 1630, without place of publication or date. It is a plea to the Lutheran theologians to lay aside their acrimonious controversy.

MEL'EA'GER (Lat., from Gk. Μελέαγρος, *Meleagros*). In Greek legend, the hero of the Calydonian boar-hunt. In the earliest known form of the legend, which is found in the *Iliad*, he is the son of Œneus, King of Ætolia, and Althæa, daughter of Thestius. When the Calydonian boar (q.v.) laid waste the land, he gathered a band of heroes, and, after a hard struggle and much loss of life, slew the monster. A strife arose between the Ætolians and Curetes over the spoils of the hunt, in which Meleager led his people to victory, until he killed his mother's brothers. Althæa then cursed her son and prayed the Furies and gods of the lower world to punish him. The hero in anger withdrew from the fight, and, knowing his fate, refused to return, until the Curetes had actually stormed the town, when he yielded to the prayers of his wife and went forth to save his people, and met his death, seemingly at the hand of Apollo. A later and more popular version introduced many alterations. When Meleager was seven days old the Fates told his mother that the child would live till a brand then on the hearth should be consumed. Althæa thereupon quenched the brand, and put it in a chest. Later, on the news of the death of her brothers, she, in her grief and rage, put the brand again upon the fire, and the hero at once wasted away. This story appears in an Ode of Bacchylides. Later still, new features were introduced. The hunt brought together many heroes, and among them the wild Arcadian maiden Atalanta (q.v.), with whom Meleager fell in love. She first wounded the boar, and received from her lover the head and hide. These the sons of Thestius, in their jealousy, took from her, and were killed by their nephew, whereupon Althæa consumed the brand. Althæa was said to have killed herself in remorse, while the lamentations of his sisters and the women of Pleuron so moved the gods that they changed them into guinea-hens (μελεαγρίδες), with the exception of the two sisters, Deianira, later the wife of Hercules, and Gorge. This story seems due to Sophocles.

The Calydonian Hunt was a favorite subject with the vase-painters from early times, and was also taken by the great artist Scopas as the subject for one of the pediments of the temple of Athena Alea at Tegea. Fragments of these sculptures are now in Athens. A statue of Meleager, copied from a work of Scopas, is now in the Vatican at Rome, and a finer copy of the head and torso in the Fogg Art Museum of Harvard University. See illustration under Scopas.

MELEAGER (flourished c.60 B.C.). A Greek philosopher and epigrammatist, born at Gadara in Syria. He compiled the first known Greek anthology, a collection called the Garland (Στέφανος), which contained epigrams by 40 authors, as well as 130 epigrams of his own, mostly of an erotic character. These are preserved in the later collection of Constantinus Cephalas, known as the *Palatine Anthology* (q.v.). Consult: Symonds, *Studies of the Greek Poets* (London, 1893), c. 21; Ouvré, *Mélegre de Gadara* (Paris, 1894); Radinger, *Meleagros* (Innsbruck, 1895); Pomeroy, *Meleager, etc.* (London, 1895).

MELEAGER, House of. A large house in Pompeii, so called from a picture of Meleager and Atalanta which it contains. Its walls bear numerous frescoes and a number are now preserved in the Naples Museum. The œcus was in the Corinthian style, with a colonnade about the sides and a vaulted central portion.

MELEAGER, Statue of. A celebrated marble in the Vatican, representing the hero with his dog and a boar's head. The statue belongs to the Imperial period and was found near the Porta Portese at Rome about 1500.

MEL'EA'GRIS (Lat., from Gk. μελεαγρίς, sort of guinea-fowl, named after Μελέαγρος, *Meleagros*, Meleager). The genus of the pheasant family that contains the American turkey (q.v.); but the term belonged originally to one of the guinea-fowls (q.v.).

MELEGNANO, mā'lā-nyä'nō (formerly *Marignano*). A town of Northern Italy, 10 miles southeast of Milan, with a population (1901) of 6666 inhabitants. It is famous as the scene of a great victory won by Francis I. of France over the Swiss and Milanese, September 13-14, 1815. The defeat at Melegnano did much to destroy the prestige of the Swiss pikemen, who for a long time had enjoyed the reputation of being the best soldiers in Europe. Francis accepted the honor of knighthood on the field from the Chevalier Bayard. After the battle Francis I. made a treaty with the Swiss, which lasted until the French Revolution. A second battle was fought here June 8, 1859, between a French force of 16,000 men, under Marshal Baraguay d'Hilliers, and a somewhat larger body of Austrian troops, the latter being routed.

MELEGUETTA (mĕl'ē-gĕt'tȧ) **PEPPER**. See Grains of Paradise; Guinea Pepper.

MELEMA, me-lā'mȧ, Tito. In George Eliot's *Romola*, a pleasure-loving and unprincipled young Greek, the husband of Romola.

MELE′NA EL′PIS. A pseudonym of Espérance von Schwartz (q.v.).

MELENDEZ VALDES, mȧ-lȧn′dȧth vȧl-dās′, Juan (1754-1817). A Spanish poet, born at Ribera del Fresno, in Estremadura, March 11, 1754. He studied at Salamanca, and began his poetical career with some compositions in the manner of Lobo, but soon came under the influence of the elder Moratin and other members of the so-called French school of writers. In 1780 he won the prize of the Spanish Academy for an ode. Coming to Madrid in 1781, Melendez there enjoyed the favor of the minister and author, Jovellanos, who appointed him to a chair at the University of Salamanca. In this intellectual centre he became the chief figure of the Salamancan circle of lyric poets, who played an important part in the regeneration of Spanish literary production. With his comedy, *Las bodas de Camacho,* he won a prize offered by the city of Madrid in 1784; but the play failed on the stage. The next year he published his first volume of collected poems, which marked a decided improvement over the methods both of contemporaries and of most lyric poets who had written since the *siglo de oro.* Melendez now entered upon a political career that was to lead to his ruin. At his own request, he was made a judge of the court of Saragossa in 1789; two years later he was promoted to the chancery of Valladolid; and in 1797 he was given a post at the royal Court. In 1798 Melendez's constant friend, Jovellanos, fell from favor and the former was involved in his ruin. He was exiled for a while, but in 1802 he was allowed to settle in Salamanca. He identified himself with the endeavors of the Napoleonic Government in Spain. Serving this cause, he incurred the hatred which his countrymen felt for the *Afrancesados,* and on several occasions he nearly lost his life at the hands of the excited populace. With the end of Joseph Bonaparte's rule, he had to leave Spain, and, going into exile in France, he died at Montpellier, May 24, 1817. During this last period of exile he prepared a final edition of his lyrics, which did not appear, however, until 1820. Melendez was one of the few genuine poets that Spain produced during the decadent period of the eighteenth century. Consult the life of Melendez by Quintana, prefixed to the edition of his poems of Madrid (1820), and also published with Quintana's prose works in volume xix. of the *Biblioteca de autores españoles;* and see, also, the edition of his poems in the *Biblioteca,* vol. lxiii., and E. Mérimée's essay on him in the *Revue hispanique,* vol. i.

MELETIUS, mē̇-lē′shĭ-ŭs (Lat., from Gk. Μελήτιος). Bishop of Lycopolis in the Thebais in the beginning of the fourth century and founder of the sect of the Meletians. According to Epiphanius, during the persecution under Diocletian and Maximin, many Christians were led through torture to renounce their faith; afterwards repenting of their sin, they repaired to the bishops to receive absolution, and to be reconciled to the Church. Peter, Archbishop of Alexandria, was willing to receive the backsliders, on their doing penance, but Meletius refused to have any intercourse with them until the close of the persecution. This caused a schism, and Meletius became the leader of the disaffected. He traveled through the patriarchate, ordaining and excommunicating according to his own will, obtaining many followers, and disregarding the protest of the Egyptian bishops. This proselyting tour was extended to Palestine. But in 325 the Council of Nicæa checked his career, compelling him to remain at Lycopolis as a mere titular bishop without active jurisdiction. He died soon after this. The Meletians afterwards allied themselves with the Arians against Athanasius, continuing, however, a distinct sect until the fifth century.

MELETIUS of Antioch (?-381). A famous Greek ecclesiastic. He was born in the beginning of the fourth century at Melitene in Armenia Minor. His first important appointment was to the bishopric of Sebaste, but he soon resigned this and retired to Beræa (Aleppo) in Syria. In 360 he was chosen Bishop of Antioch. The Church in that city was rent in twain by the Arian controversy, but Meletius, whose position was not well understood, was accepted by both parties. He was generally respected for his virtues and the Arians believed him on their side. He disappointed their expectations, however, and the dispute raged more fiercely than ever. Meletius was several times banished and recalled. The Council of Alexandria sent representatives to Antioch to settle the dispute, but Lucifer (q.v.) of Cagliari by his hot-headed advocacy of the orthodox cause defeated the plan. Meletius died at an advanced age, while presiding over the Council of Constantinople, in 381. His body was taken to Antioch and buried with great honor. His funeral oration was pronounced by Gregory of Nyssa. A part of the inaugural discourse of Meletius at Antioch is printed in the fifth volume of Galland's *Bibliotheca Patrum* (Venice, 1765-81).

MELFI, mĕl′fē. A town in the Province of Potenza, Italy, 41 miles south of Foggia (Map: Italy, K 7). It is situated on one of the old craters of the extinct volcano Monte Vulture. The frequent earthquake disturbances to which it has been subjected have destroyed most of its ancient buildings; the cathedral, dating from 1155, and the castle in which the Norman rulers lived, alone remain, both having undergone modern restoration. The soil of the vicinity is extremely fertile, and produces grain, wine, and olives. Melfi is a very ancient city, and is mentioned as early as the fourth century. It was the capital of Apulia at the time of the Norman occupation; was pillaged by Frederick Barbarossa in 1167; and in 1528 was captured by the French general Lautrec, who put to death thousands of its inhabitants. Population, in 1901 (commune), 14,649.

MELGAREJO, mĕl′gȧ-rā′hō̇, Mariano (1818-72). A Bolivian revolutionist. He was born of illegitimate parentage at Cochabamba, and was poorly educated, but rose rapidly in the army and soon became a power in politics. In 1865 he became President, after deposing Achá, and held this post through six stormy years, in which he defeated Belzú, head of the insurgents (1866), joined the alliance against Spain, and attempted to settle the Chilean boundary. A rising of the Bolivian Indians in 1871 ousted Melgarejo from office. He fled to Peru and was there killed in a brawl with Sanchez, his son-in-law. See Bolivia.

MELI, mā′lē̇, Giovanni (1740-1815). An Italian poet, born at Palermo, Sicily. He studied and practiced medicine, and in 1787 was appointed professor of chemistry at the University of Palermo. Meli wrote a number of *canzonette*, odes, and epigrams, many of them Sicilian dialect, and made collections of Sicilian proverbs. Especial mention may be made of his *Bucolica*, the *Fata galante*, the *Origini di lu mannu*, the mock-heroic *Don Chisciotti e Sanciu Panza*, and the *Favole morali*, in virtue of which he may be styled a Sicilian La Fontaine. His *Poesie* are included in the *Parnaso siciliano* (Palermo, (1874). Consult: Natoli, *Giovanni Meli, Studio critico* (Palermo, 1883); Sanctis, "Giovanni Meli," in his *Nuovi saggi critici*.

ME′LIA′CEÆ (Neo-Lat. nom. pl., from *melia*, from Gk. *μελία*, ash-tree; so called because the leaves resemble those of the ash). A natural order of mostly tropical dicotyledonous trees and shrubs, containing about 40 genera and 600 species, natives of warm climates. Many of the species possess bitter, astringent, and tonic properties; some are used in medicine; the seeds of some yield useful oil; some are poisonous; some yield pleasant fruits; and the wood of some is valuable. (See CARAPA.) The cape ash (*Ekebergia capensis*) deserves notice among the timber trees of this order. It has a trunk two feet in diameter, and yields excellent tough timber, useful for many purposes. *Melia Azedarach*, a tree about forty feet high, with large bipinnate leaves and large spikes of fragrant flowers, a native of Syria and other parts of the East, has long been planted as an ornamental tree in the south of Europe, and is now common in California and the Southern United States. The fruit is of the size of a cherry, somewhat elongated, pale yellow, containing a brown nut. The nuts are bored and strung for beads in Roman Catholic countries, whence the tree is often called bead tree. It is also known as the pride of India, and is sometimes erroneously called Persian lilac. The fruit is sweetish, and not poisonous, although generally reputed so. The bark of the root, which is bitter and nauseous, is used as an anthelmintic. The pulp of the fruit of the neem tree or margosa tree (*Melia Azadirachta*) yields a bitter fixed oil. The mahogany and Spanish cedar are both members of this order. The chief genera are Cedrela, Sweitenia, Carapa, and Melia.

MEL′IBŒ′A (Lat., from Gk. *Μελίβοια*, *Meliboia*). (1) A daughter of Oceanus, and mother, by Pelasgus, of Lycaon. (2) One of the daughters of Niobe.

MELIBŒUS (Lat., from Gk. *Μελίβοιος*, *Meliboios*). A shepherd in the first eclogue of Vergil.

MELIBŒUS, TALE OF. A prose tale in Chaucer's *Canterbury Tales*, taken probably from the *Livre de Melibée et de Dame Prudence*, a French rendering of Albertano da Brescia's Latin work, *Liber Consolationis et Concilii*.

MEL′ICER′TES (Lat., from Gk. *Μελικέρτης*, *Melikertēs*). Son of Ino (q.v.), who leaped with him (or his dead body) into the sea. Thereupon both were changed to gods, Ino to Leucothea, and Melicertes to Palæmon, who was the guardian of tempest-tossed ships. He was worshiped at Corinth, especially in connection with the Isthmian games. It is said that the name is the Greek transcription of the Semitic Melkart (or Moloch), meaning 'the king,' and thus a Phœnician origin of the cult has been assumed. The Greeks seem rather to have identified Hercules with the Tyrian Melkarth, and if Melicertes is derived from the Phœnician word, it is more probable that it is the title which Phœnicians gave to the Greek divinity, misunderstood as a proper name by the Greek worshipers.

MELIC GRASS (from Neo-Lat. *Melica*, from It. *melica*, great millet, from Lat. *mel*, honey; connected with Gk. *μέλι*, *meli*, Goth. *meliþ*, honey, OHG. *mili-ton*, AS. *mile-dēaw*, Eng. *mildew*, literally honeydew), *Melica*. A genus of grasses of which nearly half of the species (about 30) occur in the United States. The others are found in temperate climates. They are perennials of small economic importance, with soft flat leaves and rather large spikelets in open or dense panicles. *Melica uniflora* is a common species growing in woods in Great Britain and Europe, and *Melica mutica* and *Melica diffusa* in similar situations in the United States. Most of the American species are found from the Rocky Mountains westward.

MEL′ICOC′CA (Neo-Lat., from Gk. *μέλι*, *meli*, honey + *κόκκος*, *kokkos*, berry). A genus of trees or shrubs of the natural order Sapindaceæ, embracing five or six species, one of which, *Melicocca bijuga*, a native of the West Indies, where it is cultivated for its fruit, known as the honey berry, Jamaica bullace plum, and genip. It is from 20 to 40 feet high. The fruit is about the size and shape of a plum, yellow or green in color, with a very agreeable flavor. It has been successfully grown in southern Florida and California. The seeds are roasted and eaten like chestnuts. Other species of Melicocca yield eatable fruits.

MELIKOFF, mĕl′yĭ-kôf, LORIS. A Russian soldier and statesman. See LORIS-MELIKOFF.

MELILLA, må-lē′lyå. A Spanish presidio on the north coast of Morocco (Map: Africa, D 1). It is built on a rocky peninsula extending into the Mediterranean and ending in the Cape of Tres Forcas. It is protected on the land side by a circle of forts, and a citadel commands the harbor, which in 1902 was opened as a port of commerce. The population in 1900 was 10,182, including the Spanish garrison. Melilla was occupied without resistance by the Spaniards in 1496. The Kabyles have made several unsuccessful attempts to capture it, the last being made in 1893, after which a neutral zone was established outside the fortifications.

MEL′ILOT, MELILOTUS (Neo-Lat., from *melilot*, OF., Fr. *melilot*, from Lat. *melilotos*, from Gk. *μελίλωτος*, *melilōtos*, *μελίλωτον*, *melilōton*, a kind of clover, from *μέλι*, *meli*, honey + *λωτός*, *lōtos*, lotus). A genus of plants of the order Leguminosæ, natives of the Old World and widely disseminated. The species have upright stems, bear trifoliate leaves resembling those of alfalfa, and small white or yellow flowers from early summer until frost. They often take possession of waste ground, especially if composed largely of clay. All the species contain an ethereal oil known as cumarin, which gives them a strong, peculiar, sweetish odor, especially when drying. The white melilot (*Melilotus alba*), also known as sweet, Bokhara, or tree clover, is a common weedy biennial from three to six feet high, which is cultivated as a honey plant, and also to some extent for forage. For plowing under as green manure it is of some importance, especially upon heavy soil. Its roots perforate the substratum, and when they decay leave drainage tubes. In this way it may be used two or more years before being turned under as green manure. Another species which has become naturalized in the United States is the common yellow melilot (*Melilotus officinalis*), an annual growing two to three feet high and occurring in swamps and wet meadows. Its flowers are used in the manufacture of perfumery. The blue melilot (*Melilotus cœrulea* or *Trigonella cœrulea*), a native of Northern Africa, is cultivated in Europe, and was formerly much used in medicine as an anodyne.

Melilotus is useful for pasturage and for hay. The green crop, cut when in bloom, has the following average percentage composition: water, 76.5; protein, 2.8; fat, 0.4; nitrogen-free extract, 12.1; crude fibre, 6.6; and ash, 1.6. Melilotus must be cured with care, as too much sun causes shedding of the leaves. At first animals commonly refuse to eat it, but later relish it; its hay is especially valuable for home consumption. It has not been found as salable as some other kinds of leguminous hay.

MÉLINE, mā'lēn', Félix Jules (1838—). A French statesman. He was born at Remiremont, studied law in Paris, and in 1860 was admitted to the bar. His earliest political activity was in the democratic opposition to the Empire. In 1871 he refused an election to the Commune, but in the following year was returned to the National Assembly, where he upheld Thiers and became a member of the Republican Union. For a few months in 1876 and 1877, he was Under-Secretary of State in Jules Simon's Cabinet, and in 1880 made himself prominent by his able advocacy of the policy of protection. Eight years afterwards, as president of the Chamber of Deputies, Méline carried through his great protective measure which went into force in 1892. Méline refused to form a Ministry in 1893; undertook the management of the *République Française*, which he carried on until 1896; and in the winter of 1894 was reëlected president of the Chamber. In 1896 he was made Prime Minister and again took the portfolio of Agriculture, which he had held under Ferry from 1883 to 1885. The May elections of 1898 forced the Cabinet out, however, and Méline returned to the Chamber of Deputies. There he acted as the leader of the Conservative branch of the Republican Party in opposition to the Radical wing which, with the aid of the Socialists, had come into power under Waldeck-Rousseau.

MEL'INITE. See Explosives.

MELIS'MA (Neo-Lat., from Gk. *μέλισμα*, song, from *μελίζειν*, *melizein*, to sing, from *μέλος*, *melos*, song). A term applied in modern music to melodic groups of notes executed upon one syllable of a word. It is particularly employed to give Oriental color. The songs of Rubinstein dealing with Oriental subjects (Der Asra), Verdi's *Aïda*, and Goldmark's *Königin von Saba* offer fine examples of melismatic writing.

MELIS'SA. A genus of plants. See Balm.

MELISSA. (1) In Greek mythology, a nymph by whom the use of honey was said to have been discovered, whence bees were called *μέλισσαι*. The actual derivation is from *μέλι*, honey. (2) The daughter of Procles and wife of Periander, who killed her by a blow while she was with child. (3) In Ariosto's *Orlando Furioso*, a kindly fairy who protects Rogero and Bradamant.

MEL'ITA. The Latin name of Malta (q.v.).

MEL'ITO (Lat., from Gk. *Μελίτων*, *Melitōn*). Bishop of Sardis, in the second half of the second century. He is mentioned by Eusebius as an upholder of Catholic orthodoxy, and is known to have written many works, only fragments of which are extant. Among those mentioned by Eusebius are an *Apologia* addressed to Aurelius concerning the paschal controversy, and *Eclogæ*, containing the catalogue of 'the books of the Old Covenant.' Consult: Otto, *Corpus Apologetarum Christianarum Sæculi Secundi*, vol. ix. (Jena, 1842-72); Harnack, *Texte und Untersuchungen*, vol. i. (Leipzig, 1882); and the translation in the *Ante-Nicene Fathers*, vol. viii.

MELITOPOL, mā'lē-tō'pōl-y'. A town in the Government of Taurida, South Russia, situated on the river Molotchna, 150 miles north-northeast of Simferopol (Map: Russia, D 5). It has a gymnasium and a realschule and carries on some trade in agricultural products and salt. It was founded in the beginning of the nineteenth century. Population, in 1897, 15,120.

MEL'KARTH. A Phœnician divinity identified with the Greek Melicertes. He was the god of Tyre, where he had a magnificent temple. He represents the old Chaldean sun-hero, and in his adventures, strength, and labors appears as the original type of Hercules.

MELILITE (from Lat. *mel*, honey), or Honey Stone. A complex mineral silicate of sodium, calcium, magnesium, aluminum, and iron. It crystallizes in the tetragonal system, has a vitreous lustre, and is white or of light shades of yellow, green, brown, and red in color. It occurs in various rocks, certain varieties of which are known as *melilite basalts*. Melilite is found in Württemberg, Germany, in Italy, the Hawaiian Islands, and in several localities in the United States. It is also produced in furnace slags. The name is also given to a group of minerals including the one described above and gehlenite.

MELLO, māl'lō, Custodio José de (c.1845-1902). A Brazilian admiral, of whose early life little was known. For his services to the republican cause in 1889, he was made admiral and Minister of Marine. But in 1893, siding with the Federals and the navy against the Administration and the army, and fearing Peixoto's reëlection, he seized practically the whole navy and undertook the blockade of Rio de Janeiro. The bombardment was stopped by the Powers, especially the United States of America. Mello left the fleet, established a provisional government in Santa Catarina, and captured Rio Grande do Sul. But a quarrel with Saraiva made success impossible, and hearing that the navy had surrendered to the new fleet bought by Peixoto, Mello gave himself up to the Argentinian authorities in April, 1894. Mello's alleged purpose throughout had been merely to purify the Republic, but in 1901 he was suspected of a prominent part in an imperial plot, and was arrested and confined in the island of Cobras.

MELLO, or **MELO**, Francisco Manoel de (1611-66). A Portuguese poet and historian, born at Lisbon of a noble family, and there trained by the Jesuits. He became an army officer, first serving with the Spanish fleet, and then in the Portuguese service when his native country asserted its independence. Despite his loyalty, he was imprisoned by order of John IV., and, after an incarceration that lasted from 1644 to 1653, he was banished to Brazil. There he remained six years, until the death of the monarch permitted his return to Portugal. Mello is one of the best Portuguese poets of the seventeenth century, commendably free from most of the mannerisms of the time. His numerous poetical compositions, collected under the title of *Musas de Melodino*, fall into two divisions, of which the first comprises his Spanish verse, and the second—bearing the sub-title of *As segundas tres musas*—his Portuguese poems. These latter reveal him as a true poet and are not without popular and patriotic elements. Of Mello's other works in Portuguese may be mentioned certain prose compositions: the *Hospital das Lettras*, a dialogue containing much sound literary criticism; the *Dialogos apologaes;* and the *Carta de guia de casados* (1651), in which the author gives a picture of Portuguese family life of the period. Not the least meritorious of Mello's productions is the historical work, *Historia de los movimientos, separación, y guerra de Cataluña* (1645), which is in Spanish. An historical treatise in Portuguese is the *Epanaphoras de varia historia portugueza* (1660). Consult: the *Obras metricas de D. Francisco Manoel* and his *Obras* in general (Lyons, 1665); the *Fidalgo Aprendiz* in the *Musas,* and also separately in 1676 (cf. T. Braga's essay on it in his *Theatro Portuguez no seculo XVII.*, 1870-71); P. Chasles, *Voyages d'un critique* (Paris,1869); Branco in the edition of the *Carta de guia de casados* (Oporto, 1873).

MEL'LON, Harriet. An English actress. See St. Albans, Duchess of.

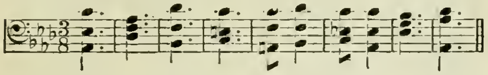
MELLONI, mĕl-lō'nê, Macedonio (1798-1854). An Italian experimental physicist, famous for his researches on the subject of radiant heat. He was born in Parma. In 1824 he was called to the chair of natural philosophy in the University of Parma; and afterwards he was appointed by the King of Naples director of the meteorological observatory on Mount Vesuvius. He discovered the existence of heat in lunar light, and the results of his investigations of invisible heat—i.e. heat emitted by bodies at a lower temperature than that at which they become incandescent—have formed contributions of the utmost importance to physics. He published numerous memoirs on various topics in natural philosophy, and the volume *La thermochrose, ou la coloration calorifique* (1850).

MELODEON. The early American organ, in which an exhaust or suction bellows draws the air inward through the reeds. About 1836 J. Carhart made a number of improvements in the melodeon, and upon the application of still further inventions by E. P. Needham and E. Hamlin the instrument became widely popular. The supply of wind for the reeds is obtained by means of a pair of treadles, worked by the performer, and the reeds themselves are controlled by stops and slider mechanism. The tone of the instrument has been steadily improved, and now successfully imitates a number of orchestral instruments. See Harmonium; Organ.

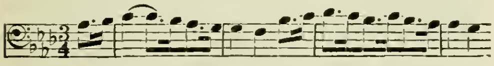
MELODRAMA (from Gk. *μέλος*, *melos*, song + *δρᾶμα*, *drama*, action, play). Properly a half-musical drama, or a dramatic performance in which the dialogue is interspersed with music. Rousseau's *Pygmalion* is commonly cited as the first French melodrama, and some of the earlier English operas are of this type. In Italy, however, the name was first applied to the opera, by its inventor, Ottavio Rinuccini, near the end of the sixteenth century. In Germany the term has been particularly used to designate a declamation with instrumental accompaniment (as distinguished from the *recitative*, which is characteristic of the regular *opera*, q.v.). The object of the music is to intensify the emotions evoked by the spoken words, which may be a poem like Schiller's *Lied von der Glocke,* or a regular drama; but the æsthetic value of the practice has been much disputed, and it has almost fallen into disuse in serious works. Our present use of the word melodrama appears to have originated in France, where, in the latter part of the eighteenth century, it came to be applied to the style of popular tragedy in which were presented the conventional types of stage villains, persecuted innocent heroines and their kind, along with elements of comedy as well as of music and dancing, and with a regularly happy ending in deference to well-known popular preferences in this respect.

MELODY (Lat. *melodia*, Gk. *μελῳδία*, from *μέλος*, *melos*, song + *ᾠδή*, *ōdē*, song). A succession of tones constituting a musical phrase. That this succession be pleasing is not absolutely essential. Whereas harmony considers all the tones sounded simultaneously in the various voices or parts, melody primarily considers the various tones of only a single voice or part, i.e. in relation to every preceding or succeeding tone. Broadly speaking, it has been stated that a melody rising in pitch corresponds to the more violent emotions, such as determination, desire, longing, striving; while a melody falling in pitch corresponds to the more passive states, as resignation, contemplation, sadness. But in reality a melody can never be considered absolutely by itself. The character of every musical phrase is determined by a combination of three vital and fundamental elements, melody, harmony, and rhythm, each of which affects the others. This is easily seen by examining any of Wagner's leading motives, where the same melodic phrase is rendered capable of great emotional variety by changes in the harmonic or rhythmic elements. In fact, the same succession of notes may sound noble or trivial, according to the choice of refined or commonplace harmonies supporting it. There is an endless variety in the succession of musical tones forming a melody; some being so easily intelligible that even people of little musical taste can distinguish them, as is the case with some popular dance forms. The term melody is by no means synonymous with *cantilena*, as many seem to think. The former term is infinitely broader than the latter. No special course in melody is given in conservatories, although in recent years several theoretical treatises on the subject have appeared. The pupil almost unconsciously acquires the practical elements of melodic formations while pursuing the study of harmony and the higher forms of composition.

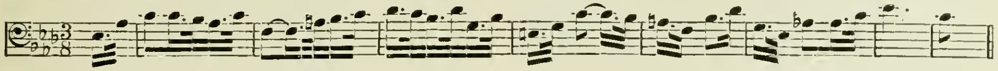
Upon any harmonic basis a practically endless number of melodies may be written, and, vice versa, all melodies can be reduced to a simple harmonic basis. To illustrate this let us take the opening theme of the famous andante of Beethoven's Fifth Symphony. The harmonic plan is as follows:



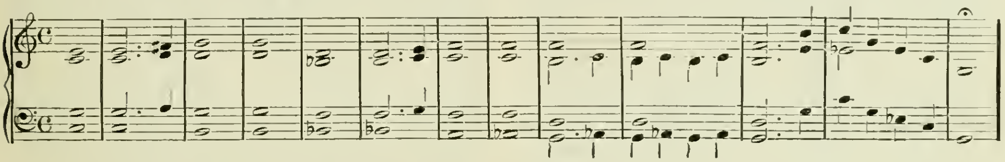
Upon this basis Beethoven wrote the melody originally in this form:



When he came to write the full score the master felt that his theme was commonplace. By retaining the harmonic basis and only altering the melodic intervals the following noble melody, such as we know it, arose:

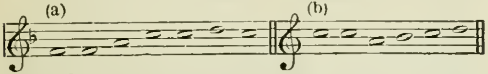


The following is a reduction to the simplest harmonic basis of the principal themes of the well-known Sonata op. 53 (Waldstein):

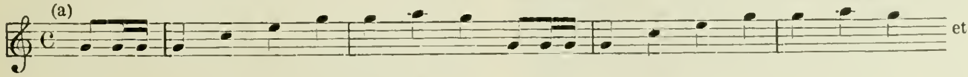


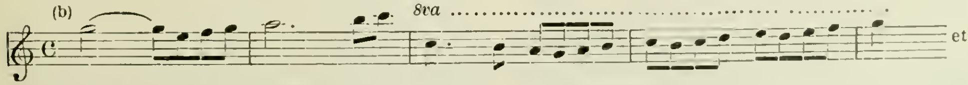
Comparing this with the original, it will be seen how Beethoven constructs his melody. The reader should examine in the score the successive melodic changes which the theme of the third example undergoes in the course of the movement. Wagner in the Prelude to *Die Meistersinger* reduces the Mastersinger's motive and the second theme from Walter's Prize Song to a common harmonic basis (slightly different from that of either of the themes in its original form), and thus is enabled to make both themes resound simultaneously on different instruments. (Piano score, p. 7.) Without making the slightest alteration in Bach's C major prelude from the *Well-tempered Clavichord*, Gounod writes an additional melody to the harmonic basis, which has become famous as Gounod's *Ave Maria*.

The following examples show how a mere succession of intervals can be changed by the infusion of the rhythmic element into a distinctive melody. In Wagenseil's book, *Von der Meistersinger holdseligen Kunst*, we find the following two tunes of prize-crowned master-songs:



Both these simple tunes Wagner uses in the Processional March of *Die Meistersinger*, where they occur in these forms:





All melody can be conceived as a rhythmic evolution from a succession of intervals in notes of equal value. And vice versa, all melodies can be reduced to a monotonous succession of intervals. It is the composer's individual genius that imparts its character to each melody. Within recent years several theorists have attempted a scientific exposition of the principles of melodic formations with practical hints toward their invention. Among the best works of this kind are: Bussler, *Elementarmelodik* (Berlin, 1879); Riemann, *Neue Schule der Melodik* (Hamburg, 1883).

MELOGRAPH (from Gk. *μελογράφος*, *melographos*, song-writing, from *μέλος*, *melos*, song + *γράφειν*, *graphein*, to write). A mechanical device for making a record of music as it is played on a pianoforte. It is supposed to reproduce on paper, by means of characters, all the notes struck on the keyboard (with their duration), so that there may be a readable record of any music which a player may improvise. Since 1747 numerous melographs have been patented, but with the exception of Fenby's 'electric melograph' or 'phonautograph' none has given lasting satisfaction. In the phonautograph under each key is placed a stud; when the key is depressed an electric connection is formed, and the particular note struck, and its duration, are recorded on paper.

MELOIDÆ, mê-lō′ĭ-dê. A family of moderate-sized beetles, with the head constructed behind the eyes, the prothorax at its hinder edge narrower than the elytra, the legs long, with front haunches large and conical, the feet with the last segment but one not bilobed, and the claws split to the base. The larvæ of several undergo metamorphosis, as explained under Blister Beetle; and most of the species exude an odorous oil, highly serviceable in medicine. (See Oil Beetle.) Consult: Le Conte, "Synopsis of the Meloids of the United States," in *Proceedings of the Academy of Natural Science*, vol. vi. (Philadelphia, 1853); Horn, "Revision . . . Meloidæ of the United States," in *Proceedings of the American Philosophical Society*, vol. xiii. (Philadelphia, 1873); Horn, "Studies Among the Meloidæ," in *Transactions of the American Entomological Society* (Philadelphia, 1885).

MELON (OF. *melon*, *millon*, Fr. *melon*, from Lat. *melo*, for *melopepo*, from Gk. *μηλοπέπων*, *mēlopepōn*, melon, from *μῆλον*, *mēlon*, apple + *πέπων*, *pepōn*, melon, so called from the shape). A name given to the fruit of *Cucumis Melo* and

Citrullus vulgaris of the family Cucyrbitaceæ. See MUSKMELON; WATERMELON.

MELON CATERPILLAR MOTH. See MELON INSECTS.

MELON INSECTS. Most of the insects which attack melons also feed upon certain other cucurbitaceous plants. Thus the squash vine borer (*Melittia ceto*) also bores in the stems of melons. The striped squash beetle (*Diabrotica vittata*) also feeds upon the leaves of melons, as does the cucumber flea-beetle (*Crepidodera cucumeris*). The melon caterpillar (*Margaronia hyalinata*) is a widely distributed insect found through the greater part of North and South America, and is particularly destructive in the southern part of the United States. The caterpillars of the first generation feed upon the leaves, and those of the second generation eat into the fruit of melons, cucumbers, and pumpkins. The wings of this moth are pearly-white with a peculiar iridescence, are bordered with black, and measure about an inch from tip to tip. A similar and closely related caterpillar, the larva of *Margaronia nitidalis*, also feeds in the fruit of melons and cucumbers. Poisoning the foliage with some arsenical mixture to destroy the larvæ of the first generation is the standard remedy. The melon plant-louse is perhaps the most destructive insect enemy of this plant. This insect has a wide range of food plants, but is an especial enemy of melons, and feeds on the under sides of the leaves. Under-spraying with a kerosene-soap emulsion is the only remedy in large fields, but in small gardens carbon disulphide may be used under inverted tubs or paper coverings. See Colored Plate of MOTHS, AMERICAN.

MELONITES, mĕl′ō-nī′tēz (Neo-Lat. nom. pl., from Gk. *μῆλον*, *mēlon*, apple). A fossil sea-urchin found in the Sub-Carboniferous rocks of North America and Europe. The test is melon-shaped with vertical grooves, is four to six inches in diameter, and made up of numerous thick hexagonal or pentagonal plates that are regularly arranged in vertical series and that are covered by minute tubercles and small needle-like spines. Large slabs of limestone on the surfaces of which are several finely preserved specimens of this sea-urchin, have been obtained from the vicinity of Saint Louis, Mo. See ECHINODERMATA; SEA-URCHIN.

MELOPLASTE, må′lō′pläst′ (from Gk. *μέλος*, *melos*, song + *πλάστης*, *plastēs*, molder, from *πλάσσειν*, *plassein*, to form). A peculiar method of teaching children the rudiments of music, originated by Pierre Galin at the beginning of the nineteenth century. In order not to confuse the beginner with the various musical characters, Galin used a slate with only the five lines of the staff drawn upon it. He then sang familiar airs to his pupils; but instead of singing words he used the syllables *do*, *re*, *mi*, etc., at the same time pointing out the place of each note upon the staff. Rhythm he taught by means of a double metronome which marked the beginning of a measure as well as each beat within that measure.

ME′LOS (Lat., from Gk. Μῆλος), or MILO. The southwesternmost island of the Cyclades in the Grecian Archipelago, or Ægean Sea, about 70 miles northeast of Crete, and 65 miles east of the Peloponnesus. It is 14 miles long and 8 broad, and has on its northern coast one of the best and safest natural harbors in the Levant. The island is crescent-shaped and seems to be part of the rim of the crater of an old volcano. The highest eminence is Mount Saint Elias (2539 feet), in the southwestern part. The island shows many traces of its volcanic character, and contains hot mineral springs and considerable deposits of sulphur. The soil is fertile, and produces good crops of grain, as well as wine and oil. The chief town is Plaka, in the northern part of the island near the site of the ancient capital, Melos, of which extensive remains are to be seen. Near the sea the ground is marshy, and the air is unwholesome in summer. In prehistoric times the island seems to have been of some importance, on account of the obsidian, used in the Stone Age for knives and arrowheads. The chief settlement was on the northeast coast near the modern Phylakopi, where are remains of three successive towns, extending from the Stone Age to the end of the Mycenæan period. There are traditions of Phœnician occupation at a later time, but during the classical period Melos was inhabited by Dorians, and during the Peloponnesian War was one of the few islands not in the Athenian League. Though the inhabitants were willing to remain neutral, the Athenians in B.C. 416 seized the island, killed the men and sold the women and children into slavery. With the fall of Athens, however, the Athenian colonists were expelled and the former inhabitants brought back so far as possible. Melos fell successively under the dominion of the Romans, the Byzantine emperors, Venice, and the Turks; it is now a part of Greece. During the later classical period the island evidently enjoyed considerable prosperity and was enriched with many works of art, some of which have been recovered from time to time. Notable among these are the fine "Poseidon" in the National Museum at Athens, and especially the "Venus of Milo," discovered in 1820 by a peasant, and now one of the chief treasures of the Louvre. From 1896 to 1899 excavations were conducted on the island by the British School at Athens, which led to the discovery of the hall of the 'Mystæ' or 'Initiated,' and some foundations at the site of the ancient capital, near the modern village of Klima on the great bay. The chief result, however, was the recovery of the prehistoric settlements at Phylakopi, with a wealth of early pottery and some very interesting frescoes. The preliminary reports may be found in the *Annual* of the British School at Athens, vols. ii.-v. (London, 1897-1900) and *The Journal of Hellenic Studies*, vols. xvi.-xix. (London, 1896-99). A complete publication is promised shortly.

MELOS (Neo-Lat., from Gk. *μέλος*, song). A musical term denoting the continuity of the melodic outline in any single movement of a composition. A symphonic movement, for instance, consists of several themes complete in themselves. In the movement, however, they do not appear as so many independent musical phrases with a full cadence, but follow one another in a certain order, one leading either directly or by means of a transition passage into the next—so that their connection, unbroken by any full cadence, forms a continuous melodic chain from the first bar to the last. This chain or aggregate of melodic phrases constitutes the *melos* of the movement. The term melos was first used in this sense by Wagner in his theoretical works.

Every act of his musical dramas resembles a symphonic movement in so much that the melodic outline is never interrupted by a full cadence. The leading motives are treated and developed exactly like the themes in a symphony. Wagner is, therefore, justified in speaking of his 'endless melody.' In the opera every number closes with a full cadence. An act consists, therefore, of a collection of several numbers, each complete in itself, having no connection whatever with the preceding or following number. Although each number has its melos, the act can have none, and consequently no artistic unity, because the fundamental principle of unity is continuity. See also LEITMOTIV; MUSICAL DRAMA; RECITATIVE.

MELO'SA. A Chilean plant. See MADIA.

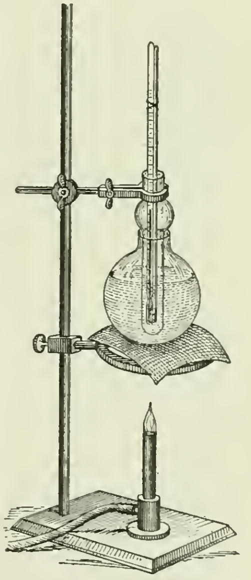
MELOZZO DA FORLÌ, mȧ-lŏt′sȯ dȧ fȯr-lē′. An Italian painter of the fifteenth century. See FORLÌ, MELOZZO DA.

MELPOMENE, mĕl-pŏm′ė-nė (Lat., from Gk. Μελπομένη, the Singing One, pres. part. of *μέλπεσθαι*, *melpesthai*, to sing). In Grecian mythology, one of the Nine Muses. When the individual muses were assigned specific functions, Melpomene was called the muse of tragedy. In ancient art she was represented with a mask in her right hand and a roll of a part of a play in her left. See MUSES.

MEL'ROSE. A city, including the villages of Melrose Highlands, Fells, and Wyoming, in Middlesex County, Mass., seven miles north of Boston; on the Boston and Maine Railroad (Map: Massachusetts, E 3). It is a popular residential suburb of Boston, attractive for its fine site, has a public library and a public park, and is engaged to some extent in manufacturing, the principal products being rubber boots and shoes. Prominent features of interest are Middlesex Fells, a State reservation of 1800 acres, and a large natural reservoir, Spot Pond. The government is administered, under the charter of 1900, by a mayor annually elected, and a unicameral council, one-third of whose members are elected at large. The council elects the city clerk, treasurer, and collector, and confirms the executive's nominations of other subordinate officials. The school board is independently chosen by popular vote. Population, in 1890, 8519; in 1900, 12,962. Melrose was settled probably as early as 1633, and formed a part of Charlestown until 1649, and of Malden from 1649 until Melrose was incorporated in 1650. In 1900 it received a city charter. Consult Drake, *History of Middlesex County* (Boston, 1880).

MELROSE. A village of Roxburghshire, Scotland, on the Tweed, at the foot of the Eildon Hills, 29 miles southeast of Edinburgh (Map: Scotland, F 4). Population, in 1901, 2195. It is noted for the remains of its Cistercian abbey, celebrated in history and literature, and one of the finest of Gothic ruins. Its erection dates from 1326, after the destruction by the English in 1322 of the Abbey of the Virgin Mary built by David I. between 1126 and 1146 at Old Melrose on a promontory overlooking the river two miles to the northeast. The abbey was built from a fund supplied by King Robert Bruce and his son David II. and was not finished until the middle of the sixteenth century. It was much mutilated and despoiled by the English in 1385 and in 1545. The present remains are the major portions of the abbey church, the choir, the transept, part of the nave, and the southern aisle with its eight small chapels, and fragments of the cloister, a square of 150 feet. The church is 258 feet long, width of transept 137 feet, height of central square tower 84 feet. It is a composite of late flamboyant Gothic architecture, rich in the elaborate ornamentation of that style, traceried windows, shafts, capitals, vaultings, and flying buttresses being its distinctive features. Abbotsford (q.v.), the home of Sir Walter Scott, is about three miles south of Melrose Abbey.

MELTING-POINT. The temperature at which a given substance passes from the solid into the liquid state. Different substances generally have different melting-points. Thus, mercury if solidified by cold would melt at a temperature of 40° below 0° C. (—40° F.); ice melts at 0° C. (32° F.); sulphur at 115° C. (239° F.); tin at 230° C. (446° F.); lead at 324° C. (615° F.); zinc at 418° C. (784° F.); aluminum at 727° C. (1341° F.); silver at 968° C. (1774° F.); gold at 1072° C. (1862° F.); copper at 1082° C. (1980° F.); pure iron at 1704° C. (3099° F.); platinum at 1777° C. (3231° F.); etc. The presence of more or less impurity in a given substance generally causes a corresponding depression of its melting-point, and hence the latter is often determined when it is required to ascertain whether a given substance, especially a carbon compound of known melting-point is perfectly pure. Such determinations may be conveniently carried out by means of the apparatus shown in the accompanying figure.



MELTING-POINT APPARATUS.

The apparatus consists of an ordinary round-bottomed flask of about 250 cubic centimeters capacity, with the greater part of the neck cut off; in this is an ordinary test-tube widened in one place so as to be readily held by the flask without touching its bottom; both contain, to about the same level, some liquid (say, strong sulphuric acid) that may be heated to a somewhat high temperature without boiling. To carry out a determination, a small amount of the given substance is introduced into a capillary tube of glass, the latter is tied on to a thermometer so that the substance is very near the mercury bulb, the thermometer with the capillary tube is immersed in the liquid of the test-tube, the temperature is allowed to rise very slowly, and the point is carefully noted at which the contents of the capillary tube begin to change color and become transparent. For very precise determinations, however, this method cannot be employed.

Instead, the investigator uses much larger quantities of substance, reduces the latter to a fine powder, and immerses the thermometer directly into it. While it is known that different modifications of one and the same chemical substance may have different melting-points, and hence the melting-point cannot be considered as strictly characteristic of a given chemical species, it is so easy to determine with great precision, that it is considered as one of the most useful constants and is very frequently employed by chemists for the purpose of identifying substances, and as already mentioned for the purpose of testing their purity. Further, in spite of but too many exceptions, certain interesting relations have been shown beyond doubt to exist between the melting-points of organic substances and their molecular weights and constitution. See article Boiling-Point.

Under Freezing-Point (q.v.) that point has been defined with reference to the vapor-tension of the given substance in the solid and liquid states. The same definition, and for precisely the same reasons, is of course applicable to the melting-point. For the 'latent heat of fusion,' see Freezing Mixtures and Heat.

Influence of External Pressure on Melting-Points. Strictly speaking, the melting-point of a solid substance, just as the boiling-point (q.v.) of a liquid, depends upon the external pressure. In the case of the melting-point, however, the influence exercised by the external pressure is so very slight that it may generally be safely left out of account altogether. The subject was first theoretically investigated, from the standpoint of thermodynamics, by James Thomson, who found that for a given substance the change of melting-temperature caused by an increase of one atmosphere in pressure must be represented by the formula,

$$\frac{T(V - V')}{r},$$

where T denotes the melting-point (on the absolute scale, i.e. the centigrade temperature increased by 273) corresponding to some given pressure; V denotes the volume occupied by one gram of the liquid substance at the melting-temperature; V′ denotes the volume occupied by the solid substance at the same temperature; and r denotes the mechanical equivalent (in terms of 'liter-atmospheres') of the heat absorbed, at the same temperature, during the melting of one gram of the substance. (By a 'liter-atmosphere' is meant the minimum mechanical work required to cause a diminution of one liter in any volume, against the constant resistance of a pressure of one atmosphere.) It will be observed that if V is greater than V′, i.e. if the melting is accompanied by an increase in volume, the above expression is positive, and hence an increase of pressure causes the melting-temperature to rise. On the contrary, if V′ is greater than V, the expression is negative, and hence an increase of pressure causes the melting-temperature to *fall*. These theoretical results are in perfect agreement with experimental observation. In the case of ice, melting is accompanied by a contraction in volume, i.e. V′ is greater than V, and the above formula leads to the result that while under normal atmospheric pressure ice melts at 0° C. (32° F.), the melting-point under a pressure of two atmospheres would be —0.0077° C. (31.9861° F.). As far back as 1851 William Thomson (Lord Kelvin) obtained practically the same result by direct observation, and the formula has since been found to hold similarly good in the case of all substances examined.

Eutectic Mixtures. It was shown in the article Freezing-Point that if a solution happens to be saturated at its freezing-point, the solid gradually separating out by freezing and the liquid remaining unfrozen cannot but have the same composition, and hence the freezing-temperature must remain constant. It is perfectly obvious that the solid mixture thus obtained must entirely melt at the same constant temperature. Mixtures of salts thus obtained from solutions are termed 'cryohydrates.' More generally, and whatever its origin, a mechanical mixture that melts at a constant temperature lower than that of any other mixture of the same substances, is termed a 'eutectic mixture.' Following are a few examples of eutectic alloys: an alloy containing 55.58 per cent. of bismuth and 44.42 per cent. of lead melts at the constant temperature of 122.7° C. (252.86° F.); an alloy of 46.70 per cent. of bismuth and 53.30 per cent. of tin melts at 133° C. (271.4° F.); an alloy of 59.19 per cent. of bismuth and 40.81 per cent. of cadmium melts at 144° C. (291.2° F.); an alloy of 92.85 per cent. of bismuth and 7.15 per cent. of zinc melts at 248° C. (478.4° F.); an alloy of 47.75 per cent. of bismuth, 18.39 per cent. lead, 13.31 per cent. of cadmium, and 20.00 per cent. of tin melts at 71° C. (159.8° F.). See Freezing-Point; Fusible Metals.

MELTON-MOWBRAY, mĕl′ton mō′brȧ. A market-town in Leicestershire, England, 16 miles northeast of Leicester, on the Eye, near its junction with the Wreak (Map: England, F 4). Stilton cheese and pork pies are extensively made for the London, Manchester, and Leeds markets. It has large quarries of iron ore, and smelting furnaces, and an important cattle market. It is the Midlands 'metropolis of fox-hunting,' with numerous hunting seats, and in the winter is crowded with sportsmen. It is a very ancient town and in 1644 was the scene of a defeat and slaughter of the Parliamentarians. Population, in 1891, 6392; in 1901, 7500.

MELUN, me-lĕɴ′. An ancient town of France; the capital of the Department of Seine-et-Marne; built on an island and on both banks of the Seine, 28 miles southeast of Paris (Map: France, J 3). The town is an important railroad centre. The manufactures are carriages, cotton and woolen goods, earthenware, and chocolate; and there is trade in grain, flour, cattle, and fowls. Population, in 1901, 13,059. Melun was taken five times during the ninth century by the Northmen. It fell into the hands of the English in 1419, and was held by them for ten years.

MEL′USI′NA. A powerful water fairy, half woman and half fish, in French folklore. She became the wife of Count Raymond of Poitiers and built a castle which from her own name was called Lusinia, the present Lusignan. When her husband surprised her in her double form in the bath she disappeared. When the death of a member of the family or of the King of France was about to occur she appeared in a high tower of the castle, in mourning garments, and announced the approaching event by three shrill cries. The legend was used in 1387 by Jean d'Arras as the basis of a romance, which was rendered into French verse by Conedoette in 1401, and in translations and other forms made the character of Melusina famous. Consult Kohler, *Der Ursprung der Melusinensage* (Leipzig, 1895).

MEL'VIL, Melvile, or Melville, Sir James, of Hallhill (1535-1617). A Scotch soldier, diplomat, and historical writer. He was the third son of Sir John Melvil of Melville of Raith, Scotland, who was convicted and executed at Stirling on charges of high treason on account of his devotion to the principles of the Reformation. Young Melvil was sent to France and became page of honor to the Bishop of Valence, and was afterwards attached to the service of Constable Montmorenci. Under him he saw his first military service in Flanders in 1553, and in 1557 was taken prisoner at the battle of Saint Quentin. Two years after he obtained his release and was dispatched to Scotland on a secret mission. During his absence occurred the tournament in which Montmorenci killed Henry II.; and at Melvil's return he judged it best to turn his steps toward Germany, where he was employed by the Elector Palatine. While on a visit to France in 1561 he met Queen Mary of Scotland, to whom he tendered his allegiance and sword. In 1564 he returned to his native land and presented himself to Mary at Perth. Shortly afterwards he was sent to England, as ambassador to Queen Elizabeth. Again in 1566 he was sent to England to bear the news of the birth of an heir to the Scottish throne. He adhered to the Queen so long as there appeared to be any hope of her ultimate success, but after she was committed to Lochleven Castle, was sent by the nobles to offer the regency to the Earl of Murray. During Morton's regency he retired from Court, but when James began to reign, was received with favor. He was knighted and appointed Privy Councilor and Gentleman of the Bedchamber to Queen Anne. On James's accession to the English throne, Melvil retired into private life and died at Hallhill, November 13, 1617. *The Memoirs of Sir James Melvil of Hallhill; Containing an Impartial Account of the Most Remarkable Affairs of State During the Last Age*, etc., accidentally discovered in Edinburgh Castle in 1660, were published in 1683 by his grandson, George Scott, but in an incomplete form. An accurate edition was printed in 1827-33 at Edinburgh, by the Bannatyne Club, and is of great historic value.

MEL'VILLE, or **MELVILL**, Andrew (1545-1622). A Scottish reformer. He was born August 1, 1545, at Baldovie, near Montrose, Forfarshire. He was educated at the grammar school of Montrose, whence he removed in his fourteenth year to the University of Saint Andrews. Here he remained four years, and then proceeded to Paris, where he continued his studies for two years. In 1566 he was chosen regent in the College of Saint Marceon, Poitiers, whither he had gone to acquire a knowledge of law. From Poitiers he proceeded to Geneva, where, by the influence of his friend Beza, he was appointed to the chair of humanity in the academy. He returned to Scotland in 1574, and was, in the course of the same year, appointed principal of the University of Glasgow. In 1580 Melville was chosen principal of Saint Mary's College, Saint Andrews. In 1582 he preached the opening sermon before the General Assembly, and boldly "inveighed against the bloody knife of absolute authority, whereby men intended to pull the crown off Christ's head, and to wring the sceptre out of his hand." The Assembly applauded his intrepidity, drew up a remonstrance in a similar spirit, and appointed Melville and others to present it. In 1584 Melville was summoned before the Privy Council. He maintained that whatever a preacher might say in the pulpit, even if it should be called treason, he was not bound to answer for it in a civil court, until he had been first tried in a church court. For this denial of secular jurisdiction he was condemned to imprisonment, but escaped to London, where he remained till the downfall of Arran in the following year. After an absence of twenty months he returned to Scotland and resumed his office at Saint Andrews. In 1606 Melville was called to England to attend the famous conference at Hampton Court. Having ridiculed the service in the chapel royal in a Latin epigram, he was twice summoned before the English Privy Council, and on the second occasion his temper gave way, and he broke out into a torrent of invective against the Archbishop of Canterbury for encouraging popery and superstition, profaning the Sabbath, etc. The King immediately sent him to the Tower, where he remained for more than four years. In 1611 he was released on the solicitation of the Duke of Bouillon, who wanted his services as a professor in his university at Sedan in France. Melville died in London, in 1622, but neither the exact date of his death nor the events of his last years are ascertained. He published much in prose and verse, in Latin and English. Consult his *Life* by McCrie (2 vols., London, 1819; revised ed. 1856).

MELVILLE, George John Whyte (1821-78). An English author. He was born near Saint Andrews, Scotland, and entered the army in 1839. In 1846 he became captain in the Coldstream Guards, and during the Crimean War served as a volunteer in the Turkish cavalry. Melville may be justly regarded as the founder of the fashionable novel of the high-life sporting variety. In describing the hunting field he aroused much interest, as shown by the popularity of his score or more of novels from *Kate Coventry* in 1856 to *Black but Comely* in 1878.

MELVILLE, George Wallace (1841—). An American naval engineer, born in New York City. He was educated in New York and at the Brooklyn Polytechnic Institute, and entered the United States Navy as an engineer in 1861. Among his contributions to the building up of the new navy are his designs for the triple screw machinery for the two cruisers *Columbia* and *Minneapolis*. Melville sailed in 1879 under Lieutenant De Long on the ill-fated *Jeannette* expedition to discover a northeast passage across the Polar Sea. After the loss of the *Jeannette* he brought to safety the crew of his own boat, and subsequently conducted the search which discovered the *Jeannette* records and the bodies of De Long and his companions. The details of this perilous experience are related in his *In the Lena Delta* (1885). He was afterwards a member of the Greely Relief Expedition (1884). He was appointed chief engineer in 1881, engineer-in-chief in 1887, and rear-admiral in 1899.

MELVILLE, Herman (1819-91). An American novelist, born in New York City, and noteworthy for his stories of the sea. He was educated at the Albany Classical School, and in New York City, and went to sea in 1837 in a merchant vessel bound for Liverpool. In 1841 he rounded Cape Horn on a whaling cruise, and was so illtreated that in the next year he and a companion made their escape from the ship and were taken captives by the Typees, a warlike tribe of Nukahiva, one of the Marquesas Islands. His companion soon escaped and Melville was finally rescued after four months by the crew of an Australian whaler. He spent the next two years (1842-44) in and about the Pacific Islands, and on his return to New York told the story of his experiences at sea and his romantic captivity, in *Typee, a Peep at Polynesian Life During a Four Months' Residence in a Valley of the Marquesas* (1846), which enjoyed a sensational and not undeserved success. In 1847 Melville married the daughter of Chief Justice Lemuel Shaw of Massachusetts. In 1850 he moved with his family to Pittsfield, Mass., and returned in 1863 to New York, where he occupied a place in the custom-house continuously from 1866 till 1885, when because of failing health he resigned. The period of his popularity is embraced in the years 1846-52, and was one of rapid production of such stories as *Omoo* (1847); *Mardi* (1849); *Redburn, His First Voyage* (1849); *White Jacket, or the World in a Man of War* (1850), in which the horrors of flogging in the navy were so graphically set forth that the abolition of the practice soon followed; *Moby Dick, or the White Whale* (1851); and *Pierre, or the Ambiguities* (1852). After 1852 he published three other volumes of fiction, *Israel Potter, His Fifty Years of Exile* (1855); *Piazza Tales* (1856); and *The Confidence Man* (1857); and later several books of poems, lyric and epic, such as *Battle Pieces and Aspects of the War* (1866); *Clarel, a Pilgrimage in the Holy Land* (1876); *John Marr and Other Sailors* (1888); and *Timoleon* (1891). His *Typee*, *Omoo*, *Moby Dick*, and *White Jacket* were reëdited in 1892 with an introduction by Arthur Stedman.

MELVILLE, or **MELVILL,** James (1556-1614). A Scottish reformer, nephew of Andrew. He was born at Mayton, near Montrose, July 26, 1556; graduated B.A. at Saint Andrews in 1571; became a Presbyterian minister, and was a zealous defender and assistant of his uncle. He was professor at Glasgow (1575-80); at Saint Andrews (1580-84); held various ecclesiastical positions, and was much respected and employed by James VI. till his courageous opposition to the King's schemes in behalf of episcopacy after he became King of England cost him his favor. He died at Berwick, January 13, 1614. His published works include prose and poetry, but his title to fame rests upon his diary (1556-1610), printed by the Woodrow Society (Edinburgh, 1842).

MELVILLE, Viscount. A British statesman. See Dundas, Henry.

MELVILLE ISLAND. One of the Parry Islands of Arctic North America, situated in latitude 74° to 77° N., north of Melville Sound and between Bathurst and Prince Patrick's Islands, the latter being the westernmost island of the group (Map: North America, G 2). Melville Island is very irregular in outline, 200 miles long and about 100 miles broad; it is of carboniferous lime and sandstone formation, and contains coal-beds. It was discovered by Parry in 1819.

MELVILLE PENINSULA. A projection of the north shore of North America, extending north of Hudson Bay, and belonging to the Canadian Territory of Keewatin (Map: North America, K 3). It is connected with the mainland by Rae Isthmus, and bounded on the west by Committee Bay. It is separated from Cockburn Island on the north by Fury and Hecla Strait, from Baffin Land on the east by Fox Channel, and from Southampton Island on the south by Frozen Strait.

MELVILLE SOUND. One of the numerous passages between the islands of Arctic North America (Map: North America, M 2). It lies between Melville Island on the north and Prince Albert Land on the south, and extends from Prince of Wales Island in the east, where it communicates through Barrow Strait and Lancaster Sound with Baffin Bay, to Bank's Land in the west, where Bank's Strait opens into the Arctic Ocean. Its length is 225 miles; its southern shore is still largely unknown, but its width is from 50 to about 175 miles.

MEMBERED (from *member*, OF., Fr. *membre*, from Lat. *membrum*, limb). A term in heraldry applied to a bird having its beak and legs of a different color from its body; it is then said to be membered of that color.

MEMBRA'NA PU'PILLA'RIS (Lat., pupillary membrane). The name given to a very thin membrane which closes or covers the central aperture of the iris in the fœtus during an early period of gestation; it begins to disappear in the seventh month.

MEMBRANE (Lat. *membrana*, from *membrum*, limb) in Anatomy. The term applied to designate those textures of the animal body which are arranged in the form of laminæ, and cover organs, or line the interior of cavities, or take part in the formation of the walls of canals or tubes. The structure and special uses of some of the most important of the animal membranes are noticed in separate articles, such as Mucous Membrane, Serous Membrane, etc.; and the membranes in which the fœtus is inclosed—commonly called the fœtal membranes—are described in the article Placenta. The membranes which cover and protect the brain and spinal cord are commonly termed *meninges*, from the Greek word *meninx*, a membrane. Simple membranes are of three kinds, mucous, serous, and fibrous. Mucous membranes line the cavities which communicate externally with the skin, as the mouth, intestinal canal, genito-urinary passages, internal surface of the eyelids, and the ramifications of the respiratory passages, the Eustachian tubes, and middle ear. Mucous membrane has three layers: a fibro-vascular layer, composed of blood-vessels, nerves, and connective tissue, which is continuous with the tissue beneath and interlacing with it; a more superficial layer, called basement membrane, which is described as structureless, and upon which rests the superficial layer, or epithelium, the latter presenting a variety of structure in different parts of the body. This membrane is at times elevated into papillæ or villi, or else depressed in the form of glands. The mucous membranes secrete mucus to lubricate the various passages, and also other fluids for special physiological purposes. The saliva, the gastric and pancreatic juices which aid digestion are examples of special secretions. The serous membranes are of two kinds: those lining visceral cavities, such as the pericardium, pleuræ, and peritoneum; and those lining joint cavities (synovial membranes). The third species of simple membrane of Bichat is the fibrous, divided into two sections: enveloping aponeuroses, the fibrous capsules of joints and the sheaths of tendons; and the enveloping membrane of bone, the periosteum, the dura mater (the internal periosteum of the skull), the fibrous membrane of the spleen and of other glandular organs. See SPLEEN.

MEMBRANOLOGY (from Lat. *membrana*, membrane + Gk. *-λογία*, *-logia*, account, from *λέγειν*, *legein*, to say). The study of the part of anatomy relating to membranes. See MEMBRANE.

MEMBRÉ, mäɴ′brȧ′, ZENOBIUS (1645-87). An early missionary to Canada, born at Bapaume, France. He became a recollet of the Franciscan Order, and went as a missionary to Canada in 1675; accompanied La Salle upon his expedition to the Mississippi in 1679, stopping at Fort Crèvecœur, on Lake Peoria, where, with Father Gabriel de la Ribourde, he conducted a mission among the Illinois until driven by the Iroquois to the Jesuit settlement at Green Bay. He descended the Mississippi with La Salle in 1682, and returned the same year to France, where he published an account of the expedition. After acting for a time as warden of a convent at Bapaume, he came again to America with La Salle in his final expedition by sea to Texas in 1684, and remained in Fort Saint Louis, where, with his companions, he was massacred by the Indians. Consult Shea, *Discovery and Exploration of the Mississippi Valley* (New York, 1852).

MEMEL, mā′mel. A river emptying into the Baltic. See NIEMEN.

MEMEL. A town of Prussia, in the Province of East Prussia, the most northern town of Germany and an important seaport, situated near the Russian border at the entrance of the Dange into the northern end of the Kurisches Haff, 58 miles by rail north-northwest of Tilsit (Map: Prussia, J 1). It has an excellent harbor protected by two lighthouses and a fort, and is of great importance in the Baltic lumber trade. The logs, sawed in the local mills, are brought down from the forests of Russia by the König-Wilhelm Canal and by the Niemen, here known as the Memel. Memel is the seat of a considerable transit trade in agricultural products imported from Lithuania, as well as in coal, petroleum, herrings, chemicals, etc. The local manufactures consist of machinery, chemicals, etc. The educational institutions include a gymnasium, a seminary for teachers, and a school of navigation. Memel was founded in 1252 by the Teutonic Order. It joined the Hanseatic League in 1254 and soon rose to a position of considerable commercial importance. It was held by the Swedes for some time during the seventeenth century, and was the residence of Frederick William III., after the battle of Jena in 1807. Here also, in 1807, a treaty of peace was concluded between England and Prussia. Population, in 1890, 19,282; in 1900, 20,174, chiefly Protestants.

MEMLING, mĕm′lĭng, HANS (c.1430-94). An eminent painter of the early Flemish school, which may be said to have attained in his works the highest delicacy of artistic development. He was born at Mömlingen, near Aschaffenburg, Bavaria, and appears permanently established at Bruges in 1478, but was probably active there a few years earlier. He was a pupil of Rogier van der Weyden at Brussels, but his work bears little resemblance to that master, whom he surpasses. His style is more akin to that of Jan van Eyck.

Memling's works, of which a large number survive, may be best studied at Bruges. In the Hospital of Saint John are the following: "The Epiphany" (1479), representing the adoration of the Magi, and the "Presentation in the Temple," the best example of the master's early manner; a triptych called the "Marriage of Saint Catharine;" the portrait of "Catharine Moreel" (1480); a diptych (1487) with the Madonna, and on the other wing the donor, Martin van Nieuwenhoven, the best of Memling's portraits; and the "Shrine of Saint Ursula" (1489), a reliquary in the shape of a Gothic chapel. Its fourteen scenes are the master's finest achievement, being remarkable for the freedom and grace with which he treated groups and figures of small proportions. A triptych (1484) with "Saint Christopher and the Infant Christ" in the centre, in the Museum at Bruges, also ranks high among his works. The Museum at Brussels contains a fine "Crucifixion;" and that of Antwerp possesses "Christ as King of Heaven," a large triptych, purchased in 1896 for 240,000 francs. Other authentic pictures of Memling are: A triptych, containing more than two hundred figures, the centre occupied by the Crucifixion (1491), in the Cathedral at Lübeck; the "Seven Joys of the Virgin," in the Pinakothek, Munich; the "Seven Sorrows of the Virgin," in the Gallery of Turin; the "Madonnas," in the Uffizi, Florence, the Louvre, the Berlin Museum, and the National Gallery, London; a large altar-piece with the "Last Judgment" (1467), in the Church of Saint Mary at Danzig. Examples of his portraits are in the galleries of Brussels, Antwerp, Frankfort, and Florence.

Consult: Michiels, *Memling, sa vie et ses ouvrages* (Verviers, 1883); Wauters, *Sept études pour servir à l'histoire de Hans Memlinc* (Brussels, 1894); Kaemmerer, *Memling* (Bielefeld, 1899); and Weale, *Hans Memlinc* (London, 1901); also Bock, *Memling-Studien* (Düsseldorf, 1900), and Gaederiz, *Der Altarschrein von H. Memling im Dom zu Lübeck* (Leipzig, 1901).

MEMMINGEN, mĕm′mĭng-en. An ancient town of the Kingdom of Bavaria, Germany, situated near the right bank of the Iller, 33 miles by rail south-southeast of Ulm (Map: Bavaria, D 5). It is still partly surrounded with walls, and its principal church has fine late Gothic choir-stalls dating from the fifteenth century. The Roman Catholic church with its fine altar-pieces, the fifteenth-century Renaissance Rathaus, and the *Fuggerbau*, in which Wallenstein received his dismissal from the command of the army in 1630, are also noteworthy. The educational institutions of the town include a realschule, a seminary for teachers, a theatre, and a library. There is an important collection of archives. Memmingen manufactures woolens and linen, cordage, various kinds of machinery, leather, soap, etc., and trades in agricultural products, wool, and live stock. The town is first mentioned in 1010 and became a free city of the Empire in 1286. It was a member of the Schmalkaldic League; it became Bavarian in 1802. Population, in 1900, 10,899.

MEMMINGER, mĕm′mĭn-jĕr, CHRISTOPHER GUSTAVUS (1803-88). An American political leader, Secretary of the Treasury in the Government of the Confederate States. He was born in Württemberg, Germany, but was brought at an early age to South Carolina by his mother, who died not long after their arrival. He was for a time in an orphan asylum in Charleston, and was then adopted by Thomas Bennett, afterwards Governor. Memminger graduated from South Carolina College in 1820, studied law, and practiced in Charleston. He was an opponent of Calhoun, and in 1832 wrote the *Book of Nullification*, a satire in biblical style upon that leader's favorite doctrine. He was for many years a member of the State Legislature, and for nearly twenty years was the head of the finance committee. In January, 1860, he was sent as a special commissioner to Virginia in order to induce that State to enter a scheme for obtaining redress of Southern grievances. Some months later he was one of the leaders in the convention which declared that the connection of South Carolina with the United States was dissolved. Upon the formation of the Confederacy, he was made Secretary of the Treasury, which office he held until June, 1864, when he resigned. He was responsible for the disastrous financial policy of the Confederate Government. For an account of his administration, consult Schwab, *The Confederate States of America, 1861-65: A Financial and Industrial History of the South During the Civil War* (New York, 1901).

MEM′NON (Lat., from Gk. Μέμνων). In Greek legend, a son of Tithonus and Eos (the dawn), King of the Ethiopians, who led an army to aid Priam, King of Troy. Clad in armor made by Hephæstus (or Vulcan), he made great slaughter among the Greeks, and finally killed Antilochus, who was defending his father, Nestor. Over the body of Antilochus he met Achilles and fell before him. His mother obtained from Zeus his immortality, and his body, or, in another story, his ashes were carried to his native country. The river Paphlagonius was said to flow blood yearly on the anniversary of his death. His comrades were changed to birds, and it was said they returned yearly from the south and fought around the funeral mound erected for their leader at Troy. In the earlier writers Memnon leads his forces from the extreme East, or Assyria; later the native land was sought in Syria, and not earlier than the end of the fifth century B.C. was it localized in Egypt and Æthiopia. Memnonia were said to exist at Susa in Persia, and at Abydos and Thebes in Egypt. Indeed, in Ptolemaic times the west bank of the Nile at Thebes was the Memnonium, as the east was Diospolis. Near by are two colossal statues of King Amenhotep III. of the Eighteenth Dynasty, the southern one of which was said to give forth a sound when struck by the rays of the rising sun, a sound probably due to the sudden expansion of the sandstone conglomerate from which the statue is hewn. Strabo (c.20 B.C.) does not mention the name of Memnon in describing this phenomenon, but early in the first century of our era the story gained currency that the statue represented Memnon, who thus greeted his mother in the morning. From the time of the Flavian emperors to that of Septimius Severus, the world seems to have been fond of visiting this place, and the sides of the figure are covered with names and verses referring to the legend. Among the visitors were Hadrian and his wife, Sabina, in A.D. 130. At some time before Strabo's visit, the upper part of the statue had been overthrown by an earthquake (popular tradition said by Cambyses), and when it was rebuilt by Severus the sounds ceased.

In art the combat of Memnon and Achilles in presence of Eos and Thetis, and the removal of the body of Memnon by his mother or by sleep and death, were favorite subjects with the Attic vase painters. Consult: Jacobs, *Ueber die Gräber des Memnon* (1830); Thirlwall, in *Philological Museum* (Cambridge, 1832); Letronne, "La statue vocale de Memnon," in *Mémoires de l'Institut Royal de France* (Paris, 1833); Curzon, in *Edinburgh Review* (1886).

MEMNO′NIUM (Lat., from Gk. Μεμνόνιον). The name applied in Ptolemaic times to an Egyptian temple about 8½ miles from the Nile, near Abydos. The geographer Strabo (c.30 B.C.) mentions it with admiration and compares it with the celebrated Labyrinth (q.v.). In 1859 Mariette, with the financial aid of the Egyptian Government, cleared away the sand and rubbish which covered the building and made it accessible to visitors and students. The temple, begun by Seti I., and completed by his son, Rameses II., was dedicated to the gods of Abydos and to the manes of Seti and of his predecessors on the throne of Egypt. Among the numerous reliefs that adorn its walls are some of the finest specimens of Egyptian sculpture. A wing running at right angles to the rear of the main building, which abuts upon a rocky hill, gives the ground plan of the structure the form of the letter L. Of the two courts which gave entrance to the temple, the first with its pylon and walls is completely destroyed, and only a portion of the wall of the second court remains. At the upper end of this court is a portico with twelve sculptured columns; its rear wall was originally pierced by seven doors, corresponding to the seven chapels within the temple, but six of these doors were walled up by Rameses II., and only the central door was left open. Upon the wall is an inscription of Rameses, in ninety-five vertical lines, describing the completion and dedication of the building. The central door gives entrance to a wide hall, its roof supported by twenty-four columns, and from the rear of this hall seven doors lead to a second hall containing thirty-six columns arranged in three parallel rows. The last row stands upon a raised platform, and its twelve columns have been left without capitals in order to bring their tops on a level with the tops of the other two rows. Both halls are richly adorned with reliefs representing Seti and Rameses paying worship to various divinities. The raised platform at the back of the second hall forms a sort of portico, and upon this open seven chapels devoted respectively to the deities Horus, Isis, Osiris, Ammon, Harmachis, and Ptah, and to King Seti himself. The chapel of Ammon occupies the centre. A door at the back of the chapel of Osiris gives access to a covered portico supported by ten columns, having on the right three additional chapels dedicated to Horus, Osiris, and Isis, and on the left a small vestibule leading to three small chambers. The reliefs on the walls of the chapels represent ceremonies in honor of the respective gods. The wing, which runs to the southeast at right angles to the rear of the main structure, contains a number of chambers, but many of them are in a bad state of preservation. The most important is a long gallery known as the Gallery of Kings. On the right wall of this room are depicted King Seti I. and his son Rameses adoring their royal ancestors whose cartouches are inscribed in two long lines. The list contains the names of seventy-six kings of Egypt, beginning with Menes (q.v.) and ending with Seti I. (q.v.), but it is far from complete. It does not contain the names of monarchs regarded as illegitimate or unimportant, and it omits all the rulers from the Thirteenth to the Seventeenth Dynasty. Copies of the list are to be found in Meyer, *Geschichte des alten Aegyptens* (Berlin, 1887), and in Flinders Petrie, *A History of Egypt* (New York, 1897). Similar lists exist at Karnak and at Sakkaran (q.v.). Consult: Mariette, *Abydos* (Paris, 1869-80); *The Monuments of Upper Egypt* (London, 1877); Baedeker, *Aegypten* (4th ed., Leipzig, 1897).

MEM'ORABIL'IA (Lat., memorable things). Something worthy of being remembered or noted down, especially the Latin title of Xenophon's *Memoirs of Socrates.*

MEMORY (OF. *memorie, memore, memoire,* Fr. *mémoire,* from Lat. *memoria,* from *memor,* mindful; connected with Gk. *μέρμερος, mermeros,* anxious, Skt. *smar,* to remember). The conscious representation of past experience. To say that a man has 'a good memory' means that he is able to recall past events fully and accurately. The term is also used, more broadly and loosely, to include the capacity of retention. Thus memory is figuratively called a storehouse. This implies that 'within memory' are preserved bits of experience which may reappear in consciousness from time to time in the form of recollections. It is well to keep distinct the terms retention, which properly considered is a physiological fact, a matter of cerebral mechanics, and conscious representation, or recollection—memory in the strictly psychological sense.

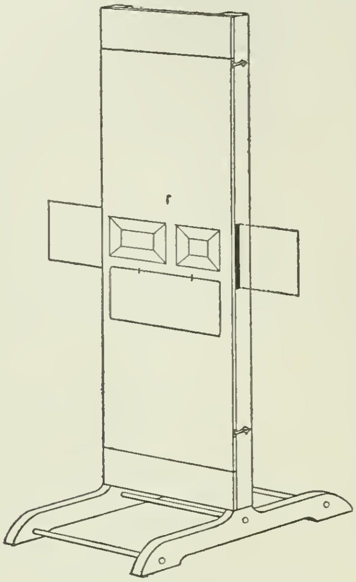
Recollection involves no new or peculiar mental processes. The core of a recollection or 'a memory,' as it may be called, is the 'memory-idea.' This may appear either as an image—visual, auditory, tactual, etc. (see IMAGINATION)—or as a word or a series of words. The thing that brands the image or word as a memory-idea is its reference. One may have the visual image of a castle, which is no particular castle; or of a pin, which is no particular pin; this is merely a mental image without a setting: or one may have a visual image of a recent event which comes to mind as 'a-part-of-yesterday' or 'a-thing-that-occurred-last-spring.' The latter images refer to the past as 'my own past.' They bear the marks of private ownership. The only way in which the memory-idea is unique is, then, in its function, its office in joining items of experience which have different temporal localization. Intermediate steps between the perception and the memory-idea are furnished by (1) the after-image (q.v.); (2) the memory after-image (i.e. the event that persists in 'standing before the mind' after the external stimulus has ceased to act, as Lady Macbeth's horror of the King's blood); and (3) the feeling that 'I have known this thing before;' finally comes (4) the free memory-idea. The 'reference' in the memory-image is given, first, by the setting, i.e. by the associations which cluster around the idea; secondly, by the degree of clearness and stability of the various parts of the image; and, thirdly, by the 'at home' mood or the mood of familiarity (see FAMILIARITY) which attaches to whatever 'fits in' with one's own list of experiences. The verbal memory-image or idea came in, of course, after the acquisition of language; and it is probable that the more direct 'intuitional' images of sense also appeared quite late in the life-series. The complete disjunction of 'present' and 'past' demands an advanced stage of mental development.

Memory is intimately related to recognition (q.v.). Indeed, one often says to an acquaintance "I remember you;" meaning that the acquaintance is recognized, that his face is familiar. But recognition need not imply a reference to a definite past at all; it may rest simply on the feeling of familiarity that is aroused by the meeting. Recognition starts from a present perception; memory or recollection from an image or idea.

Recollection is either active or passive. The effort to 'call up' a name or a situation in which a known event occurred is an instance of active recollection; whereas, in passive recollection, memories 'come of themselves,' as in the case of a reverie or in the successive appearance of the words and music of a remembered song. The former demands active attention, the latter passive. Almost any phase of consciousness may initiate recollection; the perception of a color may do it, or that of a sound, or a shiver of cold, a feeling, a 'bracing effort,' etc. See ASSOCIATION OF IDEAS for the incentives to recollection.

Retention rests upon some modification of the cortex during excitation. The most acceptable theory of retention is the theory of 'functional dispositions' (Wundt). Excitation so disposes nerve elements (probably in their molecular arrangement) that their functions are more or less permanently altered. In this manner, a reëxcitation 'renews' a function which has already been impressed upon the nervous substance. The concept of physical memory has been extended to cover all changes in organic matter which outlast the operation of their causes. It is thus made synonymous with physiological habit. See HABIT.

Experiment has attacked most of the major problems of memory within the last fifteen years. Three general methods have been used: (1) reproduction: the observer 'reproduces,' e.g. a line of poetry or a tone that he has heard previously; (2) recognition: e.g. a color is shown twice in succession, and the observer reports whether he recognizes it the second time as the same color or whether it looks 'lighter' or 'greener' or 'paler'; (3) comparison: emphasis is laid on the memory-image, which is compared with a similar perception. The first important work was done by H. Ebbinghaus in 1885 under the first method. Series of 'nonsense-syllables' (e.g. bul, rom, cil) were read over and over, and then an attempt was made to write them from memory. The investigator found that as the interval between learning and reproducing was gradually lengthened, the amount remembered fell off at first rapidly and then more and more slowly. The influence of length of series, order, repetition, rhythm, etc., was also studied. Ebbinghaus's method has been repeated with many modifications. Other subjects related to memory which have been investigated are the character of the stimulus, combination of sense modalities, association and arrangement, the effects of disease, of age, race, and individual differences. The present tendency is away from quantitative determinations of capacity and toward a qualitative analysis of the memorial consciousness. The part played by feeling and mood, and the characteristics of the image, are, e.g. attracting more attention than the answer to the question "How much can one remember of an event after an interval of an hour or a day?"



JASTROW'S MEMORY APPARATUS.
From Titchener, *Experimental Psychology.*

Each sense-department has its own memory. There are, i.e. auditory, visual, tactual, gustatory 'memories,' and not one single 'memory.' The manner in which these memories are combined in a single mind is known as the individual's 'memory type' or 'ideational type.' There are four chief memory types; visual (predominance of 'picture-ideas'), auditory (predominance of 'sound-ideas'), tactual or motor (predominance of 'touch' and 'strain-ideas'), and a mixed type in which the various sense memories are more or less evenly balanced. When 'object-images' pass into 'word-images' three subtypes are formed: verbal-visual, verbal-auditory, and verbal-tactual; i.e. words are seen, heard, or felt in the throat. In most minds there are several memories, with one (usually the visual) appearing in excess of the others. See IMAGINATION.

The systematic attempt to improve the efficiency of memory is known as the art of *mnemonics,* which is said to have originated with the Greek poet Simonides. Most mnemonic devices include the formation of artificial associations as an aid to recollection. A common device for remembering dates, e.g., is the association of the digits with letters. Then the letters corresponding to the figures in a date are brought together in a word which is associated, in turn, with the event whose date is to be retained.

Memory is subject to many disturbances or 'diseases,' most of which fall under the head of amnesia, or 'loss of memory.' Amnesia may be either general or partial. In general amnesia, a greater part of memory disappears, (1) temporarily, as in epilepsy, or (2) periodically, as in altered personality, or (3) progressively (e.g. proper names are forgotten before adjectives and verbs). Partial amnesia covers loss of memory for colors, sounds, numbers, proper names, etc. (See APHASIA). A less frequent disorder of memory is hypermnesia, or exaltation of memory. A person's general memory, or his memory for a language or for some event of his childhood, is remarkably clarified. Finally come illusions of memory, or paramnesias, in which the subject believes that a new experience has been passed through before (illusion of familiarity), or assigns to a recent date experiences which have occurred at a remote time.

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MEM'PHIS. A city of ancient Egypt, situated about 12 miles south of modern Cairo, on the left bank of the Nile, in latitude 29° 51′ N. It is said to have been founded by Menes, the first historical King of ancient Egypt, but this is as little probable as the statement in Herodotus that Menes gained the ground for building Memphis by diking off the Nile. King Uchoreus, whom Diodorus calls the founder of Memphis, cannot be identified. It is certain that a city called the 'White Wall' stood on the spot from prehistoric times; this name (*Leukon Teichos*) was still attached to the citadel and the neighboring quarter of Memphis in the Greek epoch. The kings of the Fourth to the Sixth Dynasty built their residences not very far from Memphis, and their pyramids are in the vicinity, but Memphis proper received its name and importance from the second King of the Sixth Dynasty (Pepy or Apopi I.), who built his pyramid and residence not far west of the small ancient city of 'the White Wall.' The name of that pyramid, *Men-nofer,* 'good abode,' extended to the whole city, and, corrupted to *Menfe,* came down to the classical writers. In the seventh century B.C. the Assyrians called the city Mempi; in the Bible the name has been corrupted to Moph and Noph. Memphis, which has a very favorable situation, near the head of the Delta, became the capital of Egypt. In later times, several dynasties preferred other capitals, but Memphis always remained at least the second capital of Egypt, and the second city of the land in wealth and population. The conquests by the Ethiopians, Assyrians, and

Persians do not seem to have affected it much, and the writers of the earlier Roman period still describe it as filled with temples and palaces of amazing size and beauty, the Iseum, the Serapeum, and others. The decline of the city was rapid after the Arab conquest (at which time it was still the seat of a Governor), when Fostat (Old Cairo) was erected in the neighborhood. Fostat and subsequently Cairo were built of stones taken from the deserted buildings of Memphis, and thus it came about that the ancient city entirely disappeared. The only remarkable monuments left there at present are the two colossal statues of Rameses II. (originally 42 feet high), lying on the mound near the modern village of Mit-Rahîneh, and marking the entrance to the principal and earliest temple of Memphis, that of Ptah (Greek Hephæstus), and the centre of the 'White Wall.' Abd-ul-Latîf, as late as the thirteenth century A.D., found remarkable ruins on the site of old Memphis. The insignificant rubbish-mounds (of Mit-Rahîneh, Bedrashên, Ennagîzîyeh, etc.) extend three or four miles from north to south. The classical writers give very exaggerated accounts of the size of the city. The immense necropolis west of it, including the pyramids and tombs of Sakkarah, still bears testimony, however, to the former importance of Memphis. The principal god of the city was Ptah, the 'master craftsman' among the gods, who was believed to have formed the world; afterwards the conception of this deity was called Ptah-Sokar (a combination of Ptah and Sokar, the god of the western suburb), embodied in the Apis bull and others. The numerous Phœnician merchants had a quarter of their own with a temple of Astarte. Consult: *Description de l'Egypte*, vol. v. (Paris, 1820-30); Lepsius, *Denkmäler aus Aegypten und Aethiopien* (Berlin, 1849-58); Mariette, *Le Sérapéum de Memphis* (Paris, 1882); Dümichen, *Karte des Stadtgebietes von Memphis* (Leipzig, 1895). See also EGYPT.

MEMPHIS. A city and the county-seat of Scotland County, Mo., 45 miles west of Keokuk, Iowa; on the Keokuk and Western Railroad (Map: Missouri, D 1). It is a shipping centre of some importance for the adjacent farming and stock-raising district. There are deposits of coal in the vicinity. Population, in 1890, 1780; in 1900, 2195.

MEMPHIS. The largest city of Tennessee and the county-seat of Shelby County, situated on the Mississippi River, 454 miles below Saint Louis and 818 miles above New Orleans (Map: Tennessee, B 5). It is at the head of navigation for large steamers, and has exceptional railway facilities, being on the line of the Illinois Central; the Saint Louis and San Francisco; the Missouri Pacific; the Louisville and Nashville; the Nashville, Chattanooga and Saint Louis; the Rock Island; the Southern; the Saint Louis Southwestern; the Saint Louis, Memphis and Southwestern; the Kansas City, Memphis and Birmingham; and the Yazoo and Mississippi Valley.

The city rises on the Chickasaw Bluffs, 40 feet above high water; a broad levee overlooks the river, and there are stone-paved wharves. It is laid out with broad, regular, well paved and shaded streets and has handsome residences and substantial business buildings. In the heart of the city is a public park filled with magnificent old trees. In all, there are about 1000 acres of public parks of great natural beauty. Among the notable structures are the United States Custom House, Cotton Exchange, Cossitt Library building, Hospital Medical College, Lyceum Theatre, Grand Opera House, Auditorium, Odd Fellows' building and Masonic Temple, Gayoso Hotel, Scimitar (newspaper) building, Equitable building, and the Porter, Randolph, Lowenstein, Southern Express, Napoleon Hill, and Woman's buildings. There are in Memphis a marine hospital, a large city hospital, and Saint Joseph's Hospital; and its educational institutions include the Christian Brothers' College (Roman Catholic), opened in 1871; the Memphis Hospital Medical College, Le Moyne Normal Institute, and Hannibal Medical College, the last two for colored students; besides several private secondary institutions and the schools of the public school system, in which are enrolled about 11,000 pupils. In addition to the public library and those in connection with the educational institutions, there are Bar and Law, and Odd Fellows' libraries. A steel railroad bridge across the Mississippi, consisting of five spans and nearly 1900 feet in length, was opened in 1892; and the city has two fine race tracks. Five miles distant is a National Cemetery, in which are 14,039 graves, 8822 of unknown dead.

Its facilities for transportation by water and rail have made Memphis one of the most important commercial and manufacturing centres in the South. It is one of the largest cotton markets in the United States, and carries on a large wholesale and jobbing trade in groceries, dry goods, foodstuffs, shoes, hardware, and agricultural implements. Its industrial interests are undergoing remarkable development, the city being noted particularly for its wood-working industries, chiefly of hard wood, and for the manufacture of cottonseed products. There are large cottonseed oil mills, foundries and machine shops, car works, furniture factories, flour and grist mills, saw and planing mills, carriage and wagon shops, clothing factories, saddlery and harness factories, brick and tile plants, confectionery and cracker factories, tobacco and cigar fatories, patent medicine works, cold storage fibre plants for the manufacture of pulp for paper mills, and many other establishments.

Memphis spends annually in maintenance and operation about $1,000,000, the principal items of expenditure being: for the fire department, $127,500; for the police department (including amounts for police courts, jails, reformatories, etc.), $100,000; for the health department (including garbage removal, crematories, etc.), $100,000; for charitable institutions, $100,000; for schools, $80,000; for municipal lighting, $50,000. Population, in 1850, 8841; in 1860, 22,623; in 1870, 40,226; in 1880, 33,592; in 1890, 64,495; in 1900, 102,320, including 5100 persons of foreign birth and 49,900 of negro descent.

On the site of Memphis, forts were built by the French (1698) and by the Spaniards (1794), but no regular settlement was made until 1819, when a small company arrived under the auspices of Andrew Jackson, John Overton, and James Winchester, proprietors of the land in this vicinity. In 1826 the settlement, with a population of 500, was incorporated as a town, and in 1849, South Memphis having been just annexed, a city charter was secured. On July 6, 1862, a Confederate fleet under Commodore Montgomery was defeated near Memphis by a Federal fleet under Commodore Davis, and Memphis was thereafter until the close of the war held by the Federal forces, though in August, 1864, the Confederate General Forrest raided it and carried off several hundred prisoners. In 1879, on account of the city's inability to meet its financial obligations, its charter was revoked, and until 1891, when it was reincorporated, Memphis was merely the 'Taxing District of Shelby County,' governed by three commissioners and a board of public works. Yellow fever epidemics occurred in 1855, 1867, 1873, 1878, and 1879, those in 1873 and 1878 being especially disastrous. Since 1880, however, the city has built 210 miles of Waring sewers; and this improvement in the sewerage system, together with the discovery of pure artesian water, has resulted materially in improving the healthfulness of the city. Consult: Keating and Vedder, *History of the City of Memphis* (Syracuse, N. Y., 1888); Davis, *History of the City of Memphis* (Memphis, 1873).

MEMPHIS, Ancient and Primitive Order of. See Masons, Free.

MEM'PHREMA'GOG. A lake situated in the Province of Quebec, Canada, and extending a short distance into Vermont (Map: Quebec, D 5). It has an elongated, irregular shape, is 35 miles long by from two to five miles wide, and discharges its waters northeastward through the Magog River into the Saint Francis. Along the west shore is a range of mountains reaching a height of 3500 feet; the lake is noted for its picturesque scenery. It is a favorite summer resort; numerous handsome villas dot its shores, and in summer a line of steamers runs from Newport, Vt., at the south end, to the Canadian village of Magog at the northern extremity.

MENA, mā'nȧ, Juan de (c.1411-56). A Spanish poet, born at Cordova. He studied at Salamanca and afterwards went to Rome. Here he became an admirer of the works of Dante and Petrarch, and from then continued to be influenced by them. He was secretary to King John II. of Castile, and Court historian. His principal work is *El laberinto* (1496), a poem modeled on the *Divine Comedy*, which is also called *Las tres cientas,* from the original number of its verses—300. It is an elaborate, tedious allegory.

MENABREA, mā'nȧ-brā'ȧ, Luigi Federigo, Count (1809-96). An Italian general and statesman. He was born at Chambéry, in Savoy, September 4, 1809, and was educated for an engineer. On completing his studies he entered the Sardinian army as lieutenant in the engineer corps, but was soon called to a professorship of applied mathematics in the military academy and at the University of Turin. In 1848 he was promoted to the rank of captain, served in the war against Austria, and was then employed on diplomatic business. As a member of the Chamber, he inclined to believe in the possibility of an accord of the Papacy with Italian unity; but, influenced by Cavour, he soon abandoned that hope and ranged himself with the radical Unionists. During the war of 1859, Menabrea acted as chief of staff in the Sardinian army. After the defeat of the Austrians by the French and the handing over of Savoy to France, he left the province to retain his Italian citizenship, and was created a Senator by Victor Emmanuel, and made chief of the Department of Engineers. In 1860 he became a lieutenant-general, and was director of the siege operations against Gaeta, where the King of Naples had taken refuge. It surrendered after a three months' siege, for which success he was made a count. In 1861 he succeeded Ricasoli as Minister of Marine, to which he added in 1862 the duties of Minister of Public Works. He assisted in framing the Treaty of Prague in 1866, which gave Venice to Italy. He was called in 1867, on the retirement of Rattazzi, to form a new Cabinet. He continued to carry on the Government until near the close of 1869, and in the two years of his Premiership did much for Italian stability, both at home and abroad. After resigning, Menabrea was appointed Italian Ambassador to London (1876) and Paris (1882). He remained at Paris for ten years. He died at Chambéry, May 25, 1896. Among the works he wrote are: *Etudes sur la série de Lagrange* (Turin, 1844-47); *Le génie italien dans la campagne d'Ancône et de la Basse-Italie* (Paris, 1866); *République et monarchie dans l'état actuel de la France* (ib., 1871).

MENAC'CANITE. See Ilmenite.

MENADO, mȧ-nä'dō. The capital of the Dutch Residency of Menado, in Northern Celebes. It is situated near the extremity of the northeastern peninsula of the island, on both sides of the river Tondano (Map: East Indies, F 4). It has an ethnological museum and is defended by the old Fort Amsterdam. Its unsafe roadstead detracts greatly from its commercial importance. Population, in 1895, 8996, including over 500 Europeans.

MENÆCHMI, mē-nĕk'mē. One of the best comedies of Plautus, so called from the twin brothers whose resemblance to each other and the amusing situations arising from their confusion form the plot of the play. The comedy is one of the earliest preserved plays of Plautus. It suggested in part the plot of Shakespeare's *Comedy of Errors.*

MÉNAGE, mȧ'näzh', Gilles de (Ægidius Menagius) (1613-92). A French lexicographer and linguist, born at Angers. Disliking the profession of an advocate, he renounced it, entered the Church, and fixed his residence in the Convent of Notre Dame. His *Dictionnaire etymologique, ou Origines de la langue française* (Paris, 1650-94; best ed. by Jault, 2 vols., Paris, 1750), and his *Origini della lingua italiana* (1669), are erudite and valuable works.

MENAGERIE. See Zoölogical Parks and Gardens.

MENAI (mĕn'ī) **STRAIT.** The channel which separates the island of Anglesey from the mainland of Wales (Map: England, B 3). It is 13 miles long and varies in width from about 250 yards to two miles, widening out north of Bangor into Beaumaris Bay. Navigation of it is hazardous, but the strait is nevertheless much used by vessels under 100 tons in order to save time. At the entrance of the strait the tides sometimes rise to a height of 30 feet, and the ordinary neap-tide rises from 10 to 12 feet. The strait is spanned by a suspension bridge, built in 1819-26, and by the Britannia Bridge.

MENAM, mȧ-näm′. The chief river of Siam. It rises in the northwestern part of that country, and flows southward, emptying by several arms into the Gulf of Siam, after a course of about 700 miles, or 900 miles if its length is measured from the source of its large tributary, the Mei Ping (Map: Siam, D 4). The Menam is navigable for large steamers to Bangkok, 15 miles from its mouth, and for small vessels for about 250 miles. The river divides itself several times by arms rejoining farther down, and from June to November it overflows a large part of the surrounding country, leaving an alluvial deposit of extraordinary fertility.

MENAN′DER (Lat., from Gk. Μένανδρος, *Menandros*) (B.C. 342-c.291). One of the greatest poets of the Attic New Comedy, born at Athens of a distinguished family. By his uncle, Alexis, the eminent poet of the Middle Comedy, he was initiated into the dramatist's art; his philosophical education he received from association with Theophrastus and Epicurus. He was handsome and fond of luxury. The greater part of his time he spent at his villa in the Peiræus with his beloved Glycera. When Ptolemy Soter gave him a flattering invitation to his Court, Menander declined, preferring his native city and easy independence to royal favor. About B.C. 291 he was drowned while swimming in the harbor of the Peiræus. Menander is said to have won a victory on the comic stage at the age of twenty-one. Yet during his lifetime he was less a favorite than his contemporary Philemon (q.v.). Of his 105 or 108 plays but eight won the highest place. After his death, however, he became the favorite above all other comic poets of his time, and was much read and quoted far into the Christian Era. We are unfortunately obliged to form our opinions of his comedies chiefly from the adaptations of them by Plautus and Terence. According to ancient critics he was distinguished for his wit, the refinement and perfection of his language, and his ingenious plots. Over a thousand fragments of his plays remain and a considerable collection of gnomes attributed to him. The latter collection has, however, suffered greatly from additions. The fragments are best published by Kock, *Comicorum Atticum Fragmenta*, vol. iii. (Leipzig, 1888). Two leaves of papyrus containing new fragments were published by Nicole, *Le laborateur de Ménandre* (Basle, 1898), by Grenfell and Hunt (Oxford, 1898).

MENANDER. A powerful Græco-Bactrian King, who ruled at the beginning of the second century B.C. (See BACTRIA.) Strabo refers to some of his conquests and Plutarch records that on his death, B.C. 115, various towns contended for the honor of cherishing his ashes. The large number of coins that bear his name and the wide-extended territory over which they are found seem to point to a long reign and to a domain of considerable influence. He appears in Buddhistic literature as Milinda (q.v.).

MENANT, me-näɴ′, JOACHIM (1820-1899). A French Orientalist, born at Cherbourg. He showed great skill in deciphering the cuneiform inscriptions, and on account of his valuable contributions to Assyrian literature he was made a member of the Académie des Inscriptions. His numerous writings include: *Exposé des éléments de la grammaire assyrienne* (1868); *Inscriptions assyriennes des briques de Babylone* (1860); *Les écritures cunéiformes* (1860-64); and *Leçons d'épigraphie assyrienne professées aux libres de la Sorbonne* (1873). He also published a collection of texts translated by Assyriologists: *Annales des rois d'Assyrie* (1874), and *Babylone et la Chaldée* (1875).

MEN′APHON, or CAMILLA'S ALARM TO SLUMBERING EUPHUES IN HIS MELANCHOLIE CELL AT SILEXEDRA. A story by Robert Greene published under the title *Arcadia* in 1589, the year before the publication of Sydney's *Arcadia*. It contains some of the author's finest poems.

MÉNARD, mȧ′när′, MICHEL BRANAMOUR (1805-56). A pioneer, born of French parentage at Laprairie, Lower Canada. At an early age he entered the service of a fur-trading company at Detroit, and afterwards went to Missouri as an Indian trader for his uncle. He became a chief of the Shawnee Indians, and gained much influence over other tribes. About the year 1833 he went to Texas, and engaged in trading with the Mexicans and Indians. Owing to his influence over the Indians, he was able, upon the revolt of the Texans, to prevent the Indians from assisting the Mexicans. He was a member of the convention that declared Texas independent, and afterwards served in the Congress of that State. In 1836 he bought a square league of land that included most of the site of the present city of Galveston, and became in effect the founder of that city.

MENASH′A. A city in Winnebago County, Wis., 88 miles north by west of Milwaukee; on Lake Winnebago, at the mouth of Fox River, on the United States Government Canal of the Fox and Wisconsin River Improvement, and on the Chicago and Northwestern, the Chicago, Milwaukee and Saint Paul, and the Wisconsin Central railroads (Map: Wisconsin, E 4). It has a public library, and there are paper mills, a woodenware factory, flour, saw, and woolen mills, machine shops, brick yards, and manufactories of various lumber products. Lake Winnebago is popular as a place of summer resort. Settled in 1847, Menasha was incorporated first in 1874. The present government is administered under a charter of 1892, which provides for a mayor, annually elected, and a unicameral council. Population, in 1890, 4581; in 1900, 5589.

MENCIUS, mĕn′shŭs (Latinized form of Chinese MÊNG-TSE or MŬNG-TSE) (c.371-287 B.C.). A Chinese sage, ranking next after Confucius in the estimation of the Chinese. He was born about B.C. 371 (108 years after the death of Confucius), in the small Principality of Tsow in the Province of Shan-tung, at no great distance from the birthplace of Confucius. As a youth he was known as Mêng K'o. His father died when the future philosopher was only three years old. The widow gave the fatherless boy every attention, and in due course he went to school, but does not seem at first to have been specially diligent or enthusiastic in his studies. It is said that he studied later with the disciples of Tszŭ-tse—the grandson of Confucius—and from them learned the doctrines of the Master, of whom he became an enthusiastic admirer. When he was forty he appeared as a public teacher with a large following of disciples. Like Confucius, he moved about from State to State, inculcating, expounding, and amplifying the Confucian teaching. He was more courageous and outspoken than Confucius, and was fearless in following his teachings to their logical consequences. He taught that man's nature is good, though it might appear otherwise, and that all his vices and all his misfortunes were due to evil influences from without. Humanity, righteousness, propriety, and knowledge are as natural to man as his four limbs. What is wanted is a return to this original goodness, and this can be accomplished only by the rectification of the heart. He laid special stress on humanity and righteousness, one the complement of the other, as the two main elements in man's moral being, humanity representing the fullness of virtue in the individual, and righteousness the due observance of all man owes to his fellow men. "Humanity is internal," he says; "righteousness external." "There has never been a man trained to humanity who neglected his parents; nor one who, having been trained to righteousness, made his sovereign an after consideration." In politics he taught that government is from God, but is *for* the people, whose welfare is of supreme importance; and he emphatically inculcated the application of these two principles—Humanity and Righteousness—to the conduct of rulers. And he did not hesitate to indicate the duty of the subject in regard to the 'removal' of oppressive rulers or wicked men in high places, when asked if a subject might put his sovereign to death. "He who outrages the humanity proper to his nature," he said, "is called a robber; he who outrages righteousness is called a ruffian. The robber and the ruffian we call a mere fellow. I have heard of the cutting off of Chow Sin [the ferocious tyrant of the Shang dynasty, B.C. 1123], but I have not heard in his case of putting a sovereign to death;"—only a cruel monster, a mere fellow.

Mencius died at eighty-four, the last fifteen years of his life having been spent in retirement, editing the *Book of History* and the *Book of Poetry*, and the preparation with the aid of some of his disciples of the record of his sayings, and his conversations with the Princes—a fact which may account for their greater fullness as compared with those of Confucius. It is the last of the *Four Books*, which form the basis of the Confucian philosophy. He was buried near the present Tsow Hien, in Shan-tung, where there is a temple in his honor, and where his descendants still dwell. It was not till the second century A.D. that his writings were fully studied and appreciated. In 1083 he was created Duke of Tsow; in 1088 he was admitted into the Temple of Confucius as an Associate, and titles were conferred on his father and mother.

BIBLIOGRAPHY. Legge, *Chinese Classics*, vol. ii. (London and Hong Kong, 1861), containing the Chinese text of the Mencian discourses, with a translation in English, Critical Notes, Prolegomena, and a Life; Rémusat, *Nouveaux mélanges asiatique*, vol. ii. (Paris, 1829); Faber, *Eine Staatslehre auf ethischer Grundlage, oder Lehrbegriff des chinesischen Philosophen Mencius* (Elberfeld, 1877), or Hutchinson's translation, *The Mind of Mencius* (London and Hong Kong, 1880); Johnson, "China," vol. ii., in *Oriental Religions and Their Relation to Universal Religion* (Boston, 1878); and Watters, *A Guide to the Tablets in a Temple of Confucius* (Shanghai, 1879).

MENDAÑA DE NEYRA, mån-dä′nyå då nā′ê-rå, ALVARO (1541-95). A Spanish navigator, born in Saragossa. He came to Peru in 1565, and had resided some time at Lima when his uncle, Lope Garcia de Castro, the Viceroy of the country, in 1567 put him in command of an expedition for purposes of discovery among the islands of the Pacific. Among his discoveries was that of a group of islands which he named Solomon Islands, in the belief that here Solomon obtained the gold used in the Temple at Jerusalem. Returning to Lima in 1568, he circulated reports of the wealth of these islands, which led, twenty-seven years later, to an expedition for their colonization, of which he took the command. Sailing from Callao April 11, 1595, he discovered another group of islands, which he named the Marquesas, after the wife of the Viceroy of Peru, the Marchioness Mendoza. Other groups of islands were visited, but Mendaña died without having reached the end of his voyage. Mendaña's narrative of his expeditions is in the National Library at Paris. This, with other contemporary accounts of the expedition, is translated in the Hakluyt Society volume for 1901, edited by Lord Amherst of Hackney.

MENDAÑA ISLANDS. See MARQUESAS ISLANDS.

MENDE, mäɴd. A town of Southern France, capital of the Department of Lozère. It is situated on the left bank of the Lot, 110 miles southwest of Lyons, and at the foot of a cliff rising 1000 feet above the town (Map: France, K 7). It has a cathedral founded in the fourteenth and rebuilt in the seventeenth century, with two towers, 280 and 210 feet high. In front of it stands a bronze statue of Pope Urban V., a native of the town. The town has also a communal college and a library. The chief industry is the manufacture of textiles. Population, in 1901, 5261; of commune, 7319.

MEN′DEL, GREGOR JOHANN (1822-84). An Austrian botanist. He was born in Austrian Silesia in Heinzendorf, near Odrau, and in 1843 entered the Augustinian *Königinkloster* at Brünn. He became a priest in 1847; studied at Vienna; returned to the cloister in 1853; taught at Brünn and became abbot. His experiments in hybridization, reprinted under the title *Versuche über Pflanzenhybriden* (in an English translation in the *Journal* of the Royal Horticultural Society, xxvi., 1901), were originally made public in 1865. They dealt especially with experiments on *Pisum* and *Hieracium* made in his cloister garden; advanced the idea of heterozygous form; attempted to show, under certain conditions, the ratio of dominants, cross-breeds, and recessives; and after thirty-five years of obscurity attracted the attention of biologists after their rediscovery and confirmation by De Vries, Correns, and Tschermak. Consult Bateson, *Mendel's Principles of Heredity* (Cambridge, Eng., 1902).

MENDELÉEFF, myĕn′de-lĕ′yĕf, DIMITRI IVANOVITCH (1834—). A Russian chemist, born in Tobolsk, Siberia. He graduated from the local gymnasium, and in 1850 entered the Institute of Pedagogy of Saint Petersburg, where he applied himself to the study of natural sciences. In 1856 he was appointed docent at the University of Saint Petersburg, and in 1859-61 he worked in Heidelberg and published a monograph *On the Capillarity of Gases*. Shortly afterwards he published his *Organic Chemistry.* He was made professor of chemistry at the Saint Petersburg Institute of Technology in 1863, and three years later at the university. In 1871-75 he made extensive studies on the compression of gases, embodied in his *On the Elasticity of Gases.* In 1876 he was commissioned by the authorities to study the petroleum industry in Pennsylvania and the Caucasus. His work on *Aqueous Solutions* (1886) was received by chemists as a notable contribution to experimental chemistry, although his 'theory of solutions,' according to which solvents invariably form definite or 'indefinite' chemical compounds with the substances dissolved in them, has been strongly criticised by physical chemists of the modern German schools. As member of the Council of Commerce and Industries, Mendeléeff became the champion of protection of home industries, and the policy of Russia in that direction dates practically from the publication of his *Tariff Elucidated* (1890). He worked out the formula for the *pyrocollodial* smokeless powder, serviceable for all firearms, when Russia undertook to rearm her forces. In 1893 he was made conservator of the weights and measures in the new Chamber of Weights and Measures established in the Department of Finance.

His *Elements of Chemistry* (1868-70, 5th ed., Saint Petersburg, 1889) is a standard work and has been translated into English, German, and French. In it he first set forth the theory later embodied in *La loi périodique des éléments chimiques* (Paris, 1879), now known as the periodic law (q.v.), in the following formula: "The properties of the elements, as well as the forms and properties of their compounds, are in periodic dependence on, or form a periodic function of, the atomic weights of the elements." This law enabled Mendeléeff to foretell the existence and even the properties of several unknown elements, which have since been actually discovered.

Mendeléeff's scientific contributions, dealing mostly with physical chemistry, and numbering upward of 150, have appeared in several German and French scientific periodicals. Consult T. E. Thorpe, *Essays in Historical Chemistry* (London, 1894).

MENDEL'S LAW. See Hybridity.

MENDELSSOHN, mĕn′del-sōn, Moses (1729-86). A German philosopher of Jewish parentage. He was born September 6, 1729, at Dessau. From his father, a schoolmaster and scribe, he received his first education; and in his thirteenth year proceeded to Berlin, where, amid very indigent circumstances, he contrived to learn Latin and modern languages, and to apply himself to the study of philosophy. After many years of comparative poverty he became part heir to a rich silk manufacturer, whose children he had educated. The intimate friend of men like Lessing—whose *Nathan der Weise* had its prototype in him—Sulzer, Nicolai, he contributed in a vast degree to the mitigation of the brutal prejudices against the Jews. On the other hand, he broadened the outlook of his own co-religionists. He died January 4, 1786. His principal works are: *Pope, ein Metaphysiker* (with Lessing) (1755); *Briefe über die Empfindungen* (1755); *Ueber die Evidenz in den metaphysischen Wissenschaften; Phädon, oder über die Unsterblichkeit der Seele* (1767); *Jerusalem, oder über religiöse Macht und Judenthum* (1783); and *Morgenstunden* (1785). His works have been collected and edited by G. B. Mendelssohn (7 vols., Leipzig, 1843-45). Consult: Hensel, *Die Familie Mendelssohn* (9th ed., Berlin, 1898; Eng. trans. London, 1882); Kayserling, *Moses Mendelssohn* (Leipzig, 1882); Ritter, *Mendelssohn und Lessing* (Berlin, 1886; Dessauer, *Der deutsche Plato* (ib., 1879). His philosophy was of a rather superficial popular sort, whose aim was to find good reason for opinions currently regarded as correct.

MENDELSSOHN - BARTHOLDY, mĕn′del-sōn-bär-tōl′dĭ, Felix (1809-47). A famous German composer. He was born at Hamburg, February 3, 1809, the son of Abraham Mendelssohn and Leah Salomon. The latter's brother, after embracing Christianity, assumed the name Bartholdy, which the Mendelssohns then added to their family name. The family was wealthy and highly refined. Felix's grandfather was the celebrated Moses Mendelssohn (q.v.). His children were brought up in the Protestant faith. Felix received piano instruction first from his mother; afterwards Ludwig Berger became his teacher. His instructor in counterpoint and musical composition was Zelter; and the finishing touches to his skill as a pianist were given by Moscheles. His eldest sister, Fanny, shared this instruction.

Mendelssohn began to compose before he was twelve years of age, and also showed great taste in drawing, and was rapid, yet accurate, in his general studies. Notwithstanding his remarkable achievements for one so young, his education continued on broad lines. Much of the charm which he exerted through life was due to his combining with musical genius the tastes of a man of high culture. When eleven years old he paid a visit to Goethe, who was delighted not only with his musical accomplishments, but with his modesty and refinement.

The home of the Mendelssohns was the centre of a cultured circle. At the Sunday concerts which were given there the most eminent people residing or visiting in Berlin were met—musicians like Weber, Spohr, Paganini, Liszt, Schumann; painters like Ingres, Vernet, Verboeckhoven, Kaulbach; singers like Lablache, Grisi, Pasta; and in addition to these, actors, sculptors, poets, and scientists, among the latter the Humboldts, Bunsen, and Jakob Grimm. One can imagine the rich life which unfolded itself within such a circle, and its influence upon Felix's development. One of the intimates of the circle was Hensel, the portrait painter, who married Fanny, herself scarcely inferior to Felix at the piano. Notwithstanding his pronounced musical gifts, Felix's father, in order to make sure that he was acting wisely in the choice of a musical career, took him in 1825 to Cherubini in Paris. After examining several of the boy's compositions, Cherubini gave an affirmative answer. In the same year Mendelssohn composed his octet (Opus 20). In February, 1827, his *Midsummer Night's Dream* overture was played at Stettin, and was received with great applause. April of the same year saw the production of his opera, *The Wedding of Camacho,* in Berlin, but it was not a success.

In 1828 he composed his overture to Goethe's poem, *A Calm Sea and a Happy Voyage*; and a letter from Fanny, December 8, 1828, to his friend, the poet Klingemann, refers to his composition of *Songs Without Words.* One of Mendelssohn's finest achievements, the first performance since Bach's death of the *Saint Matthew Passion*, took place in Berlin in 1829. The greatest difficulties had to be overcome, not the least being the indifference of musicians and public, but Mendelssohn brought the affair to a triumphant issue, and thus gave the first impetus to the great Bach revival through which that composer at last obtained due recognition. In April, 1829, Mendelssohn made the first of several visits to England, where his former teacher, Moscheles, was settled. He was well received socially, and his concert appearances both as pianist and composer were highly successful. He made a tour of Scotland and visited the Hebrides. During a visit to the ruined palace of Holyrood, with its traditions of Queen Mary, he hit upon the beginning of his *Scotch Symphony;* and his trip to the islands inspired his *Hebrides* or *Fingal's Cave* overture. The germ of his *Reformation Symphony* also dates from this time. The *Scotch Symphony*, however, was not completed until many years later, having its first performance in Leipzig in March, 1842, and in London at a Philharmonic concert in June of the same year.

In 1830 he declined an offered professorship of music in the University of Berlin, and in the same year he traveled to Italy. In Rome he began one of his most important works, the cantata to Goethe's *First Walpurgis Night*, and in a letter to Fanny, dated from Rome, in February, 1831, he writes that the *Italian Symphony* is making great progress. After various travels, including visits to Paris and London, where his appearances again were highly successful, he accepted an invitation to conduct a music festival at Düsseldorf. This led to his taking, in 1833, the post of musical director of the city, where he remained, quickening the musical life of the place and engaging in the composition of the greater part of his oratorio of *Saint Paul*, until 1835, when he became conductor of the famous Gewandhaus concerts in Leipzig. Here his activity was of the utmost importance. He not only brought the orchestra to a high state of perfection, but he was chiefly instrumental in the founding of the Leipzig Conservatory.

His oratorio of *Saint Paul* was brought out at the Lower Rhenish Musical Festival (q.v.), at Düsseldorf, under his own direction, in May, 1836. In 1837 he married Cécile Jean-Renaud, the daughter of a French clergyman in Frankfort. Their union was a most happy one. During his incumbency at Leipzig he made frequent tours, and in 1841 went, at the invitation of Frederick William IV., to Berlin, and at his instigation composed the music to *Œdipus*, *Œdipus Colonos*, and *Antigone; Athalie;* and the rest of his music to the *Midsummer Night's Dream*. Late in 1842 he returned to Leipzig. Previously during that year he had visited England for the seventh time, and by invitation had played for Queen Victoria and the Prince Consort at Buckingham Palace. In 1844 he was again in England, and in August, 1846, brought out with overwhelming success at the Birmingham festival his oratorio *Elijah*. In 1847 the sudden death of his beloved sister Fanny came as a great shock to him, and his system, weakened by overwork, succumbed. In September, in Leipzig, while listening to his own recently composed *Night Song*, he swooned away. Nervous prostration followed, and on November 4th he died.

Probably no composer ever was so fêted during his lifetime or lost so much ground after his death as Mendelssohn. He was the idol of the public and a large circle of friends. In England his popularity amounted to a Mendelssohn worship. His music, polished like himself, perfect in form, melodious, easily understood, and not too difficult technically, immediately became popular in concert and drawing rooms. It presented no problems and solved none. He was, as a rule, a rapid producer; the music to *Antigone* was composed in eleven days. But the very quality which made his music attain such immediate popularity, a certain superficial prettiness, has caused much of it to be laid aside. His oratories still are given, and the *Elijah* especially holds its own; the violin concerto is an admirable composition; the *Midsummer Night's Dream* overture has fairylike grace; certain *Songs Without Words* and the *Variations sérieuses* have a definite value in the pianoforte curriculum; and several of his choral works are highly valued. But the bulk of his product is less and less heard of. As a conductor his attitude toward new departures was not friendly. Wagner's *Tannhäuser* overture he played at a Gewandhaus concert 'as a warning example.' But for Bach and the appreciation of Beethoven's later works he did much.

Consult: Lampadius, *Life of Mendelssohn* (English translation by Gage, London, 1876), a standard work; Rockstro, *Mendelssohn*, "Great Musicians Series" (London, 1890), an excellent short life; Hensel, *The Mendelssohn Family, 1729-1847, from Letters and Journals* (English translation by Carl Klingemann, New York, 1881); Schubring, *Reminiscences of Felix Mendelssohn*, in the London *Musical World* for May 12 and 19, 1866; Hiller, *Mendelssohn, Letters and Recollections* (London, 1874); and an exhaustive biography in Grove, *Dictionary of Music and Musicians* (London, 1890).

MENDELSSOHN SCHOLARSHIP. The most valuable musical prize in Great Britain, which entitles its holder to a course of study abroad. The movement for founding such a scholarship began in 1848, when the proceeds from a performance of *Elijah* were set aside for the purpose. In 1856 the first scholar, Arthur Sullivan, was elected. The capital has been gradually added to until the annuity now consists of about five hundred dollars. There is also a Mendelssohn scholarship in Berlin, whose value is about seven hundred and twenty dollars, half of which is awarded to composers and half to virtuosos.

MENDENHALL, mĕn'den-hạl, THOMAS CORWIN (1841—). An American physicist, born near Hanoverton, Ohio. He received a common school education, became professor of physics and mechanics in the Ohio State University in 1873, and in 1878 accepted the chair of physics in the Imperial University at Tokio, Japan. His labors there were later incorporated into the Government meteorological system; and he was also one of the founders of the Tokio Seismological Society. He returned to Ohio in 1881, perfected the Ohio State weather service, and in 1884 was called to the United States Signal Service at Washington. In 1886 he was made president of the Rose Polytechnic Institute, Terre Haute, Ind.; in 1889 he became superintendent of the United States Coast and Geodetic Survey; and in 1894 became president of the Polytechnic Institute at Worcester, Mass. He has made several important contributions to physical science, and is the author of *A Century of Electricity* (1887).

MENDERES, mĕn′dẽr-ĕz. The modern name of the Mæander (q.v.), a river of Asia Minor.

MENDÈS, mäɴ′dȧs′, Catulle (1841—). A French poet and novelist, born in Bordeaux, May 22, 1841. He founded (1849) the *Revue Fantaisiste*, devoted to the interests of the 'Parnassian' poetic group and to 'art for art's sake.' His verses, dramas, novels, and short stories are beautiful in form, but often base in morals. Noteworthy among many volumes are: *Poésies* (1878); the dramas *Le capitaine Fracasse* (1870), *Le châtiment* (1887), and *Fiammette* (1889); the novel *La femme-enfant* (1891); and the short *Folies amoureuses* (1877), all of which show morbidity and most of them eroticism.

MENDES LEAL, mȧn′dȧsh lȧ-äl′, José da Silva (1818-86). A Portuguese dramatist and diplomat, born at Lisbon. He produced a number of plays which have been very successful. The following are the best: *Os dous renegados* (1839); *Egas Moniz* (1861); *Madre Silva* (1847); *A pobre das ruinas* (1846); *Os homens de marmore* (1854); *Os homens de vidro* (1855); *Pedro* (1857); *A escala social* (1858); and especially the comedies *O tio André que vem do Brazil* (1855), and *Receita para curar saudades* (1857). He was a member of the Portuguese Academy (1846) and director of the National Library.

MENDES-PINTO, mȧɴ′dĕsh-pēɴ′tō. Fernão. See Pinto, Fernão Mendes.

MENDIBURU, mĕn′dė-bōō′rōō, Manuel de (1805-85). A Peruvian historian, born at Lima. He studied at the University of San Marcos; entered public life in 1819 as a clerk; and at the outbreak of the Revolution of 1821 joined the patriot forces. He was captured by the Spanish troops, but was released at the end of the war, and held various posts under the Peruvian Government. His great collection of materials for a history of Peru was published as a *Diccionario histórico-biográfico del Peru* (1874 sqq.), which, although complete only for the early and colonial period, is a most valuable work.

MENDICANCY (from *mendicant*, from Lat. *mendicans*, pres. part. of *mendicare*, to beg, from *mendicus*, poor). The practice of begging. A beggar is one who seeks to get his living, in whole or in part, by soliciting alms. The word beggar is probably derived from the Beghards, a religious order of the Middle Ages corresponding to a similar order among women, the Béguines (q.v.). Small communities of the Béguines still exist in Belgium.

In primitive societies beggars have little chance for existence. Whenever and wherever a surplus results from labor, there appears a class of the economically unfit ready and anxious to live as parasites on the labor of others. If, through the influence of religion or other causes, almsgiving comes to be looked upon as a virtue, mendicants will rapidly increase. Such a condition existed in Europe in the Middle Ages, and beggars became so numerous that they threatened to overrun the Continent. The Church inculcated almsgiving and emphasized it as a means of obtaining future happiness. The great success of the orders of the 'begging friars,' the Franciscans, Dominicans, Carmelites, and Augustinians encouraged begging among the laity. Meantime there was a gradual development of monasteries, hospitals, guilds, and private benevolence, entirely independent of each other, yet all giving alms, and this without any thought of investigation as to the worthiness of the recipient.

In 1349 England began to forbid begging. France followed in 1350, and later some of the German towns, as Esslingen (1384) and Brunswick (1400). Such legislation was of little effect. During the fifteenth century the idea gradually gained ground that the able-bodied poor must be set at work. The adoption of this view involved the overthrow of the old theory of almsgiving, and it was steadily opposed by the Church.

The sixteenth century marks a great change. Luther said that one of the most crying needs of Christian countries was the prohibition of begging, and measures to this effect introduced in the 'Regulation of a Common Chest' became the basis for subsequent reforms. Under the influence of Zwingli, Zurich prohibited begging in 1525. The Catholic Vives wrote *De Subventione Pauperum* (Bruges, 1526), which led to the breakdown of the old system in Catholic Europe, in the North at least, for in Spain, through the influence of the Dominican Monk Soto, the prohibition was not decreed, and Italy has only partially forbidden the custom.

Germany after the Thirty Years' War made more stringent regulations, but the various States were not in harmony, and the root of the evil was not reached. Frankfort (1620), Anhalt 1770), Hesse (1777), forbade begging entirely. Hamburg followed in 1788 and forbade also gifts to beggars. Here was introduced more effective investigation of the individual cases, and other cities copied the plan. By 1791 it is reported that open begging had been stopped. The general German law is that vagabonds (Landstreicher, best translated tramps) may be imprisoned. Beggars, those who ask alms either in person or through letters, may be put to hard work. In some of the States appeals for assistance may not be published in the papers without special permission. Bavaria made a statistical investigation of mendicancy between 1870 and 1880 which showed that some 20,000 persons were convicted each year. In Saxony between 1880 and 1887 of those convicted 47 per cent. were Saxons, 42.7 from other German States, and 10.3 foreigners. In many towns there is a Verein gegen Verarmung und Bettelei.

France forbade mendicancy in 1566, but the efforts made to enforce the law were ineffective. In 1627 it was ordered that beggars be impressed into the navy. Later, beggars were commanded to leave Paris under penalty of being sent to the galleys. After the Revolution, however, penal colonies, dépôts de mendicité, were established.

Italy prohibited begging in 1865, but local authorities may issue permits (permissi di mendicare), and begging, licensed or not, abounds, particularly in the southern provinces.

The practice has also been prohibited in other countries—Denmark (1789, 1803, 1860), Norway

(1863), Russia (1864), Sweden (1885). In Mohammedan lands, where almsgiving is still a religious obligation, beggars abound.

England in 1536 decreed that an able-bodied beggar should be whipped for the first offense, have his ears cropped for the second, and be executed as a felon and common enemy for the third. In 1547 he was to be branded and become the slave of any one who would care for him for two years. In the act of 1536 'common and open doles' were prohibited, and the parish authorities instructed to care for the worthy poor. The civic authorities were still trying various schemes. Oxford had four 'bedells of the beggars' who "took a ward every Friday to gather the devotion of the houses," and on other days, "daily the streets to walk, to look what other beggars or vagabonds do come into the city and then to give notice to the constables." In Southampton in 1540 a 'master of beggars' with a silver gilt badge and small annual fee is mentioned. York (1538) decided that "from henceforth no Head-beggars shall be chosen," and by the end of the reign of Elizabeth the other towns had followed her example. In 1562 compulsory labor was made possible. In 1601 came the famous poor law of Elizabeth (43 Eliz., c. 2) which emphasized the necessity for work; 1676 marked the establishment of the first workhouse at Bristol, and with these changes the modern system is inaugurated. Yet begging was not abolished, and in Scotland (see *The Antiquary*, Walter Scott) in the early part of the nineteenth century the 'Bedesmen' or 'Blue Gowns' were licensed. The present English law is that of 1824. Habitual begging is a criminal offense, punishable in a summary manner, that is, without trial by jury. (See Vagrant.) For the first offense one may be committed as 'idle and disorderly' to one month at hard labor; for the second offense as a 'rogue and vagabond' for three months; for a third as an 'incorrigible vagabond' for one year. One who solicits charitable contributions by lying letters, false writings, or any other cheat, is liable to punishment for obtaining money under false pretenses (q.v.). If begging be accompanied by threats of violence, it may subject the offender to punishment for robbery (q.v.).

In the United States mendicancy has been looked upon as bad, and is generally forbidden. The laws have been very leniently enforced, and in many places are almost dead letters. Only one State, Massachusetts, has provided a farm colony to which beggars may be sent and made to work. In some cities energetic steps are being taken to make begging unprofitable, and special attention is being paid to parents who send young children out to beg, or who cover their begging by pretense of selling odds and ends.

The experience of all countries has shown that mendicancy will thrive wherever indiscriminate almsgiving prevails. In modern society it may practically be stopped if steps are taken to care properly for the worthy poor and to compel others to work or else go hungry.

For an account of the general development of the care of the poor, see Poor Law. See, also, Charity Organization Society; Tramps; Social Debtor Classes; Pauperism.

Consult: Ribton-Turner, *History of Vagrants and Vagrancy* (London, 1887); Luther, *Book of Beggars*, Eng. trans. (London, 1860); Henderson, *Dependents, Defectives, Delinquents* (Boston, 1901). This work contains an excellent theoretical discussion of the subject. Ashley, *English Economic History* (New York, 1893), contains a chapter on the development of poor relief. Ratzinger, *Geschichte der kirchlichen Armenpflege* (2 ed., Freiburg im B., 1884), discusses mediæval poor relief from a Catholic standpoint; Reitzenstein, *Die Armengesetzgebung Frankreichs* (Leipzig, 1881), gives an historical account of its development; Böhmert, *Sächsische Bettler- und Vagabundenstatistik von 1880-87* (Dresden, 1888), gives an account of the investigations into the question of mendicancy; Lammers, *Die Bettelplage* (Berlin, 1879); *Proceedings of the National Conference of Charities and Correction* (Boston), yearly reports of Charity Organization Societies and similar organizations; Hugo, *Notre Dame de Paris*, and Reade, *The Cloister and the Hearth*, contain accounts of the organizations of beggars; Ehrle, *Beiträge zur Geschichte der Armenpflege* (Freiburg, 1881), discusses the mediæval theory of almsgiving.

MENDOCINO, měn′dô-sē′nô, Cape. See Cape Mendocino.

MENDOZA, měn-dō′så. A province of Argentina, situated in the western part of the Republic, and bounded on the north by the Province of San Juan, on the east by San Luis, on the south and southeast by the Territories of El Pampa and Neguen, and on the west by Chile (Map: Argentina, D 10). Its area is estimated at 55,000 square miles. With the exception of the portion adjoining the Andes, the surface of the province is practically occupied by an extensive plain mostly sandy and only indifferently fertile. The western portion is occupied by the slope of the Andes Range, which rises on the boundary to a height of over 22,000 feet in Mount Aconcagua. Several lofty passes lead from the province into Chile. The inhabitants of the province are engaged chiefly in agriculture and stock-raising, and cattle, hides, and wool are among the chief exports. Wheat, corn, and lucerne are the chief agricultural products, but vine-culture and the production of wine have of late become an important industry. Owing to the dry climate and the scarcity of water, artificial irrigation is usually necessary. The mineral deposits of Mendoza are of importance, but mining is still in a backward state. Population, in 1895, 116,136. The capital is Mendoza.

MENDOZA. The capital of the Province of Mendoza, Argentina, situated at the eastern base of the Andes, 160 miles east of Valparaiso, on the railroad between that city and Buenos Ayres (Map: Argentina, D 10). The town has a national college, an agricultural institute, normal schools for both sexes, and a street railway. Population, 20,000. Mendoza was founded in 1560. It was the scene of a terrible earthquake in 1861, which destroyed the city and killed 10,000 people.

MENDOZA, měn-dō′thå, Anna de, Princess of Eboli. See Eboli.

MENDOZA, Antonio de, Count of Tendilla (c.1485-1552). A Spanish administrator, born in Granada. He was a member of an illustrious family and became a great favorite with the Emperor Charles V. Constant quarrels in New Spain between the Governor, the nobility, and the Audiencia (the commission representing the Emperor) led to the determination to appoint in each territory a personal representative of the Emperor's authority, and Mendoza was appointed the first Viceroy of Mexico. He arrived there in 1535. With him he brought a printing press on which was printed the next year *La Escala de San Juan Climoca*, the first book printed in Mexico. A mint was established the same year, schools and hospitals were built, and a college was founded. The breed of sheep was improved, silk culture was encouraged, and better methods of agriculture were introduced. In 1542 a formidable insurrection of the Indians was suppressed. An expedition under Vasquez de Coronado was sent to discover the mythical city of Cibola and the no less mythical Quivira, and explored much of what is now New Mexico and Colorado. Mendoza was not able to carry into effect the prohibition of further enslavement of the Indians, but succeeded better than might have been expected. In 1550 he was appointed Viceroy of Peru. He was an amiable but dignified and just man, a striking contrast to many of the Spanish rulers.

MENDOZA, DIEGO HURTADO DE (1503-75). A Spanish statesman and man of letters, born at Granada. Trained at Salamanca for the Church, he entered instead upon a military career and passed through the Italian campaigns of Charles V. The latter sent him as Ambassador to Venice, whence he passed (in 1547) to Siena as the Imperial Governor. He had (in 1545) represented his Imperial master at the Council of Trent; and in 1549 he went to Rome to carry out Charles's policy of bullying the Papacy. In 1554 he returned to Spain. As a poet Mendoza has left compositions in the older conventional Spanish manner, and some that show the influence of his classical attainments; he gained greatest repute in his own time, however, as one of the leaders in the movement which accomplished the Italianizing of Spanish lyric poetry. Mendoza's prose work of the most importance is his *Guerra de Granada*, dealing with an insurrection of the Moors. His acquaintance with Arabic equipped him admirably for the performance of this historical task, but his outspoken honesty prevented the appearance of a complete edition of the work until 1730, for the editions of Madrid (1610) and Lisbon (1627) are defective. Consult his verse in vol. xxxii. of the *Biblioteca de autores españoles*, and, in vol. xxi. of that same collection, an edition of the *Guerra de Granada*; J. D. Fesenmair, *D. Hurtado de Mendoza, ein spanischer Humanist des 16ten Jahrhunderts* (Munich, 1882); Foulché-Delbosc, in the *Revue Hispanique* i., 101, and ii., 208.

MENDOZA, IÑIGO LOPEZ DE, Marquis de Santillana. See SANTILLANA IÑIGO LOPEZ DE MENDOZA, Marquis de.

MENDOZA, JUAN GONZÁLEZ DE (c.1540-1617). A Spanish prelate, born at Toledo. He joined the army, but after some years resigned to enter the Order of Saint Augustine. In 1580 he was sent by Philip II. to China, where he spent three years in gaining information as to the politics, commerce, and customs of the country. He spent two years in Mexico before returning to Spain. He was afterwards Bishop of the Lipari Islands, of Chiapas, and of Popayán, where he died. He published an account of his observations in China in a work entitled *Historia de las cosas más notables, ritos y costumbres del gran reyno de la China.* An English translation appeared in 1588, and was reprinted by the Hakluyt Society in 1853-54.

MENDOZA, PEDRO DE (c.1487-1537). A Spanish explorer. He was of a noble family high in the favor of the Emperor Charles V. In 1529 he offered to explore South America at his own expense and establish colonies. He was made military Governor of all the territory between the Rio de la Plata and the Straits of Magellan, and the Emperor gave 2000 ducats and advanced 2000 more on the condition that within two years Mendoza should transport one thousand colonists, build roads into the interior, and build three forts. He was to have half the treasure of the chiefs killed and nine-tenths of the ransom. The office of Governor was also made hereditary. In 1534 with a considerable fleet he set sail, but a terrible tempest scattered it off the coast of Brazil. Here his lieutenant, Osorio, was assassinated, according to some authorities by the orders of Mendoza himself. He sailed up the Rio de la Plata and founded Buenos Ayres in 1535. Pestilence broke out, and the natives became unfriendly. His brother Diego, who led a force against the hostile tribes, was killed with three-fourths of his men. A general conspiracy of the natives was formed, and the city was captured and burned. Another brother, Gonzalo, arrived with reënforcements and founded the city of Asunción in Paraguay in 1536. Mendoza, disappointed and broken in health, embarked for Spain, but died a maniac during the voyage, in 1537.

MEN'EDE'MUS (Μενέδημος) (?-c.277 B.C.). A Greek philosopher, a native of Eretria. According to some authorities, he studied under Plato; according to others, under Stilpo at Megara. He was the founder of the Eretrian School of philosophy, and was also one of the leading men in the political affairs of his State. All that is known of the philosophy of Menedemus is that it closely resembled that of the Megarian School.

MEN'ELA'US (Lat., from Gk. Μενέλαος). In ancient Greek legend, a King of Lacedæmon, the younger brother of Agamemnon and husband of the famous Helen. The abduction of his wife by Paris is represented as the cause of the Trojan War. In the *Iliad* he appears most prominently in the duel with Paris, when the life of the latter is saved only by the divine interposition of Aphrodite, and in the battle over the body of Patroclus, where he is one of the foremost combatants, and eventually carries the corpse from the field. After the capture of Troy he slew Deiphobus, who had wedded Helen after the death of Paris, and in some versions intended to kill his wife, but was disarmed by her beauty. After the fall of Troy he sailed with Helen for his own land; but his fleet was scattered by a storm, and he wandered for eight years about the coasts of Cyprus, Phœnicia, Egypt, and Libya. After his return he lived at Sparta with his wife, Helen, in great happiness. Both Menelaus and Helen were worshiped as gods at Therapne, near Sparta, and it is probable that here, as so commonly in Grecian heroic myths, we have two local deities who have been reduced to hero and heroine.

MENELAUS. A Greek mathematician, who lived c.100 A.D. He wrote a book on the calculation of chords, not now extant, and a work in three books, under the title *Sphærica*. The latter, although not now extant in Greek, is known in Arabic and Hebrew, and in several Latin translations. It is a treatise on spherical triangles, with respect not to their solution, but to their geometric properties. One of the most interesting propositions is that concerning a spherical triangle cut by a transversal, the corresponding proposition for plane triangles being stated as a lemma. This theorem, known by the name of Menelaus, asserts that if the lines of the three sides of a triangle be cut by a transversal, the product of three segments which have no common extremity is equal to the product of the other three. For spherical triangles 'the chords of three segments doubled' replaces 'three segments.' The proposition was often called in the Middle Ages the *regula sex quantitatum*.

MEN'ELEK, or, more correctly, MENILEK (1844—). A King of Abyssinia, born in Ankobar, where his father, Ailu Malakoth, was crown prince of the Kingdom of Shoa. After his father's death in 1855, Menelek was for ten years interned in Gojam by his father's rival, Theodore, who attempted to make peace with him by giving him his daughter to wife. But in 1865 he escaped to Shoa, where he managed to establish himself, thanks to England's interference in Abyssinia, and as King (or *Ras*) of Shoa had little trouble in defeating the son of John in 1889 and in coming to the Abyssinian throne, to which he claimed a family right by his descent from King Solomon. For the most part friendly to European civilization, Menelek was in many respects a savage. But he showed remarkable ability in bringing his army to a high pitch of boldness. England's intervention between Italy and Abyssinia had already checked an open break, but when Italy claimed a protectorate by the Treaty of Uchali, Menelek protested in 1893, and in 1896 by the victory at Adowa forced Italy to sign the Peace of Addis Abeba, thus giving up all claim to a protectorate. He came to a complete understanding with Great Britain in 1898. See ABYSSINIA.

MENENDEZ DE AVILES, mȧ-nān'dȧth dȧ ä'vė-lās', PEDRO (1519-74). The founder of Saint Augustine, Fla. He was born at Avilés, in Asturias, Spain. Philip II. placed him in command of the fleet which escorted the treasure vessels to and from the West Indies. Securing a grant of Florida with the title of Adelantado or Governor, he set sail, June 29, 1565, with nineteen vessels carrying fifteen hundred settlers, with orders to occupy the country and expel the French, who were making this their headquarters for privateering. On Saint Augustine's day, August 28th, Menendez discovered the harbor, on whose shores, on September 6th, he began to build a fort, around which the present city of that name has grown up. Here the French Huguenots under Ribault (q.v.) attacked him, but a hurricane drove them off, and before they could return to their settlement at Fort Caroline on the Saint John's River, Menendez attacked that post and massacred one hundred and forty-two of the garrison. The French fleet meanwhile had been wrecked, and the crews were forced to surrender to Menendez, who put a hundred and eighty of them to death. In 1567 Menendez returned to Spain, and during his absence, in April, 1568, his colony was attacked by a French fleet under Dominique de Gourges, who hung a number of Spaniards. Meanwhile Menendez had already started back, sailing from San Lucas on March 13th with supplies and reinforcements, with which he reëstablished Saint Augustine. He had been appointed Governor of Cuba, and his efforts during the next few years were mainly devoted to that island and the gulf mainland. In 1570 he sent an expedition to the Chesapeake, which ascended the Potomac and built a chapel on the Rappahannock, where the party were killed by the Indians. In 1572 Menendez revisited Florida and went on to the Chesapeake, where he captured several Indians supposed to have taken part in the massacre of his colony two years previously, and hung them. Philip II. soon after this recalled him to Spain, where he died at Santander, September 17, 1574.

MENENDEZ Y PELAYO, mȧ-nȧn'dȧth ė pȧ-lä'yō, MARCELINO (1856—). A Spanish man of letters, born in the District of Santander, November 3, 1856; he studied there and at the universities of Barcelona and Madrid. When but twenty-two years old he was appointed to a chair of philosophy and letters in the University of Madrid, and at the age of twenty-five he was admitted into the Spanish Academy. He relinquished his chair at the university after more than twenty years' service to become director of the Biblioteca Nacional. Menendez y Pelayo is a humanist in letters and one of the most capable critics that Europe has produced in modern times. His works are as remarkable for their finish of form as they are for solidity of content, and give ample proof of the author's patriotism and respect for the institutions and traditions of his country. Menendez y Pelayo's literary activity began with the *Estudios críticos sobre escritores montañeses* (Santander, 1876), and the treatise, *Horacio en España* (2d ed. Madrid, 1885). The volume *Calderón y su teatro* (Madrid, 1881) contains lectures delivered upon the occasion of the centenary of the great dramatist. Various essays that had done duty as prefaces to books or as critiques were gathered together into the volume entitled *Estudios de crítica literaria* (Madrid, 1884). Religious discussions play no small part in the noteworthy *Historia de los heterodoxos españoles* (1880-81), and his æsthetically critical temperament is nowhere better exhibited than in the series of volumes constituting the *Historia de las ideas estéticas en España* (1884-91). His verse, which is graceful, also displays well the erudition of the man, as may be seen in the collection *Odas, epístolas y tragedias* (1883).

MENEP'TAH, or **MERNEPTAH** (Egyptian *Meri-en-Ptah*, 'Beloved of Ptah': Lat. *Amenephthes;* Gk. Αμμενεφθίς, *Ammenephthis*). A king of Egypt, the son and successor of Rameses II. (q.v.). He reigned for some twenty years about the middle of the thirteenth century B.C., and, in the fifth year of his reign, repelled a formidable invasion by Libyans and pirates. He built largely at Tanis, and left monuments in various parts of Egypt. Formerly there seemed to be good grounds for identifying this King with the Pharaoh of the Exodus, but an inscription, discovered in 1896, mentions Israel as settled in Palestine in the fifth year of Meneptah's reign, and the identification is therefore impossible. The text of this interesting inscription, which contains the only mention of Israel to be found on the Egyptian monuments, was published with a German translation by Spiegelberg, in the *Zeitschrift für ägyptische Sprache*, vol. xxxiv. (Leipzig, 1896), under the title "Der Siegeshymnus des Merneptah auf der Flinders Petrie Stele." The mummy of Meneptah was found at Thebes in 1898, and is now in the Museum of Cairo. Consult Budge, *A History of Egypt* (New York, 1902). See also Egypt.

MENES, mē′nēz (Egyptian *Meni*; Gk. Μήν, *Mēn*, Μήνης, *Mēnēs*). A king of Egypt whom the Egyptians regarded as their first historical monarch. His name invariably stands at the head of all monumental lists of Egyptian kings, but little is known in regard to him. According to Manetho he was a native of This, and reigned for sixty-two years. Herodotus and other Greek writers attribute to him the foundation of Memphis, and relate many other fables concerning him. In modern times certain scholars have believed that he was the Pharaoh who united Upper and Lower Egypt under a single monarchy, but recent discoveries indicate that the union took place at an earlier date. At present there is a tendency to identify Menes with an early king of whom many small memorials have been found near This. Two large tombs—one at Naggadah, near Coptos, the other near Abydos—are filled with objects bearing the name of this King. The reading of the name is, however, not altogether certain, and the proposed identification is therefore doubtful. Consult: Budge, *A History of Egypt* (New York, 1902); *Sitzungsberichte der Berliner Akademie der Wissenschaften* (Berlin, 1897); *Revue Critique* (Paris, 1897); *Zeitschrift für ägyptische Sprache*, vol. xxxvi. (Leipzig, 1898). See also Egypt.

MENFI, mĕn′fē. A town in the Province of Girgenti, Sicily, 30 miles south by east of Marsala (Map: Italy, H 10). It exports corn, barley, cotton, and wine. The quarries of the vicinity are supposed to have furnished the building material for the temples of ancient Selinus. Population, in 1901 (commune), 10,281.

MENG′ER, Karl (1840—). An Austrian economist, born at Neu-Sandez, in Galicia. He studied law and political science in Vienna and Prague, and in 1873 became professor of political economy at the University of Vienna. Since 1900 he has been a member of the Austrian House of Peers. He was the leader of a reaction against the historical method in economics, and is one of the most prominent leaders of the so-called Austrian school of political economy. His most important work, from a theoretical standpoint, is *Grundsätze der Volkswirtschaftslehre* (1871). Other important works of his are: *Untersuchungen über die Methode der Sozialwissenschaften und der politischen Oekonomie insbesondere* (1883); *Die Irrtümer des Historismus in der deutschen Nationalökonomie* (1884); and *Beiträge zur Währungsfrage in Oesterreich-Ungarn* (1892).

MENGS, mĕngs, Raphael (1728-79). A German historical and portrait painter. He was born at Aussig, Bohemia, March 12, 1728, the son of Ismael Mengs, a miniature painter of some repute, who in 1741 took him to Rome. On his return to Dresden in 1744 he was appointed Court painter by the Elector Augustus III., who permitted him to continue his studies at Rome. There he painted the first of his larger compositions, a "Holy Family," now in the Gallery of Vienna, and of additional interest because the model for the Madonna was Marguerita Guazzi, a beautiful peasant girl whom he married, and for whose sake he embraced Catholicism. The financial distress occasioned by the Seven Years' War caused his pension to be stopped, and he was in distress at Rome, but his fortune turned when the Duke of Northumberland employed him to paint a copy of Raphael's "School of Athens." In 1754 he was made director of the new Art Academy on the Capitol; in 1757 he painted the ceiling in San Eusebio, and soon after the "Mount Parnassus" in the Villa Albani.

On a visit to Naples he attracted the attention of the King, who, on his accession to the throne of Spain as Charles III., invited Mengs to Madrid. During this first sojourn at Madrid (1761-69) he executed several frescoes in the royal palace, of which "Aurora and the Four Seasons" is the best. Intrigues against him and feeble health caused his return to Italy, but he was summoned back to Madrid in 1772 to complete his work in the royal palace. He painted there the "Apotheosis of Trajan," his most important fresco, and the "Temple of Fame." In 1775 he returned to Rome, where he died, June 29, 1779.

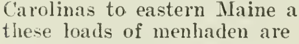
His fresco paintings are superior to his canvases. Good examples of the latter are a "Nativity" in Madrid, and an "Annunciation" in the Vienna Gallery. Mengs was an eclectic who endeavored to blend the beauty of antique art with that of the great Italian masters. Living at a time of extreme degradation in art, he commanded great admiration by his skill in composition and his thorough knowledge of technical processes. He exercised a profound influence upon his contemporaries, and trained numerous pupils. Consult Woermann, *Ismael und Raphael Mengs* (Leipzig, 1893).

MENG-TSZE, mĕng′tsē′. A town in the Province of Yun-nan, China, situated amid mountains at an elevation of about 4600 feet, about 40 miles from the frontier of Tongking (Map: China, B 7). It is a well built city with traces of its splendor and importance before the Taiping Rebellion. It was opened to foreign commerce in 1889 in accordance with the French Treaty of Tien-tsin of 1886. The trade is mostly transit and with Hong Kong. The merchandise is transported by the Red River as far as Man-has, a village on the left side of the river about 40 miles from Meng-tsze, and from there is carried by coolies and pack animals inland. The chief exports are tin from the adjacent mines and opium; textiles and tobacco are imported. The total trade amounted in 1900 to over $4,000,000. Meng-tsze is connected by telegraph lines with Yun-nan-fu and the frontier of Tongking. The French Government has obtained a concession for the construction of a railway line from Lao-kai on the frontier to Yun-nan-fu via Meng-tsze. Population, about 12,000.

MENHADEN, mĕn-hā′den (corrupted from Narragansett Indian *munnawhatteaúg*, fertilizer; in allusion to its use as a fertilizer in the cornfields). A small fish (*Brevoortia tyrannus*), closely related to the shad (q.v.), which is caught in great quantities on our eastern coast during the summer months. Its length varies from 12 to 18 inches; the color of the upper parts is greenish brown with a black spot on the shoulder, the belly silvery, and the whole surface iridescent. The flesh is not highly esteemed as food and is very full of small bones; but it is rich in oil and nitrogen.

Economic Uses. The menhaden is one of the most interesting and valuable of American sea-fishes, and its catching and utilization give occupation to a large amount of capital and number of men and vessels. (See Fisheries.) It is extremely irregular in its movements and numbers, migrating into deep water or to warm latitudes on the approach of cold weather, and reappearing north of Cape Hatteras with advancing warm weather. In some years it has been extremely numerous as far north as Nova Scotia; while there have been periods when the fish seemed to have forsaken America altogether. It appears along shore in schools, which may contain a million or two of fishes, swimming near the surface. With ordinary care such a school may be surrounded by a net, operated from two row-boats, and then hauled to the ship's side, where the net is pursed and the fish are dipped out and thrown into the hold. A catch of half a million is not unusual. Formerly small sailing vessels were altogether used, but since about 1875 high-powered, tug-like steamers have mostly replaced them. All along the shore from the Carolinas to eastern Maine are 'factories' where these loads of menhaden are sold. Their bodies yield oil of a superior sort, useful for every purpose to which any fish or whale oil may be applied. This is obtained by boiling and pressing. (See Oil.) From the residue is made a nutritious animal food called 'fish meal,' and a highly nitrogenous ingredient of artificial guanos. In early times, following the example of the Indians, the fish themselves used to be spread upon the farms near shore, and plowed into the soil; but it was found that apart from the extremely disagreeable taint this gave to the air of the whole region, the soil was injured by saturation with oil.

Great quantities of menhaden are also used as bait in the Banks fisheries; are sold fresh in the markets, very cheaply; and are salted for domestic use or to be exported to the West Indies; and the young are extensively canned in oil as 'American sardines' and 'shadines.' The fish has, however, a still higher economic value in serving as the food of other fishes important to us. It itself subsists mainly upon minute vegetable material contained in the mud of bays and soft shores, and is enormously fecund. Every predaceous animal in the sea eats menhaden. Goode estimated that the total number of menhaden devoured by fishes annually could only be counted by millions of millions; and he declared that were the menhaden to disappear three-fourths of the value of the American fisheries would instantly vanish.



FISH-LOUSE OF THE MENHADEN.

A degraded entomostracan parasite (*Lerneonema radiata*); the 'rooted' head is at the right.

The menhaden is known by an extraordinary number of different names: as 'pogy,' in Maine; 'bony fish' in eastern Connecticut; 'white fish' in western Long Island Sound; 'bunker,' a shortening of 'mossbunker' (q.v.), about New York and New Jersey; 'bugfish' or 'bughead' in Delaware and Chesapeake bays, referring to a parasitic crustacean (see Parasitism) in the mouths of the southern menhaden; and farther south as 'fatback,' 'yellowtail,' and 'savega'—the last the Portuguese term in South America. The menhaden of the Gulf of Mexico is a variety locally called 'alewife,' 'herring,' etc.; and other varieties extend the range of the species to Brazil.

Bibliography. Goode, "The Menhaden," an elaborate memoir, in *Report of the United States Fish Commission*, part v. (Washington, 1877); and a more condensed account in *Fishing Industries*, sec. i. (Washington, 1884). For a picturesque account of catching menhaden, see "Around the Peconics," in *Harper's Magazine*, vol. lvii. (New York, 1881). See Plate of Herring and Shad.

MENIN, me-năɴ′. A frontier town of West Flanders, Belgium, situated 30 miles southwest of Ghent, on the left bank of the Lys, which here forms the French boundary (Map: Belgium, B 4). It has a handsome church, a seminary, manufactures of lace and cotton textiles, and a famous old brewery. It was formerly fortified, but its works have been demolished. Population, in 1890, 13,700; in 1900, 19,312.

MEN′INGI′TIS. An inflammation of the meninges, the membranes covering the brain and spinal cord. These are three in number: the *pia mater*, lying in contact with the substance of the brain and cord; the *dura mater*, lining the cranial cavity and spinal canal; and the *arachnoid*, a delicate web-like structure lying between the *pia* and *dura*. The term meningitis is specifically applied to an inflammation of the pia mater of the brain, described in this article under the heading of *Cerebral Meningitis*. Inflammation of the dura, whether of the brain or cord, is called *pachymeningitis*, and of the pia, *leptomeningitis*. The term arachnitis was formerly used on the supposition that the arachnoid might be the seat of an independent inflammatory process, but this is no longer believed to be possible. An inflammation involving the meninges of both the brain and cord is termed *cerebro-spinal meningitis*. For convenience of description the subject may be arranged under the following heads: Pachymeningitis, involving the dura of the brain and cord; cerebral meningitis, of which two forms are recognized: tubercular and simple; spinal meningitis, and epidemic cerebro-spinal meningitis.

Pachymeningitis. The dura becomes inflamed on its outer surface from injuries, or by extension from adjacent structures. In the head a common cause is suppurative disease of the middle ear (see Ear, Diseases), and in the spinal dura a very frequent cause is caries of the vertebræ. The internal surface of the dura is the seat of a peculiar hemorrhagic inflammation, hæmatoma of the dura mater, characterized by the formation of adventitious membranes, which appear to be repetitions of the arachnoid, having blood-vessels which rupture, the extravasated blood collecting in the form of cysts containing from an ounce to a pound of blood. The symptoms of this hemorrhagic form of pachymeningitis are primarily those of inflammation and secondarily due to pressure. There is some fever, irregularity of the pulse, headache, giddiness, somnolence, gradually deepening to coma; and there may be twitching and convulsions, followed by muscular weakness and paralysis. The disease affects the dura of both brain and cord, but the symptoms referable to the latter are often overshadowed by the cerebral effects. The diagnosis is very difficult and the termination almost invariably fatal. The case may be treated as one of apoplexy (q.v.), but nothing materially alters the course of the affection. A chronic hypertrophic form of internal pachymeningitis occurs in the spinal dura, producing an extensive thickening of the membrane. This in turn causes severe compression of the cord and spinal nerve-roots. After a first stage of shooting pains along the course of the nerves affected, with muscular twitchings and spasms, there gradually supervene anæsthesia, paralysis, and atrophy. As the compression increases, paraplegia, secondary degeneration, and rigidity of the paralyzed parts appear. This form of pachymeningitis is due to syphilis, alcoholism, or injury, and is thought by some writers to follow the hemorrhagic form. Treatment consists of counterirritation over the spine, with remedies for the pain and spasms. When the trouble is syphilitic great improvement may be derived from mercurials and potassium iodide.

Cerebral Meningitis. Acute inflammation of the pia mater of the brain occurs chiefly in two forms—tubercular, and simple or purulent. The arachnoid takes part, to a greater or less extent, in the inflammatory process.

Tubercular meningitis occurs at all ages, but is more common in children than in adults. The disease is caused by the *bacillus tuberculosis* and is usually secondary to a tuberculous process in some other portion of the body, for example, pulmonary phthisis, hip-joint disease, or caries of the spine. Primary cases are said to occur, but it is usually found after death that caseous tubercular glands, or other latent or previously unrecognized forms of tubercular infection, are present. The characteristic lesions of the disease are found in the pia mater at the base of the brain, or over the optic chiasm, crura, or pons. Tubercles are deposited along the vessels of the pia, which becomes thickened, opaque, and studded with grayish white granules. There is an exudation of lymph, gray or grayish yellow, but rarely purulent, into the meshes of the membrane in the same portions in which the tubercles exist and extending along the fissure of Sylvius and the middle cerebral artery. The upper surface of the hemispheres is only slightly affected, so that the disease is sometimes called basilar meningitis. The ventricles are generally distended with fluid (whence the old name, acute hydrocephalus), clear, milky, or even bloody. The symptoms of tubercular meningitis are very complex, and a case fully developed presents a painful clinical picture, particularly in children. The onset of the disease is often preceded by a period of general ill health. The child is peevish, irritable, and experiences a complete change of disposition, together with loss of appetite and constipation. The first or irritative stage then sets in suddenly, with a convulsion, or more commonly with vomiting, headache, and fever. The headache is severe and continuous, and the child moans and occasionally utters a sharp cry—the so-called 'hydrocephalic cry.' Sometimes the patient screams until utterly exhausted and has to be kept under the influence of powerful sedatives all the time. There is moderate fever and excessive sensitiveness to light and sound. In the second period of the disease, the stage of depression, the irritative symptoms subside. The child no longer complains of headache, but is dull and apathetic, drowsy or slightly delirious. Pulse and respiration are irregular, and fever continues. The head is retracted and the neck stiff. If the finger-nail is drawn across the skin of the forehead or abdomen a broad red streak appears, the *tâche cérébrale*, which may last for five minutes. In the last or paralytic stage, all these symptoms are intensified; the drowsiness increases to coma; paralysis of various parts of the body occurs, and death takes place in from ten days to three weeks after the onset of pronounced symptoms. Few cases recover. Treatment is entirely symptomatic and palliative. An ice cap is put upon the head, and sedatives are given internally.

Simple acute meningitis is as a rule purulent or suppurative. It may be caused by inflammation of neighboring tissues, e.g. otitis, suppurative phlebitis, or abscess of the brain; or may occur as a complication of pyemia, septicæmia, malignant endocarditis, or the specific fevers, particularly smallpox, typhoid, and scarlatina. The pia mater and arachnoid become infiltrated with purulent material, and the brain beneath them is commonly softened. The symptoms resemble in a general way those of the tubercular form just described, but the onset and course of the malady are much more rapid. When simple meningitis occurs in the course of other acute illnesses, its features may be masked to a certain extent, but in other cases the symptoms begin acutely with a chill, severe pain in the head, and vomiting, and the case passes on to convulsions, paralysis, coma, and death, as in the tubercular form. A fatal termination is the rule, but some recoveries occur after a long period of convalescence.

Spinal Meningitis. The membranes of the spinal cord may be affected separately, but it is common for inflammation to spread from one to the others. Inflammation of the dura, pachymeningitis, has already been described. Acute leptomeningitis, or acute spinal meningitis as it is called, involving the pia, is often of obscure origin, but is known to be due to exposure to cold, sunstroke, and injuries to the spine; and it sometimes complicates pneumonia, scarlatina, typhoid fever, and septicæmia. Not infrequently a tubercular inflammation accompanies a like process in the cerebral pia mater. The attack begins with the usual symptoms of meningeal inflammation, namely, vomiting, chill, fever, and pain. The pain is in the back; it may be local or general, and it is increased by movement or pressure. There are also shooting paroxysmal pains radiating along the course of the nerves arising in the affected area, and extreme sensitiveness of the skin and muscles to which those nerves are distributed. Irritation of the anterior nerve-roots leads to spasms of the muscles, producing rigidity of the spine with sometimes extreme arching (opisthotonos). In addition there is the usual accompaniment of fever. After a few days the symptoms of irritation give way to paralysis and insensibility, and the disease either proves fatal from exhaustion and failure of the respiratory muscles or lapses into a chronic condition with wasting and shortening of the muscles. Some patients recover after several months, while others ultimately die from bed-sores, or from renal or vesical complications. In this form of meningitis the pia mater is reddened and congested and small hemorrhages may occur. An exudation, at first grayish in color, but later purulent and yellow or greenish-yellow, takes place into the meshes or upon the surface of the pia, and the spinal fluid is rendered turbid and opaque. The inflammatory process may extend to the substance of the spinal cord (causing myelitis), or to the inner surface of the dura mater, involving of course the arachnoid and glueing the three membranes together. Treatment comprises rest in bed, upon the side or face, active purgation, and cups or leeches along the spine, followed by the application of ice. Internally drugs are given to relieve pain and diminish sensibility. In the chronic stage counterirritants are applied along the spine, and mercurials or iodides are administered. During convalescence tonics, massage, cold douches, and the electric current are of great service.

Chronic leptomeningitis may be a continuation of the acute form or it may be chronic from the beginning, and has been attributed to cold and exposure, syphilis, chronic alcoholism, and injury. It often occurs in connection with degenerative processes of the cord itself. The condition is one of gradual thickening of the pia mater with compression and atrophy of the nerve-roots. The symptoms are the same as in the acute form, with the difference that they come on gradually and there is no fever. Muscular spasm and rigidity are less marked.

EPIDEMIC CEREBRO-SPINAL MENINGITIS has been known only since the beginning of the nineteenth century, being first recognized in Geneva, Switzerland. It made its first appearance in America in Massachusetts in 1802. Many severe epidemics have since occurred both in Europe and America. The disease visited Ireland in a very fatal form in 1846 and again in 1866-68. It is a specific infectious disease due to a micro-organism, perhaps the *diplococcus intracellularis,* although this is not definitely settled. Very little is known of the causes which favor its transmission. The disease is not directly contagious from man to man, and it has been suggested that the virus may be transmitted through one of the lower animals. Epidemics occur most frequently in winter and spring. Any conditions which produce bodily or mental depression predispose to the disease, and it has assumed its most fatal type during times of famine and among squalid tenement dwellers or soldiers in crowded barracks. The changes observed in the meninges are those characteristic of a widespread and severe leptomeningitis; the pia mater is intensely congested and its blood vessels dilated. Pus and lymph are abundant on the convex surface of the brain, along the large blood vessels, and in the fissures. The ventricles contain turbid serum or pus. Small hemorrhages and sometimes abscesses are found in the cortex of the brain. There is in addition congestion of the lungs, liver, spleen, and kidneys. Several clinical varieties of the affection have been noted and the course and symptoms vary remarkably in the different types. In the malignant or fulminant type, the disease may prove fatal in a few hours. The abortive type presents only a few symptoms and is characterized by rapid recovery. Remittent and intermittent forms are recognized in which the fever is lower or entirely absent for two or three days, and there is a form that much resembles typhoid fever. The average duration of the disease is three or four weeks, and the mortality from 30 to 70 per cent. in the different epidemics. As might be expected from the extent of tissue involved, the symptoms are very numerous and diverse. No single set of symptoms occurs in all cases. In some there is an indefinite premonitory stage, with malaise, nausea, and headache; but usually the onset is sudden, with a chill, severe headache, vomiting, pains in the back and limbs, and fever. With these manifestations come stiffness of the muscles of the neck and back, so that the head is retracted and the back arched. There are also pains in the lower extremities and hyperæsthesia of the skin. In addition to these symptoms due to irritation of the spinal nerve-roots, there are others referable to implication of the cranial nerves. These are in different cases, drooping of the eyelids (ptosis), squint, contraction, dilatation, or inequality of the pupils, or spasms of the facial muscles. Conjunctivitis or suppuration of the eyeball or ear may occur and the sense of smell is impaired. Unlike most specific fevers, the temperature runs a very irregular course. An important feature of the disease is the occurrence in many cases of a herpetic eruption or petechial or purpuric spots, whence the names 'spotted fever' and 'petechial fever.' Recovery is apt to be marked by the occurrence of many disagreeable sequels. Deafness is common from destruction of the perceptive apparatus of the ear; and when this happens in infants, deaf-mutism results. Sight is often impaired. Chronic hydrocephalus with headache, muscular weakness, and mental deficiency occurs in a few instances. Treatment must be conducted on the same general principles as in other forms of meningitis.

CEREBRO-SPINAL MENINGITIS. A non-contagious disease of varying and poorly defined symptoms, affecting horses, mules, and other domestic animals, which is most frequent and has been most studied in horses. The most serious outbreaks have occurred in the United States, England, Saxony, Hungary, and Russia. *Symptoms.*—The disease is often preceded by digestive disturbances. It begins suddenly with chills and signs of meningitis. After a short period of cerebral excitement the animal becomes abnormally sleepy, is indifferent to surroundings, and rests its head against any convenient object. At intervals there is noticeable dizziness, accompanied by muscular trembling, grinding of the teeth, and falling fits. When the animal is forced to move it staggers around in circles. There are no constant post-mortem lesions in the vital organs, the most important alterations being found in the membranes of the brain. According to Siedamgrotzky and Schlegel, the disease is due to the presence of a specific micrococcus in the central nervous system, an opinion that many investigators are inclined to deny entirely, and to attribute the trouble to digestive disturbances produced by improper or unwholesome fodder. An outbreak of the disease occurred in Maryland, and acquired the name of 'new horse disease.' An investigation indicated the probability that it was due to moldy fodder. Musty oats, musty blade fodder, and decayed corn silage have been suspected of causing the disease. After making a study of an outbreak of the disease in 1900, Pearson produced the disease experimentally in horses by feeding moldy corn silage.

For further study of the problem, consult: *Delaware Experiment Station Reports* for 1891, 1892, 1893, and 1895 (Newark, 1891, 1892, 1893, 1895); *Delaware Experiment Station Bulletin No. 43* (Newark, 1899); *Maryland Experiment Station Bulletin No. 53* (College Park, 1898); *Indiana Experiment Station Report for 1897* (Lafayette, 1897).

MÉNIPPÉE, må'nē'på'. A political satire in prose and verse, published in France in 1594, directed against the Catholic League and in favor of political religious toleration. The name is borrowed from the *Satira Menippea* of the Roman satiric poet Varro, who had taken as a model the Greek cynic Menippus, Diogenes's pupil. Its full title was *De la vertu du Catholicon d'Espagne et de la tenue des Etats de Paris.* It was the joint work of Leroy, Gillot, Passerat, Rapin, Chrestien, Pithou, and Durant, chiefly lawyers. It ostensibly reports an assembly of the States at Paris, with a satirical introduction and a burlesque close, and is the best travesty of its kind in any language before Butler's *Hudibras* (1663). Its political effect was immediate and lasting. The *Ménippée* is well edited by Labitte (1801). For a clear analysis of this satire, consult Suchier and Birch-Hirschfeld, *Geschichte der französischen Litteratur* (Leipzig, 1900).

MENIP'PUS (Lat., from Gk. Μένιππος) (c.250 B.C.). A Greek philosopher of the Cynic School, born at Gadara, in Syria. He is said to have been a slave by birth, and to have acquired considerable wealth, the loss of which caused him to hang himself. His writings, now completely lost, were a medley of prose and verse in which he satirized the follies of men, particularly of philosophers. These were the model for Varro's *Menippean Satires*, as well as for satires of Meleager and Lucian. See MÉNIPPÉE.

MEN'NO SI'MONS (1492-1559). The founder of the later school of Anabaptists (q.v.) in Holland, from whom the Mennonites (q.v.) take their name. He was born at Witmarsum, in Friesland, in 1492; took orders in 1516; and was a priest in his native place from 1531 to 1536. The study of the New Testament, however, excited grave doubt in his mind regarding the truth both of the doctrine and constitution of the Church, and in 1536 he withdrew from it altogether. He attached himself to the party of the Anabaptists, was rebaptized at Leeuwarden, and in 1537 was appointed a teacher and bishop in the university of what was then known as the Old Evangelical or Waldensian Church at Groningen. Henceforth his great endeavor was to organize and unite the scattered members of the Anabaptist sect in Holland and Germany. With this design he spent much time in traveling; but Friesland was his chief residence until persecution compelled him to flee. Finally he settled in Oldesloe, in Holstein, where he was allowed to establish a printing press for the diffusion of his religious opinions. Here he died, January 13, 1559. He was a man of earnest and spiritual nature, with no trace about him of the wild fanaticism of the earlier Anabaptists. His book of doctrine, *Elements of the True Christian Faith*, was published in Dutch in 1539. His works in English translation are published by the Mennonite Publishing Society at Elkhart, Ind.

MENNONITES. A denomination of evangelical Protestant Christians which arose in Switzerland in the sixteenth century. The beginning of the sect was in a congregation formed in Zurich in 1525 by Conrad Grebel and his associates, Manz and Blaurock. Stress was laid upon discipline rather than dogma; abstinence from the vanities of the world was imposed; and (the State being regarded as unchristian) the principle of refusing to participate in civic duties, to bear arms, and to take oaths was upheld. The movement begun at Zurich extended through Switzerland and into Southern Germany and Austria. The attitude of its adherents toward the State exposed them to persecution, which continued in Switzerland through the whole of the sixteenth century, and provoked emigrations into Moravia and Holland. The Anabaptists (q.v.) were active in Westphalia at the same time, and, professing some of the same views with Grebel's followers, gave occasion for the introduction of heresies and troubles. After the Anabaptist disaster at Münster, Menno Simons (q.v.) became a leader among the followers of Grebel, and placed their movement upon a sounder footing. Allying himself with the more sober-minded elements of the Anabaptists after 1536, he organized congregations in Northern Germany and Holland, and by virtue of his piety, discretion, and ability, made such an impression upon the body that, although he was not its founder, his name became identified with it. The Mennonite Confession of Faith, in eighteen articles, was adopted in Holland in 1632. It embodies the usual evangelical doctrines concerning God, the fall of man, the authority of the Scriptures, repentance, and baptism, and contains articles relating to discipline and conduct. Grace is presented as designed for all. The view taken of the Lord's Supper accords with that of Zwingli. In the United States the sacrament is observed twice a year, usually in the spring and fall, the communicants having been previously examined concerning their spiritual condition. The rite of foot-washing (q.v.) is observed in connection with it. Baptism, which is only upon confession of faith, is administered by pouring. After baptism the kiss of peace is given by the minister, or by a representative sister, if the convert is a woman. Correct discipline and rectitude are considered more important elements in the Christian life than learning and the elaboration of doctrinal points. Divorce is condemned, except for adultery. The bearing of arms and taking of oaths are regarded as wrong, and the holding of offices under the State is not encouraged. The Church polity is congregational, with a ministry of bishops, priests or elders, and deacons.

The Mennonite Church has been divided in both Holland and Switzerland. The different branches in Holland were reunited in 1801. A division took place in Switzerland in 1620 between the Upland and Lowland Mennonites when Jacob Amen, of the Bernese Alps, held that excommunication of one party dissolved the marriage tie, and proscribed the use of buttons and the trimming of the beard. Traces of this separation are found in the United States and Canada in the Amish congregations.

The first settlement of Mennonites in the United States was made in 1683, when immigrants, induced by William Penn's offer of religious liberty, settled in Pennsylvania and built a church in Germantown, on a spot still occupied by a Mennonite meeting house. Another considerable immigration has taken place from Southern Russia since 1871, the immigrants establishing colonies in the United States (Minnesota, Dakota, and Kansas), Canada, and Brazil. So far as it is possible to ascertain, the Mennonites have in the United States 55,554 communicants, with 1112 ministers and 673 churches. They are divided among twelve branches, which differ on points of doctrine, ritual, and discipline, or in historical origin.

I. The oldest and largest of these branches is THE MENNONITE CHURCH, the members of which are represented in seventeen States, but most largely in Pennsylvania and Ohio. Their 288 churches, with 418 ministers and 22,743 communicants, are for the most part affiliated with some of the twelve district organizations, but a few of them are independent. A publishing house is established at Elkhart, Ind., where a semi-monthly newspaper in English, the *Herald of Truth,* a weekly journal in German, the *Mennonitische Rundschau,* Sunday-school and children's periodicals, Mennonite historical and doctrinal works, and other books, are published.

II. The BRUEDERHOEF MENNONITE CHURCH traces its origin to Jacob Huter, who was burnt at the stake at Innsbruck, Tyrol, in 1536. It was at one time represented by 24 communities in Moravia, whence they were driven to Hungary. They removed to Rumania in 1767, and two years afterwards to Russia, and finally, in 1874, to the United States, where they settled in South Dakota. They live under the communal system. Their language is German, and their books, preserved in manuscript, including their history (*Gemeinde-Geschichtsbuch*), are in that tongue. Their 5 congregations have 352 communicant members and are served by 9 ministers.

III. The AMISH MENNONITE CHURCH originated in the division already mentioned, which took place in Switzerland in 1620, and represents the Oberland Mennonites, or followers of Jacob Amen, of the Bernese Alps, after whom it is named. It is second in importance among Mennonite bodies in the United States, and has 265 ministers, 124 churches, and 13,226 communicants, being most largely represented in Illinois, Pennsylvania, and Ohio. A settlement of Amish Mennonites was formed in 1824 in Wilmot Township, Ontario, where land was bought for the purpose by Christian Nafziger, of Munich. Five congregations have grown up from it, to which 329 families are attached.

IV. The OLD AMISH MENNONITE CHURCH is the result of a separation from the Amish body which took place about 1865 over questions concerning forms of worship and methods of Church work, the separatists protesting against certain steps which they regarded as innovations, and insisting upon a strict adherence to the ancient forms and practices. They have 2438 members, with 75 ministers and 25 churches, and are strongest in Indiana and Ohio.

V. The APOSTOLIC MENNONITE CHURCH is a branch derived from the Amish, which came to the United States by immigration from Europe about 1840. The discipline is less strict than in the other Amish branches. Two churches are mentioned, both in Ohio, with 2 ministers and 209 members.

VI. The REFORMED MENNONITE CHURCH originated in 1812, under the leadership of John Herr, who protested against laxity in the Mennonite Church, and insisted upon the preservation of purity in teaching and the maintenance of exact discipline. Its adherents are strict in the observance of the old ways and in their discipline, and do not as a rule hold fellowship with other denominations. They have 1680 members, about half of them being in Pennsylvania, with 43 ministers and 34 churches.

VII. The GENERAL CONFERENCE MENNONITE CHURCH has adopted modern views and practices to a larger extent than most of the other branches. It originated as a result of proceedings which were instituted in 1848 in Pennsylvania against a minister, John Oberholtzer, who was charged with attempting to introduce new teachings and practices. Oberholtzer and his sympathizers withdrew and formed a body called the New Mennonites. This body united with churches whose members had come from Germany and settled in Illinois and Iowa, and a General Conference was formed, with three districts—eastern, central, and western. A new constitution, described as being evangelical in tone, was adopted in 1898. The number of members is 10,395, with 128 ministers and 76 churches.

VIII. THE CHURCH OF GOD IN CHRIST was founded in 1859, under the leading of John Haldeman, who believed himself inspired with the spirit of prophecy. It inculcates a strict adherence to the teachings of the founders of the Mennonite Church. The estimate of its numbers gives it 18 ministers, 18 churches, and 449 members.

IX. The OLD, or WISLER, MENNONITES represent a separation from the Mennonite Church in Indiana which took place about 1870 by those who opposed the introduction of Sunday schools, evening meetings, and other new features. The first General Conference was held in 1898. They number 603 members, with 17 ministers and 15 churches.

X. DIE BUNDES CONFERENZ DER MENNONITEN BRÜDERGEMEINDE originated in Russia about 1840, and was brought to the United States by immigrant adherents between 1873 and 1876. It practices baptism by immersion, and attaches special importance to evidences of conversion. It is one of the most active of the Mennonite bodies in missionary enterprise, and has missionaries in China, Africa, and India. Its 16 churches have 2950 members and are served by 41 ministers.

XI. The DEFENSELESS MENNONITES are likewise distinguished by the stress they lay upon the necessity of conversion and regeneration, and represent a separation from the Amish, which was led by Henry Egli. They have 1126 members in 11 churches, with 20 ministers.

XII. The CHURCH OF THE MENNONITE BRETHREN IN CHRIST is the most recent in organization of the Mennonite bodies, having been formed about 1880. The Brethren are open communionists, and administer baptism in any of the usual forms. They have 59 churches, 76 ministers, and 3103 members, in eight States of the Union, and churches in Canada.

The larger Mennonite branches have in recent years displayed increased activity in missionary enterprise, in consequence of which they have enjoyed a greater relative prosperity. A general tendency has been observed toward a closer drawing together of the different branches. This was exemplified in an effort which was made in 1898 to secure the holding of a General Conference of the Mennonite and Amish district conferences, and in the coöperation of all the bodies with the Home and Foreign Relief Commission at Elkhart, for famine relief in India, for the education of the famine orphans, and for the support of the missionaries among them.

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MEN′OBRAN′CHUS. A genus of large newts, of the family Proteidæ, represented in the United States only by the mud-puppy (q.v.).

MENOMINEE, mē-nŏm′ĭ-nē (Wild-rice men, so called because of their great use of the wild rice which grows abundantly in their country). A considerable Algonquian tribe, formerly ranging over northern Wisconsin and the adjacent Upper Michigan, chiefly along the river of the same name, and now gathered with the Stockbridge upon a reservation near Green Bay, Wis. In their general characteristics they resemble the Ojibwa, but they speak a distinct language. French missionaries established a mission among them in 1670, and they remained faithful to the French interest until the end. They aided the English in the Revolution and in the War of 1812, and fought under Tecumseh during the latter struggle. In 1822 they were estimated at 3900. In 1901 they numbered 1390, nearly all civilized and Catholic, and about one-half being able to read and write.

MENOMINEE. A city and the county-seat of Menominee County, Mich., 52 miles northeast of Green Bay, Wis., and opposite Marinette, Wis., with which it is connected by three bridges. It is situated on Green Bay, at the mouth of the Menominee River, and on the Chicago and Northwestern, the Chicago, Milwaukee and Saint Paul, and the Wisconsin and Michigan railroads (Map: Michigan, F 3). It is also the western terminus of the car ferry of the Ann Arbor Railroad. One of the greatest lumber-shipping ports in the United States, Menominee has numerous saw and planing mills with a large output, and manufactories of electrical appliances, telephones, shoes, paper, steam boilers, heavy machinery, boxes, beet sugar, etc. The city possesses a public library of about 4500 volumes and a fine high school building. Menominee, first incorporated in 1883, is governed under a charter of 1891 which provides for a mayor, chosen annually, and a unicameral council which elects most of the administrative officials, only the supervisor, city treasurer, and justice of the peace being chosen by popular election. Louis Chappieu, a trader, settled here in 1799; but the city really dates from 1832, when the first mill was built here. Population, in 1890, 10,630; in 1900, 12,818.

MENOMINEE. A city and the county-seat of Dunn County, Wis., 70 miles east of Saint Paul, Minn.; on the Red Cedar River, and on the Chicago, Milwaukee and Saint Paul, and the Chicago, Saint Paul, Minneapolis and Omaha railroads (Map: Wisconsin, E 5). It has a fine memorial library of 8000 volumes, and the Stout Manual Training School and a normal training school. The Dunn County Asylum is near the city. The industrial interests are represented by brick yards, lumber mills, foundries and machine shops, carriage and wagon works, etc.; and the commercial interests by a large trade in lumber, brick, flour, wheat, and fur. Population, in 1890, 5491; in 1900, 5655.

MEN′OPOME. The hellbender (q.v.).

MENPES, mĕn′pĕs, MORTIMER (?—). An English artist, born in South Australia. He was educated at Port Adelaide and went to London when nineteen years old. There he studied at South Kensington, and then went to Pont Aven in Brittany, where he remained three years. In 1880 some of his etchings were exhibited at the Royal Academy, and in 1885 he became a member of the Society of British Artists. Two years afterwards he went to Japan, and in 1888 he exhibited his Japanese drawings and pictures at Dowdeswell's in London. He invented a process of painting in water color by which he attained uncommon brilliancy of effect, and he is particularly successful in this medium. His large drypoint, "The Officers of the Archers of Saint Adrian," after Hals, was succeeded by a series of etchings which include the brilliant studies of Whistler in different positions. He also revived the art of painting in color from etched plates. In later years he turned his attention to portraiture on a small scale, where his skill as a draughtsman, his deft handling of color, and his individual style were effectively shown.

MENSHIKOFF, or **MENTCHIKOFF**, mĕn′-shĭ-kŏf, ALEXANDER DANILOVITCH (1672-1729, or 1730). A Russian field-marshal and Minister of State. He was born at Moscow, November 16, 1672, in humble circumstances, and was a baker's apprentice. His intelligent countenance attracted the notice of General Lefort, through whose patronage he was taken into the service of Peter the Great. He discovered a conspiracy among the Streltsi (q.v.) and his rapid promotion was secured. He accompanied Peter in his travels to

Holland and England, and on the death of Lefort became the Czar's chief adviser. Menshikoff showed equal ability as a general and as a diplomatist; and although totally uneducated he did much to promote the education of the people, and was a liberal patron of the arts and sciences. On October 30, 1706, he defeated the Swedes at Kalisz; he contributed to some of the Czar's other victories, was made a field-marshal on the field of Poltava, 1709, and after the battle compelled Lewenhaupt to capitulate with a great part of the Swedish army. In 1710 he took Riga; in 1712 he led the Russian troops into Pomerania and Holstein, and in 1713 took Stettin, but gave it up to Prussia contrary to the will of the Czar. This and his avarice so displeased Peter that Menshikoff was court-martialed and condemned to death, but he was pardoned on payment of a heavy fine. During the reign of Catharine I. he regained his influence at Court, and after her death governed Russia with almost absolute authority in the name of Peter II. His daughter was about to marry the young Czar, when Menshikoff was overthrown by Dolgoruki and banished to Siberia, September, 1727. His estates and treasures were confiscated. He died in 1729.

MENSHIKOFF, or **MENTCHIKOFF**, ALEXANDER SERGEYEVITCH, Prince (1787-1869). A Russian general, the great-grandson of Alexander Danilovitch Menshikoff. He was born September 11, 1787, and participated in the campaigns of 1812 to 1815 against Napoleon. In the Russo-Turkish War of 1828-29 he took Anapa and Varna. In 1836 he became Minister of Marine, and did much to increase the effectiveness of the Russian Navy. In 1853 he was sent as Envoy Extraordinary to Constantinople, where his overbearing demeanor produced the rupture which resulted in the Crimean War. During this war he became prominent as defender of Sebastopol, where he showed the greatest energy until his retirement on account of ill health in March, 1855. He died at Saint Petersburg, May 2, 1869.

MENSES, mĕn′sēz. See MENSTRUATION.

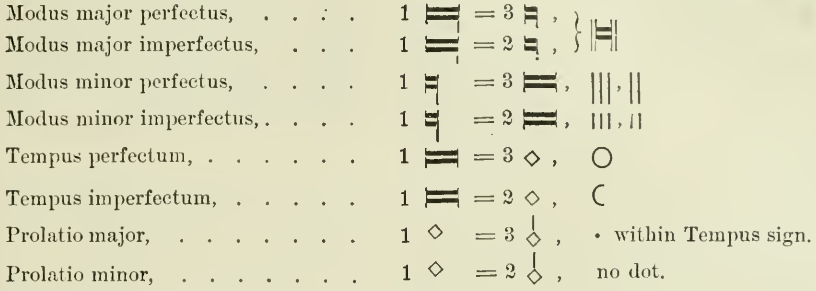
MENSTRUATION. The discharge of bloody fluid which issues every month from the generative organs of the human female during the period in which she is capable of procreation.

The first appearance of this discharge, to which are applied the terms *menses* and *catamenia*, is a decided indication of the arrival of the period of commencing womanhood, and is usually accompanied by an enlargement of the mammary glands, a growth of the external genitals, an increase of hair upon the *mons Veneris*, and an accession of reserve, thoughtfulness, and maturity. Menstruation usually commences between the fourteenth and the sixteenth years, and terminates between the forty-eighth and fifty-second years. The cessation of the menstrual flow is called menopause. The interval which most commonly elapses between the successive appearances of the discharge is about four weeks, although it is oftener shorter; and the duration of the flow is usually three or four days, but is liable to great variations. The first appearance of the discharge is usually preceded and accompanied by pain in the loins and headache, malaise, depression, and restlessness, and in many women these symptoms invariably accompany the discharge. As a general rule there is no menstrual flow during pregnancy and lactation, and its cessation is one of the first signs that conception has taken place.

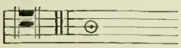
In robust young girls who have lived an outdoor life there is no disturbance experienced at the appearance of the menses. In many others, however, there is considerable nervous excitement, consisting of irritability, emotion, depression, flushing, and throbbing of the head. Difficult and painful menstruation is called dysmenorrhœa. During such nervous manifestations the girl should be treated as an invalid, and studies should not be persistently prosecuted. Avoidance of drains upon physical and mental powers should be enjoined, and abundant daily outdoor life should be secured.

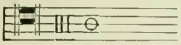
MENSURABLE MUSIC (Lat. *mensurabilis*, measurable, from *mensura*, measure). Strictly speaking, all music written in notes that have a definite time-value. In a specific sense the term is applied to the music written between the beginning of the twelfth and the seventeenth centuries, before the invention of the line dividing a composition into bars. Before the twelfth century the choral note of the plain chant indicated only the pitch. The duration of each note was left to the individual singer, and arbitrarily determined by the rhythm of the text. As long as music was sung in unison this system answered all practical purposes. But with the introduction of harmony and the development of polyphonic music, employing a number of independent voices, an imperative need made itself felt to fix the duration of the individual note. Mensurable music, therefore, borrowed the forms of the notes as used in the plain chant. These were: the large (*maxima* or *duplex longa*), ▬; the long (*longa*), ■; the breve (*brevis*), ■; and the semibreve (*semibrevis*), ◆. To these were added the minim (*minima*), 𝆺𝅥, and semiminim (*semiminima*), 𝆺𝅥𝅮. For nearly three hundred years the notes were written in this form. At the beginning of the fifteenth century the black notes were gradually supplanted by the white or open notes: 𝆶, 𝆷, 𝆸, ◇, 𝆹𝅥. For the smaller notes both the black and white forms continued in use: semiminim, 𝆹𝅥𝅮 or 𝆺𝅥𝅮; croma or fusa, 𝆹𝅥𝅯 or 𝆺𝅥𝅯; semicroma or semifusa, 𝆹𝅥𝅯 or 𝆺𝅥𝅯. Even as early as the sixteenth century rounded notes were substituted for the square ones in writing music. But it was not until 1700 that the round forms were generally adopted by music printers.

Out of reverence for the Trinity triple time was regarded as *perfect* time, whereas duple time was *imperfect*. A division of a note into three of the next smaller kind was *mensura perfecta;* into two of the smaller kind, *mensura imperfecta.* This division was indicated by certain signs, but a sharp distinction was made between the division of a long into breves, or of a breve into semibreves. These signs were placed at the beginning of a composition. The division of a large into longs or of a long into breves was known as *modus;* of a breve into semibreves as *tempus;* of a semibreve into minims as *prolatio.* The *modus* itself was further distinguished as *modus major* (division of a large into longs) and *modus minor* (division of a long into breves). A still further subdivision of both the *modus major* and *minor* was into *perfectus* (triple time) and *imperfectus* (duple). *Tempus* was thus also subdivided into *perfectum* and *imperfectum;* whereas in the case of *prolatio* this division was designated as *major* and *minor.* The following table gives a complete view of this system with the various signatures:

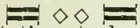
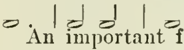

Modus major perfectus, 1 = 3 ,
Modus major imperfectus, 1 = 2 ,
Modus minor perfectus, 1 = 3 ,
Modus minor imperfectus, 1 = 2 ,
Tempus perfectum, 1 = 3 ◇ ,
Tempus imperfectum, 1 = 2 ◇ ,
Prolatio major, 1 ◇ = 3 , • within Tempus sign.
Prolatio minor, 1 ◇ = 2 , no dot.

The sign of the *modus major* was the same for the *perfectus* and *imperfectus.* The following sign for the *modus minor* determined the *modus major.* If the sign |≡| was followed by ||| or |||, it was *modus major perfectus;* if followed by || or ||, it was *modus major imperfectus.* The *length* of the vertical bars had reference to the *modus minor*, the long bars indicating the *perfectus*, the short ones the *imperfectus.* The *number* of vertical bars referred to the division of the large into two or three longs. The *prolatio* sign appeared only in connection with the *tempus* sign. Thus ⊙ meant *tempus perfectum, prolatio major;* ☾· *tempus imperfectum, prolatio major.* If the tempus sign appeared without a dot it always meant that *prolatio minor* was understood. The following table will make this clear:

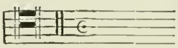

Modus major perfectus.
Modus minor perfectus.
Tempus perfectum.
Prolatio major.

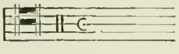

Modus major perfectus.
Modus minor imperfectus.
Tempus perfectum.
Prolatio minor.

The time-value of the different notes as fixed by these signs or signatures was known as the *integer valor notarum.* But these fundamental values could be changed by means of *augmentatio, diminutio,* and *proportio. Diminutio* reduced the value of the notes in triple time to one-third, in duple time to one-half of the original value. It was indicated by a vertical line through the signature ⦶ ȼ, or by affixing a number to the tempus sign ○ 2, or ○ 3. Time indicated thus always denoted a lively tempo, corresponding to the modern *allegro. Augmentatio* signified the restoration of the *integer valor* of notes reduced by *diminutio.* It was indicated by writing the ordinary sign of the *integer valor* ○ (. A change of the *integer valor* by means of fractions was known as *proportio.* Thus $\frac{3}{1}$ meant that the time was to be accelerated, so that *three* breves now had the same duration as *one* breve of *integer valor.* But $\frac{1}{3}$ meant the opposite, viz. that the time was to be retarded, so that *one* breve now had the same duration as *three* breves of the *integer valor.* A special kind of *proportio* was that indicated by $\frac{3}{2}$, known as *hemiolia.*

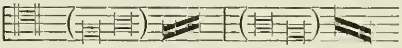
Alteratio was the doubling of the time-value of the second of two notes of the same kind when a tripartite note of the next larger kind followed. Generally the two smaller notes stood between two of the larger kind, or were separated from the following notes of equal or smaller value by a *punctum divisionis.* Thus in *tempus perfectum* (○, tripartite)  would be expressed in modern notation (values reduced one-half) 

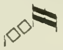
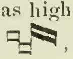
An important factor in the theory of mensurable music was the *color* of the notes. The ordinary note was black. In the fourteenth century a red note (notula rubra) was used. Originally this red note was used instead of signatures to denote a change from *perfectio* to *imperfectio* or vice versa. Soon it was definitely used to indicate *imperfectio* only. For want of red color, it was often left open or white (notula alba), and during the fifteenth century the white note had the same meaning as the red note of the fourteenth. When finally the white notes were generally adopted (during the sixteenth and seventeenth centuries), *imperfectio* was denoted by the black note (notula nigra).


Modus major imperfectus.
Modus minor perfectus.
Tempus imperfectum.
Prolatio major.


Modus major imperfectus.
Modus minor imperfectus.
Tempus imperfectum.
Prolatio minor.

A group of two or more notes to be sung on one syllable was called *ligatura.* When only two notes were given to one syllable, they were written as one and called *figura obliqua.*



In ligatures of more than two notes the time-value of the individual notes was not determined from their actual shape but from their position. The value of the first note could be a breve or a long. In the former case the term *proprietas,* in the latter *improprietas,* was applied. If the second note was lower than the first, *proprietas* was indicated by a vertical line (cauda) downward on the left side of the first note : ; if the second note was higher, the *cauda* was wanting, . In both cases the first note is breve. *Improprietas* was indicated by adding the *cauda* to the first note if the second was higher, and omitting it if the second was lower: , . Here both first notes are longs.

Out of this system of notation our modern system of notation has been gradually evolved. Those interested are referred to the comprehensive histories of music and cyclopædias of Gerber, Ambros, Coussemaker. See MUSICAL NOTATION.

MENSURATION (Lat. *mensuratio*, from *mensurare*, to measure, from *mensura*, measure, from *metiri*, to measure). A branch of applied mathematics dealing with the calculation of lines, angles, surfaces, and volumes from measured data. The metrical relations between lines and angles are computed chiefly by the principles of trigonometry (q.v.). The mensuration of common surfaces and volumes, however, can generally be effected by the principles of geometry. For the purposes of either direct measurement or computation a unit is necessary. The straight line is measured by direct comparisons with some linear unit, as the inch, foot, or yard. But in measuring a surface or a volume it is unnecessary to apply an actual square or cubic unit, or even to divide the magnitudes into such squares or cubes. It is only necessary to measure certain of its boundary lines or *dimensions*, and from these measurements to calculate the contents in terms of the appropriate unit; e.g. if a inches and b inches are the lengths of the adjacent sides of a rectangle, its area is $a \cdot b \cdot 1$ square inch $= ab$ square inch; i.e. the number of square units of area in a rectangle is equal to the product of two numbers which represent its base and altitude, measured by the same linear unit. The areas of other figures are found from this by the aid of certain relations or properties of those figures: for instance, the area of a parallelogram is the same as the area of a rectangle having the same base and altitude, and is therefore equal to the base multiplied by the altitude. As a triangle is half of a parallelogram of the same base and the same altitude, its area is one-half the product of its base and altitude. Certain quadrilaterals and polygons are measured by dividing them into triangles, the area of each of which is separately calculated. (For the area of the circle, see CIRCLE.) By reasoning similar to that employed in the case of areas, it is shown that the volume of a rectangular parallelepiped or prism is found by multiplying together the length, breadth, and thickness; and of the oblique parallelepiped, prism, or cylinder, by multiplying the area of the base by the height.

As in case of the circle, so in the mensuration of the cylinder, cone, and sphere, the theory of limits (see LIMIT, THEORY OF) is applied in connection with the circumscribed and inscribed figures. The following formulas of mensuration will be found convenient:

Abbreviations: b, base; h, altitude; r, radius; a, area; c, circumference; p, perimeter; s, slant height; v, volume; m, mid-section; α, the number of radians in an angle.

Parallelogram	$a = bh.$
Triangle	$a = \frac{1}{2}\, bh.$
Trapezoid	$a = \frac{1}{2}\,(b + b')\, h.$
Parallelepiped	$v = bh.$
Prism	$v = bh.$
Lateral area, right prism	$a = ph.$
Prismatoid	$v = \frac{1}{6}\, h\, (b + b' + 4\, m).$
Pyramid	$v = \frac{1}{3}\, bh.$
Lateral area, regular pyramid	$a = \frac{1}{2}\, ps.$
Frustum of pyramid	$v = \frac{1}{3}\, h\, (b + b' + \sqrt{bb'}).$
Lateral area, frustum of regular pyramid	$a = \frac{1}{2}\,(p + p')\, s.$
Right circular cylinder	$v = bh = \pi\, r^2h.$
Lateral area	$a = ch = 2\, \pi\, rh.$
Right circular cone	$v = \frac{1}{3}\, bh = \frac{1}{3}\, \pi\, r^2h.$
Lateral area	$a = \frac{1}{2}\, cs = \pi\, rs.$
Frustum of right circular cone	$v = \frac{1}{3}\, \pi\, h\, (r_1{}^2 + r_2{}^2 + r_1\, r_2).$
Sphere	$v = \frac{4}{3}\, \pi\, r^3,\ a = 4\, \pi\, r^2.$
Lune	$a = 2\, \alpha\, r^2.$
Spherical polygon	$a = \alpha\, r^2.$
Zone	$a = 2\, \pi\, rh.$
Spherical segment	$v = \frac{1}{6}\, \pi\, h\, [3\, (r_1{}^2 + r_2{}^2) + h^2].$
Spherical sector	$v = \frac{2}{3}\, \pi\, r^2\, h = \frac{1}{3}\, br.$
Circle	$c = 2\, \pi\, r,\ a = \pi\, r^2,\ arc = \alpha \cdot r.$

For the mensuration of geometric solids, consult Holzmüller, *Elemente der Stereomatrie* (2 vols., Leipzig, 1900).

MENTAL CONSTITUTION. The typical character which serves to give the mind its unity and individual significance. Mental constitution is determined, first of all, by the manner of the assembling of the elements which go to make up consciousness. Every normal mind comprises manifold elements and diverging tendencies—sensations, feelings, volitions—which ordinarily work together to form its bent or habitual way. By dint of natural proclivities, due to inheritance or environment, it achieves a kind of integrity and social effectiveness which we recognize as personality; a mind is thus, as we say, well organized, operating to consistent and coherent ends. Not infrequently, however, minds are deficient in organization. The weak-willed, inattentive person suffers from lack of cohesion of mental elements; his interests vary with each suggestion that comes to him through perception or bodily feeling; he is never certain of his intentions, never constant in his attitude toward things, never thoroughly self-possessed. On the other hand, there are minds in which the internal suggestion is so powerful as to dull perception to all not falling within a certain field of interest, so destroying the mind's pliancy and powers of adaptation. Such minds have, we say, strong prepossessions; they are biased, narrow; in extreme form they are afflicted with fixed ideas and monomania. A third type of aberrant constitution is found in bi-centred or multi-centred minds. Here the personality breaks up into two or more selves, or cores of interest, about each of which gather elements congenial to itself. Such personalities are usually deficient in stability and in breadth and richness of mental content. They exist incipiently in the normal mind, and where the transformation is gradual result in healthy alterations of character and in the broadening of intelligence; in a more lively form, though still subject to the domination of one supreme self, they may give the dramatic creations of the novelist; but in extreme cases they result in exaggerated transpositions of thought and feeling, partaking of the nature of insanity.

Apart from these more general variations, minds are characterized by differences in the form and trend of their presentations. One person, for example, thinks largely in visual images; another's thought takes shape in internal conversations; while yet another is more keenly conscious of his attitude toward things, the way he will act in their presence or the way he imagines that they feel. Again, presentations in the same field of sensation may vary in quality, different minds having different characteristic modes of perception; so a landscape always appeals to the artist æsthetically, to the agriculturist or promoter by its practical possibilities. This is not due merely to difference of interest, but to an actual variation in the quality of the presentation. The variation appears again in powers of memory and imagination, where there is always in evidence a natural selection of elements due to the mind's aptitude. Herein lies the chief factor of individuality, the mind's complexion or characteristic style of thought and feeling, serving to throw it into relief against that background of qualities common to all consciousness which in mankind we term human nature.

MENTALITY OF INSECTS. See section on *Social Insects* under INSECT; also INSTINCT.

MENTAL PATHOLOGY. The science of abnormal mental process. The intimate dependence of consciousness upon the functioning of the central nervous system enables us to approach the investigation of morbid mental conditions from the vantage ground of physiology. The brain, which is the substrate of mind, may, like any other organ of the body, exhibit (1) defects—i.e. lack of some structure—or (2) abnormality of function, whether it be (*a*) temporary—i.e. a disorder—or (*b*) permanent—i.e. a disease. 'Defectives' are, then, persons who suffer, congenitally or from early childhood, from the absence of some group or groups of mental elements in consequence of some underlying structural gap in the nervous system; they are the blind, the deaf, the paralytic, etc. The cases of Laura Bridgman and Helen Keller, the blind deaf-mutes, are typical. From careful reports of their educational progress, and from special psychological and neurological examination of their mental and physiological organization, valuable data have been secured. Temporary disturbances of normal mental functioning are afforded in the consciousness of dreams (extreme inattention), hypnosis (extreme attention), and the intoxication of various drugs. Frequent attempts have been made to examine mind as specific phases of it are rendered anæsthetic or hyperæsthetic in these ways. Hashish (extract of Cannabis Indica), e.g., greatly magnifies our consciousness of duration and extent, and also induces visual hallucination. Chronic mental derangement is exemplified by the various forms of insanity—mania, melancholia, dementia, general paresis, etc.—the extended investigation of which by competent alienists has thrown much light upon the nature of the more complicated mental processes.

Abnormal mental types are, as one writer puts it, "psychological experiments made for us by Nature herself." Especially is this true when the infirmity is isolated, when a single group of mental processes—e.g. a sense department—is either entirely lacking or extraordinarily emphasized. Such a state of affairs simplifies matters for the psychologist. He is able to find out the relative value of the group concerned in the normally organized mind, and, as a consequence, to proceed more successfully with the analysis of the adult human consciousness. (See PSYCHOLOGY.) Take, for example, cases of the anæsthesia of particular internal organs which lie beyond that experimental control which is of supreme importance in the laboratory investigation of the external sense organs. Evidence of this sort has been of weight in referring the sensation of giddiness to the semicircular canals of the internal ear. (See STATIC SENSE.) From observations of senile dementia Hughlings Jackson has established the law that, in the gradual loss of memory with advancing age, the latest mental stuff, that acquired with most difficulty, first decays. The successive stages of dissolution consequent upon the inroads of cerebral deterioration retrace the steps of evolution. The various types of aphasia (q.v.) have been of great assistance in the solution of the problem of the cortical localization of function, as well as in the more strictly psychological problems of apperception (q.v.) and language.

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MENTAL PROCESS. A phrase employed by modern psychology in two nearly related meanings. (1) In the first place, it is tending to replace the older static conception of 'mind' (q.v.). Stout, e.g., defines psychology as "the positive science of mental process," in preference to speaking of it as the 'science of mind,' and James declares that "the first fact for us as psychologists is [not that mind exists, but] that thinking of some sort goes on. . . . If we could say in English 'it thinks,' as we say 'it rains' or 'it blows,' we should be stating the fact most simply." (2) But not only is mind, as a whole, a 'stream' of thought and feeling; each separate element of mind or mental formation that our analysis teases out of the total consciousness is itself a process. Every sensation rises, poises, falls, in its own characteristic way; even the idea, the mental 'thing' *par excellence*, is termed by Wundt a 'variable process,' and such formations as emotion and volition bear the mark of process stamped upon them. Meaning (q.v.) and mode of connection (see FUSION; IMPULSE) are stable, but the 'stuff' of which mind is made is essentially process and not being. Consult: Wundt, *Essays* (Leipzig, 1885); *Philosophische Studien*, vi., x. (Leipzig, 1891, 1894); James, *Principles of Psychology*, vol. i. (New York, 1890); Stout, *Analytic Psychology* (London, 1896); Titchener, *An Outline of Psychology* (New York, 1899).

MENTAL SCIENCE. The name given to a philosophical or religious system which, as explained by one of its adherents, aims at the prevention of disease, rather than its cure, by awakening in the individual the inherent but dormant spiritual forces through the medium of its literature, lecture courses, and by auto-suggestion. It contends that no system of cure can rid the world of discord and disease; that the various systems of medication, ranging from the incantation of the barbarian to mind healing or faith cure, are simply compatible with the different temperaments of humanity. A materialistic nature demands 'things' as antidotes for discord, while a metaphysical temperament demands 'thoughts' as a mode of cure. Mental Science looks upon all schemes of cure as temporary expedients only to bridge over a defect in man's estimation of himself. It maintains that the phenomenal world is the differentiation of the infinite mind of humanity, ranging from an atom to immensity and from a molecule to man. It contends that man does not live in a physical world, but rather in a physical phase of consciousness, and that to mentally transcend the plane of human consciousness to that of the spiritual would dissolve the human or physical misconception of life and being. It argues that since each individual thinks for himself alone, he must be just what he thinks he is, for he is the one who thinks it. Therefore each lives, moves, and has his being in an environment compatible with the status of his own mind.

Mental Science has numerous subdivisions, known in part as 'Divine Science,' 'Spiritual Science,' 'Metaphysical Science,' 'Spiritual Ethics,' and other titles. It differs from Christian Science (q.v.), which is an organized church with government, tenets, etc., and which teaches the practical application of the Christ Mind healing to all forms of disease. Attempts to organize the Mental Scientists have met with persistent defeat, owing to the impossibility of organizing a body of individualists. It is claimed that the numerical strength of Mental Science is upward of 1,000,000 adherents in the United States, under the various titles mentioned.

MENTANA, mĕn-tä'nȧ. A village in Italy, 13 miles northeast of Rome, with 2401 inhabitants in 1901. It is noted as the place where, on November 3, 1867, Garibaldi was defeated by Papal and French troops while attempting to seize Rome and thus complete the unity of Italy. On November 25, 1877, a monument was erected in honor of the adherents of Garibaldi, who fell in this battle. See GARIBALDI.

MEN'TEL (or MENTELIN), JOHANNES (c.1410-78). A German printer of the fifteenth century, the first to establish a press at Strassburg. To him the invention of printing was once attributed by many. The erroneous character of any such assertion was very clearly demonstrated by Von der Linde in the results of his investigation of the early history of printing in his *Gutenberg* (Stuttgart, 1878).

MEN'TER, SOPHIE (1848—). A German pianist, born at Munich, in which city she subsequently studied under Schönchen, Lebert, and Niest, making her début in 1863. She met with extraordinary success, particularly at Frankfort, where, in 1867, Tausig (q.v.) secured her as a pupil. Two years later she won the good-will of Liszt, who became one of her stanchest friends. She made many tours and had many famous pupils, and finally retired to her home, Castle Itter, in the Tyrol. Meanwhile she had become known as a remarkable virtuoso, and besides her appointments as Court pianist to the Prince of Hohenzollern and the Emperor of Austria, she served for a time on the faculty of the Saint Petersburg Conservatory. In 1872 she married the 'cellist Popper, from whom she was subsequently divorced (1886).

MENTEUR, mäɴ'tẽr', LE (Fr., The Liar). A comedy by Corneille (1644), modeled after Alarcón's *Verdad sospechosa*. The leading characters are Dorante, whose propensity gives the play its name and involves the hero in numerous complications; Géronte, his credulous old father and his dupe; and Cliton, his shrewd, witty valet. The play is Corneille's best comedy, and the most important before the appearance of Molière. It was followed by the *Suite du menteur*, modeled on Lope de Vega's *Amar sin saber á quien*, a play without the successful qualities of the original comedy.

MENTHOL, mĕn'thōl (from Lat. *mentha*, mint), $C_{10}H_{19}OH$. A colorless crystalline substance obtained from official oil of peppermint, or from Japanese or Chinese oil of peppermint. It has the odor of peppermint, and produces in the mouth a sensation of cold. It is but sparingly soluble in water, but dissolves in considerable quantities in alcohol, ether, chloroform, and other organic liquids. It is often used as a remedy for neuralgic headache. In a solution of ten parts of alcohol to one of menthol, or in the solid form of a pencil, it usually gives immediate, though not always complete, relief, when applied to the seat of pain.

MENTONE, mĕn-tō'nȧ, Fr. **MENTON**, mäɴ'tôɴ'. A seaport town in the Department of Alpes-Maritimes, France, on the Mediterranean, 19 miles northeast of Nice by rail (Map: France, O 8). It is situated on two small bays known respectively as Baie de L'ouest and the Bay of Garavan, divided by a point of land from which juts the breakwater inclosing the harbor. On the north is a sheltering range of lofty mountains, the lower slopes of which are covered with orange, lemon, and olive groves, and dotted with picturesque villas and elegant residences. The inclosed situation of the town, dry and equable climate, and other natural advantages make Mentone one of the most popular of invalid resorts on the Riviera. The old portion of the town retains a mediæval aspect, with its narrow, winding streets; the newer portion is regularly laid out and clean. The prominent buildings are the churches of Saint Michel (seventeenth century) and of the Conception; the Hôtel de Ville has an interesting museum of prehistoric relics. Other notable features are the Jardin Public and the Promenade du Midi. The chief point of interest, however, is in the grottoes of Baoussé Rousse near by, in Italian territory, where Rivière discovered relics of very ancient human occupation and skeletons of a later race in the débris. Nine skeletons in all were found, and with them pierced shells and milk teeth of deer, formerly portions of personal ornaments; but more surprising is the fact that the bones were painted with red ochre. In the general stratum beneath occurred stone implements of Paleolithic type. This fact, and the entire absence of implements of bone, pierced shells, and teeth of deer from the lower beds, leaves the impression of two periods of occupation. Mentone has an extensive trade in fruit and olive oil. After belonging for 500 years to Monaco, the town revolted in 1848, and attached itself to Sardinia. With the cession of Nice to France in 1861, Mentone came under French rule, the Prince of Monaco ceding his rights to the French Government for 4,000,000 francs. Consult: Mortillet, *Le Préhistorique* (Paris, 1900), and *Bulletins de la Société d'Anthropologie de Paris,* ser. 4, vol. ix. (Paris, 1898).

MENTOR (Lat., from Gk. (Μέντωρ). The son of Alcimus of Ithaca, the trusted friend of Ulysses, who, on setting out for Troy, left to him the charge of his household and the education of Telemachus. His name has become proverbial for a wise guide and counselor.

MENYANTHES, mĕn'ĭ-ăn'thēz. A genus of plants. See BUCKBEAN.

MENZALEH, mĕn-zä'le, LAKE. A lagoon on the northeastern coast of Egypt, extending from the Damietta branch of the Nile to the Suez Canal, and separated from the Mediterranean by narrow sand bars (Map: Egypt, F 1). It is 30 miles in length by about 20 miles in average breadth, is very shallow, and studded with low islands, on one of which are the remains of the ancient city of Tennesus. The lagoon has valuable fisheries, besides producing much salt.

MENZEL, mĕn'tsel, ADOLF VON (1815—). A German historical and genre painter, illustrator, and lithographer, one of the leading painters of the present day. He was born at Breslau, December 8, 1815, and when a mere lad assisted his father, a lithographer, in his work. To give him opportunity for study, the family removed to Berlin in 1830, but he soon relinquished as unprofitable the ordinary routine of training at the Academy, and may truly be called self-taught. His father's death in 1831 threw the support of the family upon his shoulders, and he worked hard at lithographic commissions. In 1833 he executed for the publisher Sachse "The Artist's Earthly Pilgrimage," a series of ten drawings in pen and ink illustrating Goethe's poem, "Künstler's Erdenwallen," which attracted immediate attention. Among his other efforts in lithography, the "Essays on Stone with Brush and Scraper," in which he produced effects resembling mezzotinting, are of especial interest as a novel departure, in which for a long time he had no imitator or rival. The real beginning of Menzel's triumphs was the year 1839, when he began the illustration of Kugler's *History of Frederick the Great,* a task occupying three years. These four hundred designs, drawn in pencil on wood and reproduced in fac-simile, brought him royal and popular favor, and gave a new impetus to the art of wood engraving in Germany. Menzel began to paint at the age of twenty, without formal instruction.

Of his paintings the best known are the episodes from the history of the great Prussian monarch. These include: The "Round Table of Frederick the Great at Sans Souci" (1850), and the "Flute Concert" (1852), both in the National Gallery, Berlin; "Frederick the Great Traveling" (1854), Ravené Gallery, Berlin; "Frederick and His Men at Hochkirch" (1856), in the Royal Palace at Potsdam. He appears as the painter-historian of the modern Hohenzollern in another series, of which the "Coronation of King William I. at Königsberg," in the Royal Palace, Berlin, and "Departure of the King for the Seat of War in 1870" (1871), in the National Gallery, Berlin, are the most conspicuous examples. Among a great variety of genre pictures, the "Modern Cyclops" (1875, National Gallery, Berlin), representing the interior of a rolling mill in Silesia, is a sterling piece of realistic characterization and of masterly light effects. Remarkable for this latter quality, as well as for its keen satire, is "The Ball Supper" (1879), and a later noteworthy example is the "Carnival Morning" (1885), in the National Gallery, Berlin. Besides various other honors bestowed upon him, Menzel was made a Privy Councilor, with the title of excellency, on his eighteenth birthday, in 1895, and received the Order of the Black Eagle, conferring hereditary nobility, in 1899. For his biography, consult: Sondermann (Magdeburg, 1895), and Knackfuss (Bielefeld, 1897); also Jordan, *Das Werk Adolf Menzels* (Munich, 1895); Waldstein, in *Harper's Magazine* (New York, 1896), and *Magazine of Art* (London, 1884 and 1901).

MENZEL, WOLFGANG (1798-1873). A German historian and critic, born at Waldenburg, Silesia, June 21, 1798. He studied at Jena and Bonn, became an ardent disciple of Jahn (q.v.) and the Turner movement, taught (1820-24) at Aarau, in Switzerland, and from 1825 lived as a man of letters at Stuttgart, where he edited the *Litteraturblatt* (1826-48; again in 1852). From 1830 to 1838 he belonged to the Württemberg Diet. Unsuccessful in politics, he gave himself up to literature, assailed Goethe, and was himself mercilessly attacked by Heine and others. His popular *Geschichte der Deutschen* came out in 1824-25; *Die Geschichte Europas, 1789-1814,* in 1853. His strongly monarchical tendencies develop in other histories. He composed the dramatic fairy tales *Rübezahl* (1829) and *Narcissus* (1830), and an historical novel, *Furore* (1851). His *Deutsche Litteratur* (1828) can be studied in *Specimens of Foreign Literature* (Boston, 1840). Consult also his autobiographical *Denkwürdigkeiten* (Bielefeld, 1876).

MENZELINSK, mĕn'tsĕl-ĭnsk'. A town of eastern Russia in the government of Ufa, situated on a branch of the Kama, 125 miles northwest of Ufa. Important fairs are held here, in which miscellaneous goods are sold to the value of $2,000,000 annually. Population, in 1897, 7542.

MEPH'ISTOPH'ELES (formerly also *Mephostophilus, Mephostophilis;* of uncertain derivation, but perhaps most plausibly explained as

Gk. μή, *mē*, not + φῶς, *phōs*, light + φίλος, *philos*, loving). One of the seven chief devils in the old demonology, the second of the fallen archangels, and the most powerful of the infernal legions after Satan. He figures in the old legend of Dr. Faustus, and in Marlowe's play of that name, as the familiar spirit of that renowned magician, and his name was commonly used as a term of jocular reproach. To modern readers he is chiefly known as the cold, scoffing, relentless fiend of Goethe's *Faust*.

MEP'PEL. A town in the Netherlands, situated on the Meppeler Diep, 16 miles northeast of Zwolle (Map: Netherlands, F 2). It is an important centre for the butter trade, and has calico and canvas manufactures. Population, in 1889, 8866; in 1900, 10,154.

MEQUINEZ, mĕk'ĭ-nĕz, or **MEK'NEZ.** A noted town of Morocco, Africa, situated in a mountainous region over 30 miles southwest of Fez (Map: Africa, D 1). It is still one of the finest cities of Morocco, although it has greatly declined since the eighteenth century, when it had attained unusual magnificence under the Sultan Muley Ismail. It is surrounded by extensive olive groves, and has a fine mosque which is visited by pilgrims, and a palace of the Sultan, who occasionally visits the town in the summer. It is of little commercial or industrial importance, its chief manufactures being earthenware and leather goods. The population is estimated at from 50,000 to 60,000.

MERAN, mȧ-rän'. A famous health resort in Tyrol, Austria, situated on the Passer, about 42 miles south-southwest of Innsbruck (Map: Austria, B 3). It lies at the foot of the Küchelberg, at an altitude of about 1000 feet, and is noted for its salubrious and moderate climate. The vicinity abounds in picturesque old castles and châteaux, and fine promenades extend along both banks of the Passer. The principal street, Unter den Lauben, flanked with arcades, contains the fifteenth-century burg—the former residence of the counts of Tyrol, and now in its restored condition serving as a museum. The season lasts from the beginning of fall to the end of spring, and the annual number of patients exceeds 10,000. Meran is provided with several churches, schools, and a theatre. On the northwestern side of the Küchelberg is the remarkable old castle of Tyrol, the ancient seat of the counts of Tyrol, and now in a half-ruined condition. The château of Lebenberg, south of Meran, is also of no little interest. Meran is first mentioned as Mairania in 857. It became a town at the end of the thirteenth century, and was until 1490 the residence of the counts of Tyrol. Population, in 1890, 7176; in 1900, 9284.

MERAN, AGNES OF. See WHITE LADY.

MERCADANTE, mĕr'kȧ-dän'tȧ, FRANCESCO SAVERIO (1797-1870). A celebrated Italian musician, born at Altamura. He studied the violin and the flute under Zingarelli at the Conservatory San Sebastiano at Naples, but soon turned his attention to compositions for the voice. In 1818 he produced a grand cantata, entitled *L'unione delle belli arti*, which was performed at the Teatro Fondo, and which met with a very favorable reception. This led to an engagement at the Teatro San Carlo, where his first opera, *L'apoteosi d'Ercole* (1819), was well received. In 1833 he was appointed chapelmaster at the Cathedral of Novara, and in 1836 his opera *I briganti* was performed in Paris with an extraordinary cast, which consisted of Rubini, Tamburino, Lablache, and Grisi. He was made director of the royal conservatory at Naples in 1840, but became totally blind in 1862. He composed many masses, and much Church music. He died at Naples.

MERCANTILE AGENCY. "An institution which, for a subscription price, agrees to collect information as to the financial condition and responsibility of business men and to transmit the same to its subscribers." At times it also undertakes the collection of debts for its customers. It originated in the United States, during the period of depression following the panic of 1837, and its avowed object was to uphold, extend, and render safe and profitable to all concerned the great credit system which had grown up with the increase of commerce. The first mercantile agency was established in New York during the year 1841 by Lewis Tappan, and was followed the next year by a similar agency under the control of Woodward and Dusenbury.

While originally established for the purpose of answering questions about the financial standing of particular persons, the scope of the agency has been extended, until its records contain the financial ratings of nearly every business man in the country. In addition to the general agencies, such as Dun & Co. and the Bradstreet Company, there are many special agencies which confine themselves to particular lines of trade. By the general agencies the country is divided into districts, in each of which is a managing agent with various correspondents in the several localities. If a subscriber wishes more minute or more recent information than that contained in the agency's periodical reports, he asks for and receives a special report brought down to date.

While a mercantile agency is employed by its subscribers to do certain things for them, it is not in the strict sense their agent (q.v.) in these transactions; it is rather an independent contractor. It engages to accomplish a stipulated result, but is entirely free to accomplish this in its own way and with its own instrumentalities. If, in obtaining and publishing information, it does a legal wrong to third persons, it is responsible therefor, but its employers are not. A statement made to a subscriber asking for it is generally held to be conditionally privileged, but when made to other subscribers who have no interest in the information it is not privileged. In a case of the former kind the plaintiff would be obliged, therefore, to prove actual malice, or malice in fact, to sustain an action for libel, slander, or the like, on the part of the agency; but in the latter case he would not.

A subscriber who is misled to his injury by acting upon false information supplied by the agency is generally entitled to damages against it. Most agencies, however, require their patrons to agree that the agency shall not be responsible for any loss caused by the neglect of any of its servants, clerks, attorneys, or employees in procuring, collecting, and communicating information. Such agreements have been upheld by several courts. If, however, after correct information has been received by the agency, a blunder is made by its managers in printing it, the agency should be held liable, and such a decision was made by the Supreme Court of Pennsylvania. When a business man makes false statements about his financial condition to a mercantile agency, and this is communicated to a third party who acts upon it to his injury, the third party has as good cause of action in deceit (q.v.) against the business man as though the statement had been made directly to him. Consult: Errant, *The Law Relating to Mercantile Agencies* (Philadelphia, 1889); Reinhard, *A Treatise on the Law of Agency* (Indianapolis, 1902).

MERCANTILE AGENT. In the absence of a statutory definition, specifically one who acts as agent for another in important commercial transactions. It does not include a mere servant, care-taker, or a merchant's clerk or salesman, or a common carrier. The present Factors Act in England (52 and 53 Vict. c. 45 § 1) defines the term as an "agent having in the customary course of his business as such agent authority either to sell goods, or to consign goods for the purpose of sale, or to buy goods, or to raise money in the security of goods." This is the signification in which the term is most frequently used in current law literature.

MERCANTILE LAW. A term which, at present, covers a rather indefinite domain in English law. It is ordinarily applied to a group of topics, more or less closely related, and having this element in common, that they have originated in, or been greatly modified by, the usages and customs of merchants. The legal rules governing these various topics do not form a separate and independent branch of jurisprudence: they cannot be called with accuracy a distinct and homogeneous body of law. In the leading English treatise on this subject mercantile law is viewed as comprising: partnership, joint-stock companies, agency, negotiable paper, contracts with carriers, insurance, sale, bottomry and respondentia, debt, guaranty, stoppage in transit, lien, and bankruptcy.

Much of the law upon these subjects is of ancient origin, coming to us from the Roman civil law and later codes. For a discussion of this early development, see LAW MERCHANT. For the law upon the various subjects included under the term mercantile law, such as partnership, lien, etc., see those titles in the vocabulary. Consult the authorities cited under LAW MERCHANT, and the titles PARTNERSHIP; LIEN; etc.

MERCANTILISM. The system of economic policy evolved by the European States after the decay of the feudal system. In essence it represented a transition from local and territorial to national economy. In the earlier period each town had regulated industry in the exclusive interest of its own inhabitants, treating the citizens of other towns as aliens who could trade in the town only after submitting to such restrictions as the town government chose to impose. It was the purpose of the mercantilist statesmen to break down the barriers to internal intercourse, and to unite the State in a single economic organism in rivalry with other States.

The practical measures by which the mercantilist statesmen sought to attain national power were: (1) the accumulation within the State of a large amount of the precious metals; (2) the encouragement of agriculture; (3) the development of manufactures; and (4) the creation of a mercantile marine. In the writings of the exponents of mercantilist doctrine especial emphasis was devoted to the acquisition of treasure. The European States were rapidly passing from an economic order in which payments in kind prevailed to an economy based upon money transactions, and as a consequence the great importance of a sufficient stock of the precious metals occupied a large share of the attention of statesmen. In the earlier mercantile period an effort had been made to prevent the exportation of bullion altogether. Later it came to be recognized that bullion sent abroad in the way of exchange might result in an ultimate increase in the stock of bullion at home. Statesmen then concentrated their attention upon securing a favorable balance of trade. One way of attaining this end was to encourage the exportation of finished commodities and the importation of raw materials, since in this way a greater value would be exported than imported.

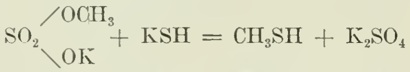
Manufactures were encouraged because they furnished materials for commerce, helping thereby to secure the so-called favorable balance of trade. Agriculture also took a subordinate position, and was encouraged as a source of abundance of raw material. The growth of population was desired in order to have an ample supply of cheap labor power. Cheap agricultural products and cheap labor were aims, and herein we see a difference between mercantilism and modern protectionism, the avowed claims of which are high prices for the products and high wages for labor. In England the earlier prohibition of exportation of grain, which had been calculated to favor the consumer, was succeeded by prohibition of importation when prices fell below a certain figure, in order that tillage might be uniformly profitable. Manufactures were stimulated by high duties, or even by prohibition of imports, and by numerous sumptuary laws favoring domestic manufactures. The aim here was twofold: to attain national economic independence and to prevent the export of bullion in payment for foreign goods. Finally, the encouragement of shipping was naturally regarded as of the greatest consequence at the time, since the new trade with America and the Orient rapidly enriched the nations which controlled it. For the mercantilist navigation policy, see NAVIGATION ACTS.

Mercantilism as a definite policy first appears in English history at the end of the fourteenth century; not much later it was also the settled policy of France. In England it reached its height under Elizabeth; in France under Colbert in the seventeenth century. From that time pure mercantilism rapidly decayed, degenerating into a complicated system of discriminating duties designed to favor private interests instead of those of the State as a whole. It was mercantilism of this kind against which Adam Smith directed his criticisms, which prejudiced economic writers for a century against the system. Recent historical investigations have, however, demonstrated that at its best mercantilism represented a great advance in economic policy, and that it was effective in bringing about national unity and independence. See INTERNATIONAL TRADE; PROTECTION; BALANCE OF TRADE; PHYSIOCRATS; NAVIGATION ACTS.

BIBLIOGRAPHY. Perhaps the best presentation of a moderate mercantilism by an advocate is that found in Sir James Stewart's *Inquiry into the Principle of Political Economy* (London, 1767). For the older critical attitude toward mercantilism, consult Adam Smith, *Wealth of Nations,* book iv. By far the best statement of the modern view is Schmoller's *Mercantile System* (Eng. trans., New York, 1896).

MERCAP′TANS (from Lat. *mercurius,* mercury, quicksilver + *captans,* pres. part. of *captare,* frequentative of *capere,* to take; so called as absorbing mercury). A class of carbon compounds analogous to the alcohols. The latter are defined as compounds containing one or more OH (hydroxyl) groups directly combined with hydrocarbon groups like methyl (CH_3), ethyl (C_2H_5), etc. Similarly, the mercaptans may be defined as compounds containing one or more SH (sulphur and hydrogen) groups directly combined with hydrocarbon groups. Thus, methyl alcohol has the constitution CH_3OH, methyl mercaptan the constitution CH_3SH; ethyl alcohol has the constitution C_2H_5OH, ethyl mercaptan the constitution C_2H_5SH; etc. The following are the two principal methods used in preparing mercaptans: (1) by the action of an alcoholic solution of potassium sulpho-hydrate (KSH) upon halogen derivatives of the hydrocarbons (CH_3Cl, C_2H_5Cl, etc.): (2) by distilling an aqueous solution of potassium sulpho-hydrate with salts of acids like the well-known ethyl-sulphuric acid. Thus methyl mercaptan may be prepared according to either of the following reactions:

$$\text{I.}\quad \underset{\substack{\text{Methyl}\\\text{chloride}}}{CH_3Cl} + \underset{\substack{\text{Potassium}\\\text{sulpho-}\\\text{hydrate}}}{KSH} = \underset{\substack{\text{Methyl}\\\text{mercaptan}}}{CH_3SH} + \underset{\substack{\text{Potassium}\\\text{chloride}}}{KCl.}$$

II. 

$$\text{II.}\quad \underset{\substack{\text{Potassium}\\\text{methyl-}\\\text{sulphate}}}{SO_2\begin{matrix}\diagup OCH_3\\ \diagdown OK\end{matrix}} + \underset{\substack{\text{Potassium}\\\text{sulpho-}\\\text{hydrate}}}{KSH} = \underset{\substack{\text{Methyl}\\\text{mercaptan}}}{CH_3SH} + \underset{\substack{\text{Potassium}\\\text{sulphate}}}{K_2SO_4}$$

Most mercaptans are liquid, though some exist, at ordinary temperatures, in the solid state. The liquid mercaptans are much more volatile than the corresponding alcohols. They are only sparingly soluble in water, but mix freely with alcohol or ether. Their most characteristic property, however, is their exceedingly offensive odor, by which, according to Emil Fischer and Penzoldt, a quantity of ethyl mercaptan can be detected that is 250 times more minute than the smallest amount of sodium that can be revealed by the spectroscope. The hydrogen of the SH group of a mercaptan can be replaced by metals. The resulting substances, called 'mercaptides,' are decomposed by acids, but—unlike the alcoholates (see Alcohols)—they are unaffected by pure water. The ethyl mercaptide of mercury is formed according to the following equation:

$$\underset{\substack{\text{Ethyl}\\\text{mercaptan}}}{2C_2H_5SH} + \underset{\substack{\text{Mercuric}\\\text{oxide}}}{HgO} = \underset{\substack{\text{Mercuric}\\\text{mercaptide}}}{(C_2H_5S)_2Hg} + \underset{\text{Water}}{H_2O}$$

The first mercaptan ever prepared was ethyl mercaptan, which was obtained by Zeise in 1833. It is now extensively used in the manufacture of sulphonal (q.v.), a well-known hypnotic.

MERCAP′TIDES. See Mercaptans.

MERCA′TOR, Gerardus (Latinized form of Gerhard Kremer) (1512-94). A Flemish mathematician and geographer, born in Rupelmonde. He took his degree in philosophy at the University of Louvain, and later made a profound study of the sciences of geography and mathematics. In 1559 he was appointed cosmographer to the Duke of Jülich and Cleves. His name is perpetuated by the projection used in nautical maps, in which the meridians are represented by parallel lines, and parallels of latitude by straight lines intersecting the meridians at right angles. The projection, however, seems to have been applied to nautical maps by Edward Wright. Besides a large number of maps, Mercator compiled series of geographical tables, *Tabulæ Geographicæ ad Mentem Ptolemæi Restitutæ* (1578). He also wrote a *Harmonia Evangeliorum* (1592); and a work entitled *Atlas, sive Cosmographicæ Meditationes de Fabrica Mundi* (1594), which was placed on the Index Expurgatorius.

MERCATOR (properly Kaufmann), Nicolaus (c.1620-87). A German mathematician, astronomer, and engineer, born at Cismar in the Duchy of Holstein. He was educated at the universities of Copenhagen and Rostock, and in 1660 or thereabouts went to London, where he became one of the first members of the Royal Society, then newly founded. Subsequently he proceeded to France, where he was appointed hydraulic engineer to direct the construction of the Versailles fountains. Owing to his refusal to accept the Roman Catholic faith, the sum agreed upon as payment for this work was withheld, and this fact is said to have hastened his death. He is credited with the discovery of several methods of calculation, in astronomy and higher mathematics. His publications include, besides contributions to the *Philosophical Transactions* of the Royal Society, *Cosmographia* (1651); *Astronomia Sphærica* (1651); *Rationes Mathematicæ Subductæ* (1653); and *Logarithmotechnia* (1668-74). Consult: Kaestner, *Geschichte der Mathematik* (Göttingen, 1796-1800); Montucla, *Histoire des mathématiques* (Paris, 1799-1802).

MERCATOR'S PROJECTION. See Chart; Geography; Map; Mercator; Navigation; Sailings.

MERCEDES, mĕr-sā′ᴅȧs. A town in the Province of Buenos Ayres, Argentina, situated on the Pacific Railroad, 36 miles west of Buenos Ayres (Map: Argentina, H 13). It is a flourishing town in a rich sheep-raising region, has a college, a public library, and several steam-mills and soap factories. Population, about 10,000. It was founded as a military station in 1779, and has been settled largely by Irish immigrants.

MERCENARIES (Lat. *mercenarius,* hireling, from *merces,* wages, from *merere,* to gain, deserve; connected with Gk. *μείρεσθαι, meiresthai,* to share, divide). Hired soldiers, usually foreigners in the country for which they fight. They existed from the earliest times. In the early Greek republics there was no standing army or mercenary force, but the citizens themselves formed a national militia. In Persia, however, there were large numbers of Greek mercenaries, and they appear to have played the same part which in later centuries the Swiss did in Western Europe. The first Grecian State which used mercenaries in large numbers was Athens, and other Greek States soon followed this example, so that by the end of the Peloponnesian War there were a large number of men in

Greece whose profession was war, and who fought regardless of the cause. In Rome mercenary troops were long used merely as auxiliaries, but about the fourth century after Christ the army began to assume the characteristics of a mercenary force, being composed largely of Germans, who finally overthrew the Western Empire. In the Byzantine Empire nearly all the troops were mercenaries.

But the golden age of mercenaries was in Western Europe during the Middle Ages and the beginning of the modern era. In the early Middle Ages armies were recruited by a feudal levy, but when wars came to be waged on a larger scale in the eleventh century, the forty days per year which the vassal had to serve proved insufficient, and instead the King or feudal lord preferred to commute the service of the vassal for a money payment and hire soldiers instead. In England, it is true, mercenaries were rare, though they did form one of the grievances against John and Henry III. The reason for their scarcity in England was that there warfare consisted to a great extent in border raids, for which the feudal levy or local militia was ample. On the Continent circumstances were different, and kings with a wide and scattered empire, like Henry II. of England, who possessed a large part of France, were compelled to employ mercenaries of all kinds. At first it was common to buy their services by a gift of land, but by the twelfth century money became more common, and Norman knights, Genoese bowmen, and Flemish pikemen were frequently hired for pay. A fuller development was reached in the thirteenth century by the appearance of the *condottiere* system, in which some noted chief collected an army of free companions, and sold his force as a whole. The first of these was Roger de Flor, who waged war successfully against the Byzantine Emperor Andronicus II. (See CATALAN GRAND COMPANY.) It was to this type that the various noted Italian adventurers belonged. The character of Italian civilization was of a kind to give impetus to the rise of a mercenary force, for the inhabitants of the many commercial city States were unwarlike and at the same time engaged in numerous petty quarrels. Frequently, however, the mercenaries turned their arms against the city which had hired them, or aided in imposing a tyrant upon the city, who then rewarded the company from the spoils. Thus arose in Milan the rule of the Visconti, in Verona that of the Scala, in Ferrara that of the Este, in Rimini that of the Malatesta. At the end of the fourteenth century the Italian mercenary met a dangerous rival in the Swiss pikeman. Switzerland was too small and poor to support all of its hardy sons, and they were sold in large numbers, usually by the canton itself, to some warlike prince. After the battle of Melegnano in 1515, they formed a valuable contingent in the French armies until the French Revolution. All parties in the Thirty Years' War used mercenaries to the exclusion of nearly all other troops, and to this fact is partly due the terrible devastation which was caused. In the American Revolution Great Britain used Hessian mercenaries to fight against the colonists, it being common for some of the smaller princes to sell their subjects in this fashion. The use of mercenaries on the Continent ended with the French Revolution, their place being taken by national standing armies. See BRABANÇONNES; CONDOTTIERE; FREE LANCE; SWISS GUARD.

MERCER, FORT. See FORT MERCER.

MER'CER, HENRY CHAPMAN (1856—). An American anthropologist and archæologist, born at Doylestown, Pa., and educated at Harvard, where he graduated in 1879. He made special studies of the relations of extinct animals to primeval man in North America, especially in connection with the mylodon, peccary, and sloth; made valuable discoveries of fossil carnivora in the Port Kennedy (Pa.) bone cave; and explored the caverns of Yucatan. After research on the Pennsylvania Dutch pottery manufactures he perfected a preparation for mural tiles. Mercer wrote: *Lenape Stone* (1885); *Hill Caves of Yucatan* (1896); *The Antiquity of Man in the Delaware Valley* (1897); and *Tools of the Nation Maker* (1897).

MERCER, HUGH (1720-77). An American soldier. He was born at Aberdeen, Scotland; was educated at the university there; entered the medical profession, and served as assistant surgeon under Prince Charles Edward in 1745. The rebellion having failed, he emigrated to America in 1747, and settled as a physician near the site of the present Mercersburg, Pa. He served as captain under Braddock in 1755, and was so severely wounded in the battle near Fort Duquesne that he could not keep pace with the other fugitives, and spent several weeks in solitary wandering, before he finally reached Fort Cumberland, 100 miles away. In 1758 he was promoted to be lieutenant-colonel, accompanied General Forbes to Fort Duquesne, now Pittsburg, and commanded that post for some time. Afterwards he settled at Fredericksburg, Va., and on the approach of the Revolution took sides with the patriot party. He organized and drilled the militia of Virginia in 1775, and the minute men in 1776, and at Washington's request on June 5, 1776, was made a brigadier-general by Congress. He commanded a column in the attack on Trenton, and led the advance in the night march on Princeton, which he had himself advised. While rallying his temporarily disorganized troops early in the engagement at Princeton he was mortally wounded, after a stubborn hand-to-hand conflict in which he refused all quarter, and on January 12 he died in a neighboring farm-house. A monument to his memory was erected at Laurel Hill Cemetery, Philadelphia, in 1840.

MERCERIZED COTTON. Cotton that has been treated by a chemical process which imparts a permanent silky lustre to the fabric, yarn, or thread. About the middle of the nineteenth century John Mercer, an English chemist, discovered that caustic soda or caustic potash had a remarkable effect upon the cellulose structure of the cotton fibre, changing its physical and chemical nature, causing it to shrink and become thicker and softer, and increasing its affinity for dyes. No practical use was made of the discovery because the process shrunk the material so badly. Toward the close of the last century, it was discovered that by treating the cloth under tension the shrinkage is obviated and the material assumes a glossy appearance, like silk. This effect is due to the elongation of the fibres, which under the action of the chemicals have been softened and made glutinous, so that the fabric acquires the same striated texture and lustre that silk possesses. In fact, the artificial process is exactly similar to that involved in the production of silk, for it is the elongation of the plastic glutinous thread from the silkworm that gives lustre to the silk.

MER'CERSBURG. A borough in Franklin County, Pa., 73 miles southeast of Harrisburg; at the terminus of a branch of the Cumberland Valley Railroad (Map: Pennsylvania, D 4). It was formerly a noted educational centre as the seat of institutions under the control of the Reformed Church in America (German). It now has the well-known Mercersburg Academy. The principal interests are agricultural. Mercersburg, originally called Black Town, was settled about 1730 and was incorporated first in 1831. It was the home of President James Buchanan. In 1901 the limits of the borough were extended, considerably increasing the population. Population, in 1890, 967; in 1900, 956.

MERCERSBURG THEOLOGY. The name of a system of views emanating from the theological seminary of the German Reformed Church formerly located at Mercersburg, Pa. (now at Lancaster), and chiefly defended by Prof. J. W. Nevin (q.v.). He insisted upon the true unity of the person of Christ, and the genuinely human character of His life. The person of Christ was made central in the system. Christ is united with generic humanity, which develops itself by an inward force in the Church. Thus the Church has a true theanthropic character. Emphasis was also laid upon the objective operation of the sacraments. Consult Nevin's principal work, *Mystical Presence* (Philadelphia, 1846), and his *Life* by Theodore Appel (Philadelphia, 1889).

MERCER UNIVERSITY. A Baptist institution of learning at Macon, Ga., founded in 1838. In 1902 it had a faculty of 15, and a student enrollment of 222 in the College of Liberal Arts, and 50 in the Law Department. The library contained 15,000 volumes. Its endowment was $293,000, and its income $20,000. The grounds and buildings were valued at $200,000.

MERCHANTABLE ARTICLE. One that is salable in the market under the name which it bears in the contract relating to it. Frequently a contract of sale expressly provides that the article to be delivered shall be merchantable; but even in the absence of such a statement, a contract for the sale of goods by description, as for the sale of sugar, or wheat, or coal, implies an undertaking by the seller to supply a merchantable article. The buyer is not entitled to a perfect article, but he is entitled to one that is salable under its contract name. If the contract is for a quantity of Manila sugar, the buyer cannot insist upon absolutely pure sugar, but he can reject sugar that is adulterated to such an extent as not to pass in market as salable Manila sugar. Where the term 'merchantable' is used in the contract, either party may show that it bears a peculiar meaning in that locality. Consult the authorities referred to under Sales (of personal property).

MERCHANT OF VENICE, The. A comedy by Shakespeare, produced probably in 1597, printed in 1600. The earliest version was probably that by Henslowe, in 1594, under the title "The Venesyon Comedy." The incidents of the play are drawn from many sources. The story of the pound of flesh is very ancient; Shakespeare took the story of Bassanio no doubt from the counterpart in the "Adventures of Gianetto" in Fiorentino's "Il Pecorone," written in 1378, but printed in 1558; and possibly from a similar tale in the "Gesta Romanorum," which contained as well the story of the choice of three caskets, a popular mediæval tale. He may have been indebted to the lost play "The Jew," mentioned by S. Gosson in his "School of Abuse," 1579; but certainly was influenced by Marlow's "Jew of Malta." The character of Shylock was drawn in part at least from "The Orator" by Silvayn; while the story of Antonio and Shylock was foreshadowed in "Three Ladies of London," by Robert Wilson, 1584.

MERCHANTS, Custom of. See Law Merchant.

MERCHANTS ADVENTURERS. An English company organized in late mediæval times for carrying on foreign trade. Its constitution was that of a regulated company (q.v.), any one having a right to join in the trade upon payment of a fine and agreement to submit to the regulations of the company. The date of its incorporation is not known, but privileges were granted to it by the Count of Flanders as early as the fourteenth century. The principal business of the company was the export of cloth; and it exacted regular contributions from all persons who exported cloth to countries covered by its privileges. In the sixteenth century the chief work in extending English foreign trade was performed by this company. When the Portuguese made Antwerp the depot for Oriental wares, the Merchants Adventurers grew rapidly in wealth, since their goods could find a ready sale for the Eastern trade. In the same century the company began a long war with the traders of the Hanseatic League (q.v.), who were infringing upon their monopoly of the export of woolen goods. The Hanseatic traders were at first protected by the Crown, but finally were driven from England by a decree of Queen Elizabeth. With the siege and capture of Antwerp by the Spaniards (1584-85), the Merchants Adventurers had to find new centres for carrying on their foreign trade, and finally settled in Hamburg, becoming known as the Hamburg Company. Much of the historical importance of the Merchants Adventurers lies in the fact that their organization served as a model for the great foreign trading companies of the sixteenth and seventeenth centuries. See Regulated Company, Staple.

Bibliography. For a brief account of the Merchants Adventurers, see article "Adventurers, Merchants," in Palgrave, *Dictionary of Political Economy* (London, 1894). A more extended discussion will be found in Lingelbach, *The Merchant Adventurers of England* (Philadelphia, 1903).

MERCHANTS' COURTS. Certain courts which arose out of the guild merchant, by the practice of the guild brethren assuming to do justice at their 'morning speeches,' or periodical meetings of the society. They first assumed to decide cases of inheritance and succession, the right of a member of a guild being treated as an object of ownership. Then, besides these matters, they assumed jurisdiction over actions of debt, covenant, and trespass, and such other matters as they could enforce by their decrees. These judicial functions of the guild merchant became well established, in some cases at least, as early as the twelfth or thirteenth century; and the merchants' courts exercised a large influence upon the economic and corporative growth of the municipalities where they existed both in England and on the Continent. These old courts disappeared with the disappearance of the guild merchant, which was superseded by the aggregate of the crafts; but the business customs that they recognized and helped to establish became the source of a large part of the mercantile usages and laws of to-day. See further under Law Merchant, and consult the authorities there referred to. .

MERCHANT'S TALE, The. One of Chaucer's Canterbury tales. The story is the betrayal of an old husband by a young wife. Tyrwhitt thinks it was taken from a Latin fable by Adolphe of 1315, but the story with the incident of the pear-tree is found in many sources. It forms the seventh of the "Fables of Alfonce," added by Caxton to his edition of Æsop, 1484, and is found in "Behar Damish," composed in 1650, though the story, evidently of Oriental origin, is far older. Boccaccio and Chaucer may have drawn it from the "Commedia Lydiæ." An account of these sources is found in the Chaucer Society publications under "Origins and Analogues" of the Tales. Pope used the tale as a basis for his "January and May."

MERCIA, mẽr′shȧ. An ancient Anglo-Saxon kingdom, which extended on both sides of the river Trent from the North Sea to Wales. It owed its origin to the fusion of many smaller States, though the chief portion was conquered by Angles late in the sixth century. The name Mercians signifies 'men of the march,' for they were settled along the moorlands, which for centuries remained the borderland between Angle and Welshman. The Kingdom was of little importance until the accession of Penda in 626, who rapidly attained a supremacy over the other kingdoms after his victory over the powerful Edwin (q.v.), the Deiran King, at Hatfield (or Heathfield) in 633. In 655, however, Penda was defeated and slain by Oswin of Northumberland at Winwaed, and for the time being Mercian supremacy came to an end. It recovered gradually under Wulfhere (658-675), who was the first Christian King of Mercia, and attained its highest development in the eighth century, especially under Æthelbald (716-757) and Offa (757-796). After the death of the latter the Kingdom rapidly declined, and in 828 it was merged in the realm of Egbert (q.v.) of Wessex. Consult Green, *The Making of England* (New York, 1882). See Heptarchy.

MERCIÉ, mâr′syâ′, Antonin (1845—). A French sculptor, born at Toulouse. He was a pupil of Jouffroy and Falguière, and shows much of his latter master's technical perfection. He won the Prix de Rome in 1868, and sent from Rome his "David Vainqueur" (1872), now in the Luxembourg. Other works by this sculptor are: "Gloria Victis" (1874), now in the Place Montholon; "David avant le combat" (1876); "Le génie des arts" (1877), for the entrance to the Tuileries; the "Quand même" (1882), at Belfort; and busts of Gambetta and Michelet. He erected the tombs of Thiers and Michelet at Père-Lachaise, and the monument to Gounod for the Park Monceau. One of his most celebrated works is the statue of Napoleon on the Vendôme Column.

MERCIER, mâr′syâ′, Honoré (1840-94). A Canadian political leader. He was born at Saint Athanase, Quebec; was educated at the Jesuits' College, Montreal; studied law, and in 1867 was admitted to the bar. In 1862-64, as editor of *Le Courrier de Saint-Hyacinthe,* he for some time advocated liberal principles. In 1871 he was elected to the Commons from Rouville, in 1879 to the Legislative Assembly, and in the same year became Solicitor-General. In 1883 he was selected to lead the Liberal opposition in the Assembly, but later founded a party of his own by combining Liberals and Clericals, and in 1887 became Premier.

MERCIER, Louis Charles Antoine (1744-1812). A French engineer, born at Melun. He entered the French naval service about 1760, but at the outbreak of the American Revolution got permission to join the Patriot forces as a volunteer, and served under d'Estaing and Lafayette. At the close of the war he reëntered the French service, but during the Reign of Terror fled to Louisiana, where in 1803 Napoleon employed him to draw up plans for the protection of the Gulf Coast. Later Mercier explored the country as far as Oregon and California. In 1808 he returned to France, where he published *Mémoire sur les vapeurs de l'atmosphere le long du cours du Mississippi* (1808); *Carte du bassin du Mississippi* (1808); *Système hydrographique de la Louisiane* (1809); *Carte du delta du Mississippi* (1810); *Etudes topographiques, géographiques, hydrographiques, géologiques et géodésiques sur la Louisiane* (1811); and *Tableau du climat de la Louisiane, et de son influence sur les Européens et les Créoles* (1812).

MERCIER, Louis Sébastien (1740-1814). A French author, born in Paris. At first he wrote novels, some of which, especially *L'homme sauvage* (1767), were widely read. After having written some dramas, which were severely criticised, he published an *Essai sur l'art dramatique* (1773), in which he contended that the dramas of Racine and Corneille had ceased to be of any interest to the French theatre. Mercier wished to see Diderot's theories realized on the boards; he wished to see life portrayed more faithfully. It was after a prolonged struggle that Mercier had the satisfaction of seeing his dramas, *L'habitant de la Guadeloupe, La brouette du vinaigrier,* and *Le déserteur,* played on the Parisian stage, where they were enthusiastically received. In his essay *L'an 2440, rêve s'il fut jamais,* published in 1770, he sketches out a programme of political and social reforms. His *Tableau de Paris* (1781), in which the vices and lawlessness of the Parisian aristocracy are described, gave so much offense that he was compelled to leave France. His other books include: *Le nouveau Paris* (1800), and *Histoire de France depuis Clovis jusqu'au règne de Louis XVI.* (1802). Mercier was a member of the Convention, in which he voted for the death of Louis XVI., and of the Council of Five Hundred.

MERCIER DE LA RIVIÈRE, mâr′syâ′ de lȧ rē′vyâr′, Paul Pierre (1720-1794). A French economist. In 1758 he became Intendant of Martinique, where he attempted to apply the free-trade notions of the Physiocratic School. He returned to France in 1767, and published *L'Ordre naturel et essentiel des sociétés politiques,* pronounced by Adam Smith to be the best exposition of the doctrines of the Physiocrats. This work was received with extravagant applause, and gained for him an invitation to the Court of Catharine II. of Russia. He published several other works, which do not, however, rise above mediocrity.

MERCK, mĕrk, Johann Heinrich (1741-91). A German author and critic, born at Darmstadt and educated at Giessen. His influence on German literature was the result of his critical ability, but chiefly through his early recognition and encouragement of Goethe, his intimate friendship with Herder, Wieland, Forster, and Lichtenberg, and the prominent part he took in Wieland's *Merkur,* the *Frankfurter gelehrte Anzeigen,* and Nicolai's *Allgemeine deutsche Bibliothek.* In business ventures and in his domestic relations he was unfortunate, his mind became affected, and in 1791 he committed suicide. His correspondence, printed at Darmstadt (1835-38) and at Leipzig (1848), and a selection from his critiques, edited by Stahr (1840), alone remain as evidences of his literary ability. Consult Zimmermann, *Johann Heinrich Merck* (Frankfort, 1871).

MER'CUR, James (1842-96). An American military officer and scientist. He was born at Tonawanda, Pa., and, after graduation at West Point, was assistant engineer on the survey of the Northern and Northwestern lakes. In 1867 he was appointed assistant professor of natural and experimental philosophy at West Point. He likewise engaged in different river and harbor improvements, notably at Hell Gate, and was professor of civil and military engineering at West Point from 1884 until his death. He revised and enlarged Mahan's *Permanent Fortification* (1887), and wrote *Elements of the Art of War* (1888), and *Military Mines, Blasting, and Demolitions* (1892).

MERCURIC CHLORIDE, or Corrosive Sublimate, $HgCl_2$. One of the two known compounds of mercury and chlorine, the other, which contains a smaller proportion of chlorine, being described under Calomel (q.v.). Mercuric chloride may be prepared by heating a mixture of mercuric sulphate and common salt with manganese dioxide, and collecting the sublimate in a suitable receiver. The manganese dioxide remains behind unchanged, its presence being desirable only in order to prevent the formation of calomel along with mercuric chloride. Corrosive sublimate is moderately and very slowly soluble in water, but is quite soluble in ordinary alcohol, which dissolves about one-third of its weight of the sublimate. Mercuric chloride is a violent poison, the symptoms of acute poisoning being painful gastro-intestinal irritation, vomiting, and diarrhœa. A moderate amount of white of egg forms a good antidote. Besides, milk and flour should be given, and vomiting should be induced by mustard and lukewarm water, or by irritating the fauces. In small quantities mercuric chloride is administered internally, either by the mouth or hypodermatically, as a remedy for syphilis, mercury salts being especially valuable in the primary and secondary stages of the disease. Externally mercuric chloride is extensively used as an antiseptic and as an antiparasitic, the maximum strength of solutions thus employed being about one part of the sublimate to one thousand parts of water. It is one of the most powerful antiseptics known.

MERCURIC CYANIDE. See Hydrocyanic Acid.

MERCUROUS CHLORIDE. See Calomel.

MERCURY (Lat. *Mercurius,* Gk. ʽΕρμεαίς, *Hermeias,* hence ʽΕρμῆς, *Hermēs,* Doric ʽΕρμᾶς, *Hermas*). The Latin name for one of the Olympian divinities of Greece and Rome, known to the Greeks as Hermes.

Greece. According to the common Greek legend Hermes was the son of Zeus and Maia, who bore him on Mount Cyllene in Arcadia. Immediately after his birth he went forth and stole the cattle of Apollo, dragging them backward to his cave. When accused he stoutly denied the theft even before Zeus, and when convicted succeeded in pacifying his brother by the gift of the lyre, which he had been led to invent from discovering a tortoise-shell in which only the dried sinews remained. In the *Odyssey* and later, Hermes is the messenger of the gods—their herald (κῆρυξ), of supernatural swiftness, often with wings on his shoes and cap, and carrying a magic rod (the later caduceus, q.v.). With this rod he charms men to sleep and wakes them. He also appears in the latest stages of epic poetry and throughout classical antiquity as Hermes Psychopompos, who conducts the souls of the dead to the lower world, where he intrusts them to Charon, who ferries them over the Styx. He was also the herdsman's god, being especially worshiped to secure increase of the flocks. And from this function perhaps arises connection with the ram and calf, both of which are associated with him in cult and art. Travelers looked to him for guidance and help on their journeys, and traders venerated him as one who could increase their gains, for he was the god of good luck and 'windfalls.' He was also the patron of thieves; perhaps originally of cattle-raiders. He was also honored in the palæstra and gymnasium, where his statues were erected, as the guardian and favorer of manly sports. In later times he appears frequently as a god of eloquence and persuasion.

Perhaps his most common appearance in the Greek world, certainly in Attica, was as the god of roads and boundaries. Square pillars, called *hermæ,* were common as guide-posts and boundary marks. They usually bore the head of the god, and a phallus, and on them, as a sacred place, food was sometimes left for needy wanderers. The pillar seems the essential and original sign of the god, and perhaps even earlier the god was present in cairns or heaps of stones, which were called *hermæa.* The worship of Hermes therefore shows a mixture of elements in which conceptions of a heavenly god are combined with worship of rude stones. The name has not been satisfactorily explained, for its etymological identity with *Sarameyas* or *Sarama,* the *dog* of the gods of Indian mythology, is by no means certain, and any other connection in the conception is hard to see. It is possible that ἕρμα, a 'mound' or 'cairn,' is at the basis of the name, and that the pile of stones in the pasture or on the road is the dwelling place of the god who protects the herds and the wayfarer. Many of his functions, however, agree well with the theory of Roscher, that Hermes is a wind-god. This explains his position as swift messenger of the gods, and as guide of the souls, for *wind* and *soul* are closely connected in the primitive conceptions. The variety and apparent lack of connection in his functions would find easy explanation in the union of divinities originally separate.

In art the types of Hermes show a marked change in the course of time. At first he is a bearded man, with the 'petasus' or broad-brimmed hat, winged shoes, and his herald's staff. Later the type becomes distinctly youthful and vigorous, sometimes with short-girded tunic and cloak, but with the figure often nude, or but lightly draped. The most famous extant statue of Hermes is the beautiful figure at Olympia, representing the god holding the infant Dionysus, the work of Praxiteles. See illustration under PRAXITELES.

ROME. Mercurius was brought to Rome from the Greeks of Southern Italy, as the god of merchants and trade, and this always remained his character in the Roman religion, as his attributes of the purse and caduceus plainly show. The literature of course presents him in all his varied Greek activities, but these are absent for the most part from the inscriptions. As the Roman traders penetrated to the north, they identified with their tutelary god the Celtic Esus, and even found grounds for regarding the Germanic Wotan as the same divinity.

EGYPT. Another divinity identified with Hermes was the Egyptian god Dhouti or Thoth (called Thout(h) or Thôt by Greek writers), and in this case the resemblance is more striking. Originally Thoth was the local god of Chmûnu, the Greek Hermopolis Magna (q.v.), and is usually represented in the form of, or with the head of, an ibis. Before historic times, however, he had become a moon god, worshiped throughout Egypt, and he plays an important part in Egyptian mythology as the assistant of the sun god in his fight against hostile powers. (See HORUS.) He was the inventor of writing and the scribe of the gods. A euhemeristic Phœnician tale represents him as a man of ancient times, who invented letters and communicated his discovery to his King, Thamus. Thoth was the judge who decided between Osiris (or Horus) and Set, and he assisted as recorder at the judgment of the dead. (See DEAD, JUDGMENT OF THE). He was the patron of learning and the inventor of all sciences, including especially astronomy and medicine. His sacred animals were the ibis and the cynocephalus. On Thoth as Hermes Trismegistus and on his writings, see HERMETIC.

OTHER COUNTRIES. According to Greek accounts, Taaut would seem to have been the Phœnician Hermes, the inventor of letters and sciences; but this is only a late importation of Egyptian ideas, as may be seen from the name of the deity, and from the fact that he is called a son of Misor or Egypt. Sumes, a name of obscure etymology, is given as the Punic name of Hermes. Among the Babylonians, Nabû the god of Borsippa, worshiped in the planet Mercury, corresponded to Hermes in many of his attributes. The later Arabs relate many fables about Hermes, stating, for example, that Hermes Trismegistus once lived at Calovaz in Chaldæa, but these stories are all worthless distortions of very late Greek traditions.

Consult Roscher, *Hermes der Wind-Gott* (Leipzig, 1878).

MERCURY. The planet nearest the sun. Its mean distance from the sun is 36,000,000 miles, its periodic time 88 days, its diameter 3030 miles, mass $\frac{1}{21}$ of the earth's; density 0.85, that of earth being unity. Since Mercury is an inferior planet, it is seen alternately east and west of the sun, at an apparent angular distance never exceeding 29°, and its apparent motion in the orbit is at times retrograde. When a change in the apparent motion takes place it appears for a short time stationary. During the year Mercury is morning star in the east three times and evening star in the west three times. Owing to its nearness to the sun, it is never above the horizon more than about two hours after sunset or the same time before sunrise. On this account, and from its small apparent size (5″ to 13″ angular diameter), it is seldom distinctly observable by the naked eye. It is said that Copernicus was never able to see it. It is very difficult to observe any markings on Mercury's surface, and there is consequently much doubt as to the period of revolution on its axis. In 1889 Schiaparelli (q.v.) announced that he had been able to fix this period at 88 days, in precise accord with the period of the planet's revolution around the sun. If this be correct (and it has received some confirmation from the observations of Lowell), Mercury always turns the same side toward the sun. This undecided question concerning the rotation time of Mercury is of much importance in theoretical astronomy. See SOLAR SYSTEM; PLANETS.

MERCURY, or QUICKSILVER. A metallic element that has been known since ancient times. As early as B.C. 300 Theophrastus mentions 'liquid silver,' which he says is obtained by rubbing cinnabar with vinegar in a copper vessel. Dioscorides describes the production of mercury by subliming cinnabar with charcoal in an iron pot. Pliny gave it the name of *hydrargyrum* when so obtained, while native mercury he called *argentum vivum*. Mercury was extensively studied by the alchemists, who believed that it was one of the component parts of all metals, and they were familiar with the method of purifying it by distillation. Many of the alchemists and iatrochemists considered mercury a metal; but this was disputed, and even as late as 1735 some chemists contended that it was a semi-metal. Not until 1759, when Braune found it possible to solidify it by exposure to a freezing-mixture, was its metallic nature established beyond dispute.

Mercury is found in small quantities in the metallic state, principally disseminated through its native sulphide. It is also found alloyed with silver, with gold, and with platinum, but in small quantities only. Its principal ore is the sulphide or *cinnabar,* but it also occurs in small quantities in combination with selenium, as *tiemannite* and *onofrite,* and with chlorine, as *calomel.* The ores of mercury are not widely distributed in nature, there being but few districts where extensive mining operations are carried on. In the United States the most important deposits are those of New Almaden and New Idri, Cal.; Lane County, Ore.; and Terlingua, Tex. The California mines have been for a long time the chief domestic source of mercury, producing about 1000 tons of metal annually. The mines of Terlingua have not been developed sufficiently to test their value. In foreign countries mercury is produced in Mexico, Spain, Italy, Austria, Russia, Australia, and China. The Spanish mines at Almaden yield about one-third of the world's total production. In 1900 the production of the different countries was as follows: Austria, 550 metric tons; Italy, 220 tons; Mexico, 335 tons; Russia, 340 tons; Spain, 1111 tons; United States, 967 tons; total, 3523 metric tons.

Mercury (symbol, Hg; atomic weight, 200.3) is a silver-white liquid metal that solidifies at — 40° C. (— 40° F.), and, while slightly volatile at ordinary temperatures, boils at about 360° C. (648° F.). Its specific gravity at 0° C. (32° F.) is 13.59. Its principal uses are in the separation of gold and silver from their ores, in the manufacture of vermilion, in medicine, in various chemical and physical operations, in the manufacture of alloys, etc. It dissolves and possibly combines chemically with nearly all of the metallic elements to form alloys termed 'amalgams' (q.v.). With oxygen it forms two oxides, of which the *mercurous* oxide is obtained by the action of caustic alkalies on mercurous salts, while the *mercuric* oxide ('red oxide of mercury,' or 'red precipitate') is formed by prolonged heating of mercury in air. The latter oxide is used in medicine and as an oxidizing agent in chemical operations. Corresponding to the two oxides, mercury forms two series of compounds, which are known as mercurous and mercuric salts. Among these, one of the most important is the mercuric sulphide found native as cinnabar, and when prepared artificially is the red pigment known as vermilion (q.v.). The two chlorides are important commercial salts, and of these the mercurous chloride, or *calomel* (q.v.), occurs native. The mercuric chloride, or *corrosive sublimate*, finds extensive use in medicine, and is extensively used for the preservation of skins and natural-history specimens. Mercuric ammonium chloride is a white powder that is extensively used in medicine, under the name of *white precipitate*, especially in the form of ointment. Metallic mercury and its salts are poisonous, and chronic mercurial poisoning is common among those who habitually work with the metal. When taken internally, salivation, ulcers of the mucous membrane of the mouth, and ultimately paralysis, result. The usual antidotes are albumen, milk, and flour and water. See also Hydriodic Acid; Hydrocyanic Acid.

Metallurgy. Practically the only ore which is regularly worked for mercury is cinnabar. Mercury may be extracted from cinnabar in several ways, but two methods only are used upon a large scale. They are (1) extraction by heating the ore in the air, and (2) extraction by heating the ore with lime or iron, air being excluded. In both methods the chemical reactions take place at temperatures above the boiling point of mercury, so that the latter is separated in the gaseous form and has to be condensed. Heating the cinnabar in the air is a process performed in shaft, reverberatory, or muffle furnaces, and is preferred to methods using lime or iron, inasmuch as it is more economical and less dangerous to the workmen, whose health should be considered, since mercurial vapors are exceedingly injurious. The leading objection to this method is the dilution of the mercurial vapors by sulphur dioxide, oxygen, and nitrogen, especially where shaft and reverberatory furnaces are employed, by the products of combustion. For these reasons it is rather difficult to condense the mercury, and therefore there are losses of the metal through incomplete condensation. On the other hand, where the mercury is extracted by heating the cinnabar with lime or iron, retorts are used in which the crushed ore is treated in small quantities. Concentrated mercurial vapors are obtained from these retorts, and then condensed so that with a high grade of ore the output is somewhat greater than by the first process. But as there is a much greater expense of labor and fuel, and as the process is unhealthy for the workmen, on account of the mercurial vapors in emptying retorts, the process is less frequently employed.

The extraction of mercury in the air consists in heating cinnabar with an excess of air to a high temperature. The heating is usually accomplished in shaft or reverberatory furnaces, from which the gases pass into the condensers, consisting of a series of tubes and chambers, and are there cooled until the mercurial gases condense into metallic mercury, while the other gases escape. The process requires great care to prevent the loss of mercury and danger to the workmen, and in the best operated plants the loss of mercury is at present not more than 8 per cent. of the metal in the ore, while every attempt is made to draw off the mercurial gases by fans and other apparatus, and so to keep them confined that they will not be inhaled by the workmen. Mercury is transported in wrought-iron flasks closed by a screw stopper and holding about 76 pounds of metal. Sheepskin bags are also used for this purpose. Consult: Schables, *Handbook of Metallurgy* (New York, 1898); Eggleston, *Metallurgy of Silver, Gold, and Mercury* (New York, 1890).

MERCURY, Medicinal Uses of. The twenty-one official preparations of hydrargyrum, or mercury, may be classified as follows: (1) *Preparations of mercury*, including mercury with chalk, blue mass, mercurial ointment, and two plasters of mercury; (2) the *chlorides of mercury and their preparations*, including calomel, corrosive sublimate, and others; (3) *the oxides and their preparations*, including the red precipitate and others; (4) *the iodides and their preparations*, including the red iodide, the yellow iodide, and others; (5) *acid combinations and their preparations*, including the solution of mercuric nitrate and others; (6) *cyanide of mercury;* and (7) the *triturations*. Besides the official preparations, the following unofficial preparations are well known: Yellow solution of mercury ('yellow wash'), black lotion of mercury ('black wash'), and red ointment of mercuric nitrate ('brown citrine ointment').

Mercury is purgative, alterative, and tonic, and promotes the flow of bile. Some of its preparations are corrosive, some are caustic, some are poisonous. In small quantities some of the mercurials are tonic, while in large quantities they cause 'poverty of the blood,' diminishing the number of the red corpuscles, reducing nutrition, and impairing digestion, finally causing waste of tissue. Long-continued exhibition of mercury causes a cachectic condition termed hydrargyrism.

Mercury stimulates glands to a production of an increased amount of secretion. Hydrargyrism, commonly called 'salivation' from one of its symptoms, consists of fœtid breath, swollen and spongy gums, with a blue marginal line, sore mouth, swollen and tender tongue, excessive production of saliva, loss of appetite, diarrhœa, and fever.

Mercury is used in syphilis, tonsillitis and other glandular affections, gastritis, dysentery, gastric ulcer, early cirrhosis of the liver, typhoid fever, diphtheria, Asiatic cholera, pneumonia, gastro-enteric disturbances, conjunctivitis, enlarged thyroid, and enlarged spleen.

Bichloride of mercury is very largely used as an antiseptic. It is irritant and corrosive, and in toxic doses causes severe gastro-intestinal irritation, nausea, vomiting, suppression of urine, bloody diarrhœa, convulsions, and collapse. It is, however, a very safe and valuable internal remedy in proper dosage. It occurs in heavy, colorless crystals, with sharp metallic taste and acid reaction. It is soluble in 2 parts of boiling water, 3 of alcohol, and 16 of water. Its symbol is $HgCl_2$. It is used locally as a parasiticide in a solution of 1 part in 250 parts of water, and as a general surgical antiseptic in a solution of 1 part to 1000 of water, or 1 to 2000, sometimes 1 part to 5000 of water. In these dilutions it is an efficient antiseptic for cleansing wounds, moistening gauze dressings, injecting into cavities, etc. See LINIMENT; ANTIDOTE; and POISONS.

MERCURY, DOG'S (*Mercurialis*). A small genus of plants of the natural order Euphorbiaceæ. The common dog's mercury (*Mercurialis perennis*), common in woods and shrubby places in Europe, has a simple stem about a foot high, rough ovate leaves, and axillary loose spikes of greenish flowers. It turns a glaucous black in drying. The root, which is reputed poisonous, contains two coloring substances, one blue and the other carmine. The mercury mentioned by some writers as a pot herb is not this plant, but Chenopodium Bonus Henricus. Annual dog's mercury (*Mercurialis annua*) is eaten in Germany as spinach.

MERCUTIO, mẽr-kū′shĭō. A character in Shakespeare's *Romeo and Juliet*, the kinsman of the Prince of Verona and friend to Romeo. He is killed in a quarrel with Tybalt.

MERCY, FATHERS OF. A religious congregation of the Roman Catholic Church founded by Jean-Baptiste Rauzan (1757-1847), a zealous French priest, immediately after the restoration of Louis XVIII., whose chaplain he was. Its constitution was approved by the Pope in 1834, under the title of "Society of the Priests of Mercy." The members devoted themselves to mission preaching and works of charity. Mgr. de Forbin-Janson, Bishop of Nancy, brought two of them to America in 1839, and houses were established in New York and Saint Augustine, Florida. The fathers of the society still care for the French population of New York, and have also a church in Brooklyn. In 1903 the motherhouse in Paris was closed by the Government under the Associations Law, and the headquarters were accordingly transferred to Rome. Consult Delaporte, *Vie de Jean-Baptiste Rauzan* (Paris, 1857).

MERCY, SISTERS OF, or ORDER OF OUR LADY OF MERCY. A Roman Catholic religious community founded in Dublin in 1827. They are of two classes, choir sisters and lay sisters, the choir sisters being occupied with the visitation of the sick and prisoners, the care of poor and virtuous girls, and other charities; the lay sisters being employed in the domestic occupations of the convent. Each community is independent of the rest of the Order, being subject only to the bishops. The origin of the Order was due to Miss Catharine McAuley, of Dublin, who, born of Roman Catholic parents and left an orphan, having been educated a Protestant, joined the Roman Catholic Church and devoted her life and ample fortune to the service of the poor. The Order has been introduced into many parts of Ireland, England, Scotland, and America. After a preliminary preparation of six months, candidates assume the white veil and become novices. The novitiate lasts two years. Their vows bind them to poverty, celibacy, obedience, and the care of the sick and poor. In the United States their first, now the mother, house was opened in Pittsburg, Pa., in 1843, and they are now very widespread and have sixty-five convents. Consult *Leaves from the Annals of the Sisters of Mercy* (3 vols., New York, 1881).

MERCY SEAT. The ordinary translation of the Hebrew *Kapporeth* (Ex. xxv. 17 sqq.), signifying the 'covering' of the Ark of the Covenant (q.v.). It was made entirely of gold, and surmounted at the two ends by two figures, called *cherubim*, also made of gold. The kapporeth appears to have been a movable cover to the ark, resting above it like a roof. The cherubim covered this kapporeth with their wings. See CHERUB.

MER DE GLACE, mâr de glȧs (Fr., Sea of Ice). One of the largest and most interesting of the Alpine glaciers. It lies on the northern slope of Mont Blanc, and is formed by the confluence of three branches known as the Glacier du Géant, the Glacier du Lechaud, and the Glacier du Talèfre. Its extreme length is about 9 miles, and in all it covers an area of 16 square miles. The rate of flow, compared with other glaciers of the Alps, is very rapid, the average advance during the summer and autumn months being about two feet per day. The Mer de Glace is noted for its beautiful scenery, and is one of the favorite tourist resorts in the Alps. It is most easily reached from the village of Chamonix, near which it debouches into the valley as the Glacier des Blois and gives rise to the Arveyron River. See GLACIER; MONT BLANC; and Illustration accompanying CHAMONIX.

MEREDITH, GEORGE (1828—). A distinguished English novelist and poet. He was born in Hampshire, February 12, 1828, and received part of his early education in Germany—a land whose influence, especially through its poetry and music, is perceptible in his writings. On returning to England he studied law for a while, but soon abandoned it, as his literary genius began to make itself felt. His first published poem, "Chillianwallah," appeared when he was only twenty-one, in *Chambers's Journal* (July, 1849). He married a daughter of Thomas Love Peacock (q.v.), and it was to Peacock that he dedicated his first volume of poems (1851). Original and unique as Meredith's novels are, it is possible to trace in them an inheritance from the dilettante, whimsical work of his father-in-law. After *The Shaving of Shagpat*, 'an Arabian entertainment' (1856), and *Farina*, a bit of German fairy-lore (1857), he published his first novel in 1859—strange as it now seems to associate the two dates, the year of the publication of George Eliot's first novel, *Adam Bede*. This book, *The Ordeal of Richard Feverel*, which many of his admirers think he has never surpassed, is, almost as much as Rousseau's *Emile*, a formal treatise on methods of education, and at the same time contains some of his most beautiful passages in its tender love-episodes. *Evan Harrington* (1861) was a more purely humorous treatment of the psychological problems involved in the great question whether a tailor could be a gentleman. A year later appeared *Modern Love, and Poems of the English Roadside*. The splendid sonnet-sequence, *Modern Love*, is now recognized as probably its author's highest and most durable achievement in the poetic form; but at the time it was severely criticised, especially by the *Spectator*, in which Swinburne replied with a fervid eulogy. Among the few accessible biographical data, the close association of three of the foremost poets of the century is worth mentioning; for a short time in 1863, after the first two had lost their wives, Meredith, Rossetti, and Swinburne shared a house in Cheyne Walk, Chelsea. *Emilia in England* (afterwards called *Sandra Belloni*) came out in 1864, and the next year *Rhoda Fleming*, as a story the simplest and the best told from an artistic point of view; a savage onslaught on the idols of fatuous respectability, a digging down to the elemental and primitive passions. When the war between Austria and Italy broke out in 1866, Meredith, who had already done considerable work in journalism, went out as the correspondent of the *Morning Post*. He turned to good account the knowledge of Italy thus gained and his sympathy with Mazzini and the cause of Italian independence in his next book, *Vittoria*, a sequel to *Emilia in England* (1867). For some thirty years he acted as literary adviser to the publishing house of Chapman & Hall, and helped many a young author by his wise and kindly criticism. Thomas Hardy, in particular, has said that he would probably never have persevered in the path of literature without the encouragement which Meredith gave him when he submitted his first manuscript. Meanwhile Meredith was going on steadily with his own work. In 1871 he brought out *The Adventures of Harry Richmond*, a fascinating romantic novel, which is recommended to beginners as easier reading than the metaphysical, subtle, enigmatic style of his later books. It had undoubtedly no small influence on younger writers, and the class of romantic stories at the head of which stands *Prince Otto* may be clearly derived from it. *Beauchamp's Career* (1876) is largely occupied with English politics. While standing aloof as usual from questions of actual detail, Meredith allowed his philosophic liberalism to be seen almost distinctly, though he did not declare for either side. After two short but brilliant studies in comedy, *The House on the Beach* and *The Case of General Ople and Lady Camper* (1877), he made, in *The Egoist* (1879), a pitiless analysis of the selfishness innate in humanity as a whole. In its central figure, Sir Willoughby Patterne, the abstract egoist takes on final shape and becomes typical. In fact, it may be said of Meredith generally that, unlike most psychological novelists, he gives us a psychology of types, not of individuals. Next came *The Tale of Chloe* (1879); *The Tragic Comedians* (1880), recounting in the guise of fiction a decisive episode in the life of Ferdinand Lassalle, the German Social-Democrat; and another volume of verse, *Poems and Lyrics of the Joy of Earth* (1883). All this time, in spite of such a bulk of admirable work, and though recognized by an increasing number of cultivated people, Meredith had remained strangely unknown to the public at large—in this like Browning, with whom in many ways his genius had strong affinities. The publication of *Diana of the Crossways* (1885), partly, perhaps, because its central episode bore a strong resemblance to an actual occurrence in English political life of a generation earlier, made a general impression. From this time he came more and more to be recognized as the head of the profession of letters in England. He was elected president of the British Society of Authors on the death of Tennyson in 1892; and his appearance as the guest of honor at the meeting of the Omar Khayyam Club (an organization including many of the best-known men of letters) in 1895 was an event of singular interest, from the universal homage paid to him, as well as from the fact that he then made what he called his first public speech. Three more novels remain to be mentioned: *One of Our Conquerors* (1891), *Lord Ormont and His Aminta* (1894), and *The Amazing Marriage* (1895), as well as three notable volumes of verse, *Ballads and Poems of Tragic Life* (1887), *A Reading of Earth* (1888), and *The Empty Purse* (1892). His poems, like his novels, will probably never be popular; and for the same reason, that they require too much thought on the part of the reader. Yet as a poet he has many remarkable achievements to his credit, and none more signal than the expression of a perfect understanding of nature—nature as she is in herself, not, as with Byron and so many others, the mere reflex of the poet's temperament and moods.

His fiction is characteristic of an age of analysis and introspection, when every art must take account of the results of psychology and metaphysics. He is before all things a student of life. His attitude, as illuminated by the *Essay on Comedy* (1877), is not unlike that of his own Adrian Harley in *Feverel*; with an amused but not unkindly cynicism he stands off and watches his characters act on each other as deliberately, as inevitably, and often through situations as apparently unimportant as in life. He shows us the progress from act to act of dramas subtly philosophical, in the manner of *Hamlet*. We are reminded of Shakespeare again as we think of one of Meredith's strongest points—his gallery of fair women, types of the best in their age, for parallels to which we are driven to recur to Beatrice and Rosalind and Portia.

His style is frequently obscure—not because he cannot write simply, for (like Browning again) he can give us "English as ripe and sound and unaffected as the heart could wish." His aim, however, is not simplicity; it is to pack as much thought as possible into a phrase, to say only what is worth saying, and to say it in terms charged to the fullest with significance. The final verdict of his contemporaries, slowly though it was reached, is justified (if there were nothing else) by his unquestioned intellectual eminence, by the constant distinction of his thought. Consult: Le Gallienne, *George Meredith: Some Characteristics*, with a full bibliography (3d ed., London, 1900); Lynch, *George Meredith* (ib., 1891); and essays by Henley, in *Views and Reviews* (ib., 1890); by Brownell, in *Victorian Prose Masters* (New York, 1901); also Cross, *The Development of the English Novel* (New York, 1899).

MEREDITH, LOUISA ANNE (maiden name, TWAMLEY) (1812-95). An Australian writer, born at Birmingham, England. She studied art, and was thus able to illustrate many of her books, both in verse and in prose, as the *Romance of Nature, or the Flower Seasons* (1836). In 1839 she married Charles Meredith and went with him to Australia. After living for five years at Sydney, they settled in Tasmania, where Mrs. Meredith wrote several delightful volumes of description. *Notes and Sketches of New South Wales* (1844) was followed by *My Home in Tasmania* (1852); *Some of My Bush Friends in Tasmania* (1859); *Over the Straits, a Visit to Victoria* (1861); and later, *Our Island Home* (1879); *Tasmania, Friends and Foes, Feathered and Furred, etc.* (1880). Her first volume of verse appeared in 1835 and her last, *Grandmama's Verse-Book for Young Australia*, in 1878. Mrs. Meredith died at her island home in 1895.

MEREDITH, OWEN. The pseudonym of Bulwer-Lytton. See BULWER-LYTTON, EDWARD ROBERT.

MEREDITH, SOLOMON (1810-75). An American soldier and politician, born in Guilford County, N. C. He removed to Indiana in 1830, and at the outbreak of the Civil War was made colonel of the Sixty-ninth Indiana Volunteers. He participated in many of the most desperate battles fought by the Army of the Potomac and became the commander of the famous Iron Brigade. At the close of the war he was retired with the brevet rank of major-general of volunteers.

MEREDITH, SIR WILLIAM (1840—). A Canadian jurist and politician, born in Middlesex County, Ontario, of Irish descent. He was educated in London, Ont., and at the Toronto University, was admitted to the bar in 1861, was made Chief Justice of Common Pleas in 1894, and was knighted two years afterwards. His political career began in 1872, when he was elected a member for London of the Provincial House, and in six years he became leader of the Liberal-Conservative opposition. Equally noted as a judge and a parliamentary orator, Sir William was also a member of the Toronto University Senate (1895), as well as honorary lecturer to its law faculty.

MERES, mērz, FRANCIS (1565-1647). An English author and teacher. He was educated at Pembroke College, Cambridge, graduating B.A. in 1587, and M.A. in 1591. By 1597 he was living in London, where he gained an intimate knowledge of contemporary literature. In 1602 he became rector of Wing in Rutland, and subsequently opened a school. He died at Wing, January 29, 1647. His *Palladis Tamia, Wits Treasury* (1598), gives an account of Marlowe's death and an estimate of Shakespeare. After mentioning twelve of Shakespeare's plays and the "sugred sonnets among his private friends," Meres says, "The muses would speak Shakespeare's fine filed phrase, if they could speak English." The important sections dealing with Elizabethan literature were reprinted in *Shakspere Allusion Books*, New Shakspere Society (London, 1874); and by Arber in the *English Garner*, vol. ii. (London, 1879).

MERGAN'SER (Neo-Lat., from Lat. *mergus*, diver + *anser*, goose). A small subfamily of ducks, Merginæ, having a slender, straight, much compressed bill, hooked at the tip, and notched at the edges, almost as if furnished with teeth. Their other anatomical peculiarities are like those of the sea-ducks. They feed largely upon fish, which they are said to pursue and capture under water. Most of the species are of little value for food, but the hooded merganser (*Lophodytes cucullatus*) is said to feed upon roots and seeds, and is thus a palatable table duck. The males are black and white, with a large, circular crest, giving them a peculiar and very striking appearance; the adult female also has a crest, but it is small, grayish-brown, tinged with cinnamon. (See Plate of WILD DUCKS.) The hooded merganser is the smallest of the North American species, only a foot and a half in length. The other two species, the goosander (*Merganser Americanus*) and the red-breasted merganser or shelldrake (*Merganser serrator*), are much larger, nearly or quite two feet long, and have no true crest, though the feathers of the crown may be somewhat lengthened. The hooded and red-breasted mergansers are found in nearly all parts of the Northern Hemisphere, while the goosander is replaced in Europe by a very closely allied species (*Merganser merganser*). All of these species breed in the northern portions of their range and winter southward almost to the tropics. About half a dozen other mergansers are known, one or two of which are South American.

MERGER. (1) In the law of real property, the union of a lesser with a greater estate in the same property in the same person, with the result that the lesser estate is obliterated by the larger estate. Thus, if one is a tenant for years or for life of real estate, and the estate of his landlord or the reversioner in fee comes to him either by descent or purchase, the tenancy is extinguished in the larger estate, and the tenant becomes owner in fee. If, however, there be an intermediate estate, merger is prevented. Thus, if one be in possession of property as tenant for years, with remainder to another for life, and remainder to a third in fee, there will be no merger if the fee remainderman convey his estate to the tenant for years; but if the owner of the life estate convey to the tenant for years, or vice versa, the tenancy for years will merge in the life estate. Courts of equity will in many cases, where justice requires it, in effect prevent merger by compelling the owner of the estate to hold the property as though the two estates were distinct. Thus, for example, if a tenant of real estate in his own right purchased the reversion as trustee for another, a court of equity would compel him to continue to collect the rents from himself as tenant and to account to the beneficiary for them as trustee of the reversion. In the same manner when the legal estate in property becomes vested in one having an equitable claim with reference to the property, or an equitable estate as it is sometimes called, the equitable becomes merged in the legal estate unless kept alive for the purpose of furthering justice, when equity will treat the two interests as distinct notwithstanding the merger. Consult the authorities referred to under Trust; Mortgage.

(2) The term is also applied in the law of contracts when it is held that the acceptance of a higher security or obligation in lieu of a lower extinguishes the lower. Thus rights upon contract are merged in a judgment secured in an action upon the contract. A simple debt merges in a promissory note given in its stead, and both merge into a bond or obligation under seal given in their place. The effect is to limit the obligee to his action or remedy upon the higher obligation.

(3) The term is also in use in the criminal law to denote both the inclusion of a lesser crime in a greater and the sinking of private wrongs in public wrongs or crimes. Many greater crimes include lesser crimes; that is, the lesser crime is necessarily committed in committing the greater, as an assault in committing robbery or homicide. The State may prosecute and punish either the greater or the lesser offense, but of course not both, since that would be putting a man twice in jeopardy for the lesser offense. In England, where criminal prosecutions are usually conducted by private persons, whenever a tort is also a crime, the private wrong is postponed to or merged in the public wrong, so that the injured party has no private remedy until after the conviction and punishment of the criminal. This does not hold in the United States. Consult the authorities given under Tort.

(4) By extension the term 'merger' is now applied to denote the consolidation of the control of two or more corporations in a single corporation by means of issuing the stock in exchange for a majority of the stock of the several corporations to be controlled. The several corporations to be controlled are then said to be merged in the single corporation holding their stock. The several corporations preserve their separate legal identities, and there is no merger in a legal sense.

MERGUI, mĕr-gē′. The capital of the Mergui Archipelago (q.v.).

MERGUI ARCHIPELAGO. A group of islands in the Bay of Bengal, forming part of the district of the same name in the Burmese division of Tennasserim and scattered along the northwestern shore of the Malay Peninsula (Map: Asia, J 7). The islands are rocky and mountainous, some of them rising to 3000 feet above sea-level, and are noted for their varied and picturesque scenery. They are inhabited by a race called Selungs, who subsist mainly by pearl-fishing and by collecting and selling edible birds' nests. Tin mines are worked in the south. Area of district, 9789 square miles; population, in 1901, 88,667. Mergui, the capital of the district, with a heterogeneous population of 10,000 inhabitants, is situated on an island at the chief outlet of the Tenasserim River in the Bay of Bengal.

MERIAN, mā′rē-ȧn, Maria Sibylla (1647-1717). A German painter and naturalist, born in Frankfort-on-the-Main, daughter of the engraver Matthäus Merian. In 1665 she married Johann Andreas Graff, a painter, and removed to Nuremberg. Though she was skillful in painting fruits and flowers, her taste led her particularly to natural history. Her exquisite taste, as well as the great precision which characterized her artistic work in botany and entomology, gained for her a high reputation in the scientific world of the time. In 1679 she published an excellent work on caterpillars, entitled *Erucarum Ortus, Alimentum et Paradoxa Metamorphosis*. In 1698 she went to South America and devoted herself to research on the natural history of Dutch Guiana, the result of which appeared in her *Metamorphosis Insectorum Surinamensium* (1705). There are two volumes of her drawings in the British Museum, one of the insects of Europe, the other of those of Dutch Guiana. There are collections in Saint Petersburg, Amsterdam, and Frankfort.

MERIAN, Matthäus, called The Elder (1593-1650). A Swiss engraver. He was born at Basel, and afterwards lived in Paris and Frankfort. He began in 1640 the famous Zeiller's *Topographia*, presenting perspective views of European cities, towns, and castles which were drawn, engraved, and described by himself. The work, which is regarded as extremely valuable, was continued after his death. For his biography, consult Eckardt (Basel, 1887).

MÉRIDA, mā′rē-dȧ. The capital of the State of Los Andes, Venezuela, situated about 60 miles south of Lake Maracaibo, on a plateau 5500 feet above sea-level (Map: Venezuela C 2). Its climate is cool and moist, the temperature averaging 61° Fahr. It has a new cathedral, and one of the two universities of the Republic. Its chief manufactures are carpets, cotton and woolen goods; it exports coffee and preserved fruits. Population, about 11,000. Mérida was founded in 1558 by Juan Rodrigeuz Saurez. It has suffered much from earthquakes, notably in 1812 and 1894.

MÉRIDA. The capital of Yucatan, Mexico, situated on a barren plain in the northwestern part of the peninsula, 25 miles from the Gulf of Mexico (Map: Mexico, O 7). The town is regularly built, with fine streets, squares, and parks, and has a university, a cathedral built in 1598, a Government palace, a museum, various secondary schools, and a hospital. Among its manufactures are straw hats, cotton goods, soap, and leather, while great quantities of sisal grass are exported from here to the United States, as well as brandy, sugar, hides, indigo, and salt. Population, about 37,000. Mérida was founded in 1542 by Montejo, the conqueror of Yucatan.

MÉRIDA. A small town of Southwestern Spain, in the Province of Badajoz, situated on the right bank of the Guadiana, 30 miles east of Badajoz (Map: Spain, B 3). It is now an insignificant town, but contains numerous evidences of its ancient greatness. Among these are the remains of the Roman walls with five gates still preserved, a triumphal arch erected by Trajan, the ruins of an amphitheatre and of a Roman circus built to accommodate 20,000 spectators, some remains of a temple of Diana, and parts of an old reservoir and of two Roman aqueducts, as well as numerous columns, statues, and minor ruins. There is also a magnificent Roman stone bridge crossing the Guadiana by 64 arches and nearly 3000 feet long. Mérida was founded as a colony for Roman veterans (*emeriti*), and called *Augusta Emerita*, whence the present name is derived. It was made the capital of the Province of Lusitania, and later became the seat of the Visigothic archbishops. It remained an important town during the time of the Moorish domination until it was captured by Alfonso IX. in 1228. Its population in 1900 was 9124.

MER'IDEN. A city in New Haven County, Conn., 18 miles north-northeast of New Haven, and the same distance south-southwest of Hartford; on the New York, New Haven and Hartford, and the Meriden, Waterbury and Middletown Railroad, a branch of the former (Map: Connecticut, D 3). It is picturesquely situated, overlooked by the Hanging Hills on the northwest, and is drained by Harbor Brook. Meriden is one of the most prosperous industrial centres in New England. Among its manufactures are silver and plated ware, hardware, cutlery, steel pens, bronzes, brass castings, malleable iron, firearms, organs, self-playing attachments for pianos and organs, glassware, cut glass, curtain fixtures, gas and kerosene fixtures, screws, vises, and machinery. The city has the Connecticut School for Boys (Reform), Meriden Hospital, Curtis Home for Orphan Children and Aged Women, and the handsome Curtis Memorial Library. Hubbard Park is a beautiful natural reservation of 900 acres, within the limits of which are the Hanging Hills, the highest point rising 1000 feet above sea level. Another attraction is Lake Merimere.

The government, under a charter of 1897, is vested in a mayor, elected every two years; a bicameral council; and administrative officials, appointed or elected as follows: by the mayor—boards of apportionment and taxation, public works, and police, fire, and park commissioners; by the council—tax-collector, plumbing inspector, fire marshal, boiler inspector, health officer, and board of compensation; by the people—clerk, treasurer, auditor, and sheriffs. The city owns and operates its water works. Population, in 1890, 21,652; in 1900, 24,296. From 1725 until incorporated in 1806 as a town under its present name (probably from Meriden, Eng.), Meriden was a parish of Wallingford. In 1867 it was chartered as a city. Consult Perkins, *Historical Sketches of Meriden* (West Meriden, 1849).

MERID'IAN (Lat *meridianus*, relating to midday, from *meridies*, for **medidies*, midday, from *medius*, middle + *dies*, day). Any great circle of a sphere passing through its poles. A *terrestrial* meridian is the intersection of the earth's surface made by a plane passing through the poles. A *celestial* meridian is a great circle of the celestial sphere passing through the celestial poles. The *prime* meridian is the one from which longitude is measured. The *magnetic* meridian at any point is the horizontal direction at the point of a freely suspended compass needle undisturbed by influences other than the earth's magnetic force. To distinguish the terrestrial or geographical meridian from the magnetic, the former is called the *true* meridian, as its direction is that of true north or south. It is evident from the explanation given that the so-called *magnetic* meridian is not a great circle of the earth, but merely a *direction* at a particular point. The line joining the points of equal variation are not therefore coincident with the magnetic meridian; they are called isogonic lines, and, owing to the non-uniform character of the earth's magnetic force, these lines are very irregular curves. See MERIDIAN CIRCLE; MERIDIAN MEASUREMENT.

MERIDIAN. A city and the county-seat of Lauderdale County, Miss., 87 miles east of Jackson; on the Queen and Crescent Route and the Southern Railway (Map: Mississippi, H 6). It is the seat of the East Mississippi Female College (Methodist Episcopal), opened in 1869, and of the Meridian Academy (Methodist Episcopal South), and Lincoln School (Congregational), the last two for colored students. The city has an extensive trade, due to its position in a cotton-growing region, and is the most important manufacturing centre in the State. Its industries, represented by railroad machine shops, cotton mills, cottonseed oil mills, lumber mills, etc., had, by the census of 1900, a production valued at nearly $3,000,000. Meridian was an important Confederate railway centre during the Civil War, and in February, 1864, General Sherman was sent against it. Arriving on the 14th, he remained unmolested until the 20th, completely destroying the railroads in the vicinity and demolishing the large store-houses and many private residences. Population, in 1890, 10,624; in 1900, 14,050.

MERIDIAN CIRCLE. An instrument used for determining the meridian altitude or zenith distance of a star. It consists of an astronomical telescope firmly fixed to a graduated circle, which moves about a horizontal axis, resting on a pair of very solid supports. In the common focus of the eye-piece and object-glass of the telescope is a system of fixed cross-wires (spider lines are generally used for the purpose), one being horizontal, and five or more vertical, with equal spaces between. An imaginary line passing through the optical centre of the object-glass and the intersection of the horizontal and middle vertical wires is called the line of collimation of the telescope, and, when the instrument is in perfect adjustment, this line moves in the plane of the meridian. Besides the above-mentioned fixed wires there is a movable one, called a micrometer wire, which is moved by means of a screw, remaining always parallel to the fixed horizontal wire. If the instrument is in perfect adjustment, and if the image of a star, while passing across the middle vertical wire in the field of view, is at the same time bisected by the fixed horizontal wire, the star is at that moment in the line of collimation of the telescope. It is therefore at that moment in the meridian, and its meridian zenith distance is the angle through which the circle would have been turned from the position it had when the line of collimation of the telescope pointed to the zenith. There is a fixed pointer, for the purpose of approximately reading the instrument. If the instrument was adjusted so that the pointer was opposite the zero point of the circle, when the line of collimation of the telescope pointed to the zenith, the arc measured on the circle between these two positions of the instrument is the meridian zenith distance of the star.

Great nicety is required in reading the instrument; i.e. in determining exactly the arc through which the circle has moved in bringing the telescope from the vertical to any other position. The rim is usually graduated at intervals of five minutes; and the eye could determine only the division nearest to the fixed index. But by means of a reading microscope or micrometer (q.v.), fixed opposite to the rim, the portion of the interval to the nearest division on the rim can be read to seconds. There are sometimes six such microscopes fixed opposite different points of the rim; and the reading of the instrument is the mean of the readings of all the microscopes. This tends to eliminate errors arising from imperfect graduation and errors of observation. If the instrument is properly adjusted, the zero point of the circle will be opposite the fixed pointer when the line of collimation of the telescope points to the zenith. In practice, however, this is not always accurately, or even approximately, the case, and is really of no consequence, as the final result of every observation is the difference between two readings. It is evident that the difference between any two readings of the instrument will represent the angle through which the line of collimation of the telescope moves in passing from one position to the other. It remains to show how a fixed point, viz. the nadir (q.v.), is observed, and then how an observation is taken of the star itself on its meridian passage. It must be explained here that the fixed horizontal wire in the eye-piece of the telescope, in the instrument as now used, is only an imaginary line, which determines the line of collimation of the telescope. It coincides with the position of the micrometer wire when the screw-head of the micrometer marks zero.

To observe the nadir, a trough of mercury is placed underneath the instrument, and the telescope is turned so as to look vertically downward into it. An image of the system of cross-wires which is in the common focus of the object-glass and eye-piece will be reflected back again to nearly the same focus. Looking into the telescope, the observer now adjusts it by means of a slow-motion screw till the reflected image of the horizontal wire coincides with the real one. The final adjustment is perhaps most delicately effected by turning the screw-head of the micrometer which moves the wire itself. When they coincide, the line joining the centre of the object-glass of the telescope with the intersection between the middle vertical and horizontal micrometric wire will be vertical. For that position of the movable wire, the circle now gives the exact nadir reading, which differs 180° from the true zenith reading.

Again, to observe a star in the meridian, the instrument is previously adjusted so that the star, in passing the meridian, shall pass over the field of view of the telescope. As the image of the star approaches the centre of the field, the observer adjusts the telescope by the slow-motion screw, so as very nearly to bring the image of the star to the horizontal wire. Finally, just as the star passes the middle vertical wire, he bisects the image of the star with the horizontal wire by a touch of the micrometer screw-head. The circle being now clamped (or made fast), the reading is determined as before by reading the pointer and microscopes, and adding or subtracting, as the case may be, the reading of the micrometer. This reading now subtracted from the zenith reading gives the meridian zenith distance of the star; and this, again, subtracted from 90°, gives its meridian altitude above the horizon. See Transit Instrument.

MERIDIAN MEASUREMENT. The determination of the form and size of the earth from the measurement of a meridional arc has been a favorite problem with mathematicians from the earliest times, but up to the middle of the eighteenth century their operations were not carried on with exactness sufficient to render their conclusions of much value. Since that time, however, geodesy has progressed so rapidly, owing to the invention of more accurate instruments and the discovery of new methods, that the measurement of the meridian can now be performed with very high precision. The *modus operandi* is as follows: Two stations, having nearly the same longitude, are chosen; their latitude and longitude are accurately determined (the error of a single second in latitude introduces a considerable error into the result), and the direction of the meridian to be measured ascertained; then a base line is measured with the greatest accuracy, as an error here generally becomes increased at every subsequent step; and then, by the method known as triangulation (q.v.), the length of the arc of the meridian contained between the parallels of latitude of the two stations is ascertained. As the previously found latitudes of its two extremities give the number of degrees it contains, the average length of a degree of this arc can be at once determined; and also, on certain assumptions as to the earth's form, the length of the whole meridional circumference of the earth. This operation of meridian measurement has been performed at different times on a great many arcs lying between latitude 68° N. and latitude 38° S., and the results show a steady though irregular increase in the length of the degree of latitude as the latitude increases. On the supposition that the law of increase holds good to the poles, the length of every tenth degree of latitude up to 70° is as follows:

DEGREE OF LATITUDE	Length of degree in English feet
0°	362,756
10°	362,868
20°	363,188
30°	363,679
40°	364,284
50°	364,929
60°	365,536
70°	366,033

This table is calculated on the theory that the earth is not spherical, as in that case the length of all degrees of latitude would be alike, but of a more or less spheroidal form, that is, having its curvature becoming less and less as we go from the extremity of its greater or equatorial diameter to the lesser or polar axis. See Earth; Degree of Latitude.

Meridional Parts. In preparing a chart (q.v.) upon Mercator's projection, in order to preserve the relative proportion between the lengths of meridians and parallels at any point, the former must be increased in length. The lengths of small portions of the meridians thus increased are called *meridional parts*, and tables giving the lengths at different latitudes are prepared for use in constructing charts.

MÉRIMÉE, må'rė'må', Prosper (1803-70). A French novelist, historian, dramatist, and critic, born in Paris, September 28, 1803. He studied law, which he never practiced; he held various offices in the civil service, became, in 1831, inspector of archæological and historical monuments of France, an Academician in 1844, and a Senator of the Empire in 1853. His reports of professional researches were the basis of four volumes: *Dans le midi de la France* (1835); *Dans l'Ouest* (1836); *En Auvergne et Limousin* (1838); *En Corse* (1840). To this science he contributed also *Monuments historiques* (1843); *Peintures de l'Eglise Saint-Savin* (1844); and to history a monograph on *Don Pedro de Castille* (1843), *Les faux Démétrius* (1854), and a volume of miscellaneous *Essays* (1855). He is best known, however, for his fiction, narrative and dramatic, *Théâtre de Clara Gazul* (1825), a pretended translation from the Spanish and an ironical toying with Romanticism; *La Guzla* (1827), a pretended translation of Illyrian songs; *La Jacquerie* (1828), dramatic scenes from the Peasants' War of 1358; a similar but far finer historic study, *La chronique du régne de Charles IX.* (1829), of which the massacre of Saint Bartholomew forms the central scene; *Colomba* (1840), his most popular novel, a story of Corsica; *Carmen* (1847), a Spanish gypsy romance and subject of a popular opera by Bizet, and three volumes of short stories of remarkable polish and artistic effect, but hard, ironical, and sometimes cynically pessimistic. Mérimée was, before Maupassant, an unapproached master of stylistic restraint and concision. He chooses exotic scenes, a material and moral life alike foreign to his readers, but he never fails to produce the illusion of reality even when he crosses the border of the supernatural. Although impassive in his writing, Mérimée was in private life characterized by tender and devoted friendships, of which his *Lettres à une inconnue* (1873), trans. in the *Bric à Brac Series*, ed. by Stoddard, vol. iii., New York, 1874; the *Lettres à une autre inconnue* (1875); the *Lettres à Panizzi* (1881); and *Une correspondance inédite* (1896), are most interesting and beautiful monuments. They show Mérimée gracious, affectionate, loyal, capable of even a romantic idealism. Mérimée died at Cannes, September 23, 1870. Consult: Filon, *Mérimée et ses amis* (Paris, 1894); Haussonville, *Mérimée* (ib., 1888); Tourneux, *Prosper Mérimée, ses portraits, ses dessins, etc.* (ib., 1879); and Faguet, *XIXème Siècle* (ib., 1894).

MERINO. See SHEEP.

MER'ION'ETH. A county of Wales, bounded west by Cardigan Bay, and north by the counties of Carnarvon and Denbigh (Map: Wales, C 4). Area, 668 square miles. Merioneth is the most mountainous county in Wales, and large tracts are unfit for profitable cultivation. Slate and limestone are largely quarried, and lead and copper are mined. Woolens and flannels are manufactured. Capital, Dolgelly (q.v.). Population, in 1891, 49,200; in 1901, 49,100.

MER'ISTEM (irregular formation from Gk. μεριστός, *meristos*, divided, from μερίζειν, *merizein*, to divide, from μέρος, *meros*, part). The region of activity dividing undifferentiated cells. See HISTOLOGY.

MERIT, ORDER OF. An order instituted in London, June 26, 1902, by King Edward VII., with the object of conferring distinction on persons who have gained prominence in military, scientific, artistic, and professional circles. The Order consists of the sovereign and the members and is not conferred as a reward for political services. Members of the order are accorded precedence immediately after the Order of the Bath and before the other orders of knighthood. Up to January 1, 1903, only twelve members had been installed, comprising, as representatives of the army, Lords Roberts, Wolseley, and Kitchener; of the navy, Admirals Keppel and Seymour; of science, Lords Rayleigh and Kelvin and Sir William Huggins; of medicine, Lord Lister; of literature and history, John Morley and W. E. H. Lecky; of painting, G. F. Watts.

MERIT SYSTEM, THE. The merit system, as the name implies, looks toward the appointment of men to office because of their competency, and not because of their political opinions. The fitness of the candidate is determined by his ability to pass a written competitive examination, given by a commission of examiners. The answers submitted by candidates must be unsigned, so as to obviate the possibility of favoritism on the part of the examiners. A list is made of the successful candidates, arranged in the order of their merit as shown by the results of the examination. Appointments must be made from this eligible list in the order of rank unless good cause can be shown why one of higher rank should be set aside for one standing lower on the list. A common objection to the merit system is that it does not give an adequate test of a man's real capacity to administer the office to which he seeks appointment. This is in a measure true, though more and more the civil service examiners are coming to lay stress upon experience and practical knowledge. Inasmuch as the merit system makes it more difficult for the ordinary political heeler to secure lucrative offices because of his vote-getting ability, the system must be recognized as a power for good. Though it does not inevitably lead to the choice of the most competent, it does very effectually exclude the absolutely unfit—the political trickster and dealer in votes. See CIVIL-SERVICE REFORM.

MERIVALE, mĕr'ĭ-văl, CHARLES (1808-93). An English historian, best known by his work on the Roman Empire. He was born March 8, 1808, the son of John Herman Merivale, a well-known minor poet. He was educated at Harrow, Haileybury College, and Saint John's College, Cambridge. He took his degree at the latter place in 1830, and was successively scholar, fellow, and tutor. During all this time he was interested especially in Roman history, and between 1850 and 1864 wrote his well-known *History of the Romans Under the Empire*, which deals with the period between the rise of the Gracchi and the death of Marcus Aurelius. The first part of the work was especially popular, and was published in popular form under the title of *The Fall of the Roman Republic*. The merit of this history was great in its day, but more recent investigation, especially the study of epigraphy, has controverted many of Merivale's views. In 1869 he became dean of Ely, though he had only a slight interest in strictly ecclesiastical questions and disputes. He continued to publish various studies on Roman history, among which may be noted *General History of Rome from the Foundation of the City to the Fall of Augustulus* (1875). He died December 27, 1893. Consult *Autobiography and Letters*, edited by his daughter, Judith Anne Merivale (London, 1899).

MERIVALE, HERMAN (1806-74). An English political economist and author, born at Dawlish, Devonshire. He was a brother of

Charles, the historian, studied at Harrow, and graduated at Trinity College, Oxford, in 1827. In 1832 he was called to the bar of the Inner Temple. From 1837 to 1842 he was professor of political economy at Oxford, delivering while there a valuable series of *Lectures on Colonization and the Colonies* (1841). Appointed Assistant Under-Secretary of State for the Colonies in 1847, he became permanent Under-Secretary in 1848. He was transferred in 1859 to the Under-Secretaryship for India, and continued in that office until his death. His further works—and none of his books, it is said, well represents him—include *Historical Studies* (1865) and *Memoirs of Sir Philip Francis* (1867).

MERIVALE, John Herman (1779-1884). An English scholar, translator, and poet. He was born in Exeter, studied at Saint John's College, Cambridge, and was called to the bar in 1804. He contributed largely to Bland's *Collections from the Greek Anthology,* published in 1813, and himself brought out a second edition in 1833. From 1831 to his death he held the office of Commissioner of Bankruptcy. Among his further literary works may be mentioned *Poems, Original and Translated* (1841), and *Minor Poems of Schiller* (1844).

MER'IWETH'ER, Lee (1862—). An American lawyer and author, born at Columbus, Miss. After a study of the law he practiced his profession at Saint Louis, and was appointed by the Secretary of the Interior to write a report on the condition of the laboring classes in Europe. Subsequently, as a special agent of the Department of the Interior, he was active in collecting statistics regarding labor in the Hawaiian Islands and the United States. This post he resigned to accept that of Labor Commissioner of Missouri. He made himself known by his report on the corporation (or 'truck') store system, by which miners in Missouri were provided with supplies, at exorbitant figures, as a substitute for the regular wages, and he introduced into the Legislature of the State a bill which put an end to this system. Later he studied European prisons, and upon his return to the United States resumed the practice of law in Saint Louis. His publications include: *A Tramp Trip: How to See Europe on Fifty Cents a Day* (1887), describing a pedestrian journey taken by him from Gibraltar to the Bosporus in 1885-86: and *Afloat and Ashore on the Mediterranean* (1892).

MERKEL, mĕr'kel, Adolf (1836-96). A German jurist, born in Mainz, and educated at Giessen and Heidelberg. He became docent at Giessen in 1862 and professor in 1867, and was successively appointed professor at Prague (1868), at Vienna (1872), and at Strassburg (1874). He contributed largely to Holtzendorff's *Handbuch des deutschen Strafrechts* and *Encyklopädie der Rechtswissenschaft* and wrote *Zur Lehre vom fortgesetzten Verbrechen* (1862); *Kriminalistische Abhandlungen* (1867); *Juristische Encyklopädie* (1885); *Lehrbuch des deutschen Strafrechts* (1889); *Vergeltungsidee und Zweckgedanke im Strafrecht* (1892;) and other essays on criminal law.

MERLE (OF., Fr. *merle*, from Lat. *merula*, blackbird). The common European blackbird (*Turdus merula*), a thrush closely allied to the American robin, the male of which is uniformly black, while the female is dusky olive-brown above and reddish-brown below. The species is migratory except on the borders of the Mediterranean, and is one of the most familiar of the summer birds of Europe, coming about all gardens and roadsides, and making its rude nest in bushes and hedgerows; the eggs are bluish-green freckled with brown. This is one of the finest of European songsters, and is frequently kept in cages and aviaries. The genus is a large one, with numerous species in the Orient, Australia, and South America. Compare Blackbird; Thrush.

MERLE D'AUBIGNE, mârl dō'bē'nyȧ', Jean Henri (1794-1872). A Swiss historian. He was born at Eaux-Vives, a suburb of Geneva, in Switzerland, August 16, 1794; studied there and at Berlin, and in 1818 became pastor of the French Protestant Church in Hamburg. Thence, after a residence of five years, he proceeded to Brussels. In 1831 he returned to Geneva and took part in the institution of a new college for the propagation of orthodox theology, in which he was appointed professor of Church history. His *Histoire de la réformation au seizième siècle* gave him a wide reputation. It is, however, marred by partisanship and misleading and uncritical use of authorities. The first part, that on the Reformation in the time of Luther (Paris, 1835-47, 4 vols.; best ed. of the Eng. trans., Edinburgh, 1853, 5 vols., the last volume on the English Reformation), was vastly more popular than the second part, that on the Reformation in the time of Calvin (1862-78, 8 vols.; Eng. trans., London, 1863-78, 8 vols.). His other writings, mostly historical, are of less account. He died at Geneva, October 21, 1872. Consult his *Life* by Bonnet (Paris, 1874).

MERLET, mâr'lȧ', Lucien Victor Claude (1827—). A French antiquary, born at Vannes. He studied paleography, and in 1851 became head of the departmental archives of Eure-et-Loir. He edited many chartularies and ecclesiastical registers and published: *Histoire des relations des Hurons et des Abnaquis du Canada avec Notre-Dame de Chartres* (1858); *Robert de Gallardon, scènes de la vie féodale au XIIIème siècle* (1858); *Dictionnaire topographique du département d'Eure-et-Loir* (1861); *De l'instruction primaire en Eure-et-Loir avant 1789* (1878); and *Dictionnaire des noms vulgaires des habitants de diverses localités de la France* (1883).

MER'LIN. The name of an ancient British prophet and magician, who flourished, according to the romancers, during the decline of the native British power in its contest with the Saxon invaders. The earliest traces of him are found in the *Historia Britonum,* ascribed to a certain Nennius (about 800). He there appears as a prophetic child under the name Ambrosius, and is confounded with Aurelius Ambrosius, to whom Vortigern surrenders Mount Heremus (Snowdon). He next appears in Geoffrey of Monmouth's *Vita Merlini,* afterwards incorporated in the *Historia Regum Britanniæ* (about 1139), where he is called Merlin Ambrosius, or simply Merlin. Geoffrey expanded the narrative of Nennius, evidently employing for the purpose traditions concerning a Cambrian or Welsh bard known in Welsh legend as Myrddin. According to Geoffrey, Merlin lived in the fifth century, and was sprung from the intercourse of a demon and a Welsh princess. Merlin displayed miraculous powers from infancy. He is made to predict the history of Britain down to Geoffrey's own time. From Geoffrey and other sources was built up the French prose romance of Merlin (thirteenth century). Versions of this romance were made in Italian, Spanish, German, and English; and parts of it were embodied in Malory's *Morte d'Arthur* (1485). A collection of prophecies attributed to him appeared in French (Paris, 1498), in English (London, 1529 and 1533), and in Latin (Venice, 1554); and their existence is traceable as far back as the thirteenth century. Besides this Cambrian Merlin (Merlin Ambrosius) there is the Strathclyde Merlin, called Merlin the Wyllt, or Merlin Caledonius. He is supposed to have lived in the sixth century, a contemporary of Saint Kentigern, Bishop of Glasgow. His grave is still shown at Drummelzier on the Tweed, where, in attempting to escape across the river from a band of hostile rustics, he was impaled on a hidden stake. A metrical life of him, extending to more than 1500 lines, professedly based on Armoric materials, and incorrectly ascribed to Geoffrey of Monmouth, was published by the Roxburghe Club in 1833. His prophecies, published at Edinburgh in 1615, contain those ascribed to the Cambrian Merlin. Consult: Geoffrey of Monmouth, *Historia Regum Britanniæ*, edited by A. Schulz (Halle, 1854); *Merlin, roman en prose du XIIIème siècle*, ed. by Paris and Ulrich, Société des Anciens Textes (Paris, 1886); *Merlin, or the Early History of King Arthur: A Prose Romance* (about 1450-60), ed. by Wheatley, Early English Text Society (London, 1865-99); Malory, *Morte d'Arthur;* and Tennyson, *Idylls of the King.*

MER′LIN (OF. *esmerillon*, *emerillon*, Fr. *émerillon*, merlin, augmentative form from ML. *smerillus*, *smerlus*, merlin, probably from Lat. *merula*, blackbird). The smallest of Old World falcons (*Falco æsalon*), scarcely exceeding a blackbird in size, but very bold and powerful. It is bluish ash in color above; reddish yellow on the breast and belly, with longitudinal dark spots, the throat of the adult male white. It builds its nest on the ground, and is fond of localities where large stones are plentiful, whence it is often called 'stone falcon.' It is common in most parts of Europe, Asia, and Africa, and was of great repute in the days of falconry. The merlin is represented in North America by the pigeon-hawk (q.v.).

MERLIN DE DOUAI, mâr′lăɴ′ de dōō′ȧ′, PHILLIPE ANTOINE, Count (1754-1838). A French politician and jurist. He was born at Arleux and studied at the College of Anchin. He began his career by practicing law at Douai, whence the second part of his name. In 1775 he became advocate at the Parlement of Flanders, where he soon acquired reputation as an able lawyer. His frequent contributions to the law dictionary, then appearing under the title *Répertoire universel et raisonné de jurisprudence*, increased his reputation and established his authority as a jurisconsult. After the outbreak of the Revolution he was elected a member of the National Assembly, where he attracted much attention by his report on the bill of April 4, 1789, abolishing the feudal system. In 1795 he became Minister of Justice, and kept this post till January 18, 1799. After the coup d'état of the Eighteenth Brumaire he took the office of procureur-général at the Court of Cassation, and Napoleon made him Counselor of the State in 1808, and two years afterwards created him Count. By a royal ordinance of July 24, 1815, he was expelled from France. On his return to France in 1830 he became a member of the Academy of Moral and Political Science. He is the author of *Recueil alphabétique des questions de droit qui se présentent le plus fréquemment dans les tribunaux* (1810-27).

MERLINO COCCAJO, mĕr-lē′nȯ kȯ-kä′yȯ, otherwise known as TEOFILO FOLENGO, his real name (1491-1544). One of the principal macaronic poets of the sixteenth century. At the age of eighteen he became a member of the Benedictine Order, and while a monk he wrote Latin verses in the style of Vergil. About 1515 he forsook monastic life and wandered about the country with a young woman of good family, Girolama Dieda, often in great poverty, for he had no resource but his poetic talent. His first publication was *Merlini Coccaii Macarononicon* (Venice, 1517 and 1521), which relates the adventures of a fictitious hero named Baldus. This poem is written in macaronic verse, which Folengo was the first to use with success. Coarse though it was, it contained much genuine poetry and it became very popular. Like the later *Orlandino*, an Italian poem in octaves dealing with adventures of the youthful Roland, the work was a parody on the heroic epic as written by Ariosto. Ruing his wayward career, Folengo returned to his Order. About this time appears the macaronic *Chaos del tripperino*, an autobiographical account of his errors and repentance (1527). He seems to have devoted the rest of his life to the production of religious works only, such as the *Palermitana o umanità di Cristo* and the play *Atto della Pinta.* For editions of his works, consult: *Le operé maccheroniche di Merlino Coccaio*, edited by Portioli (Mantua, 1882-89); Marzo, *Drammatiche rappresentazioni*, vols. i.-ii. (Palermo, 1876), which contains the *Atto della pinta* and the *Palermitana; Raccolta dei più celebri poemi eroicomici italiani*, vol. i. (Milan, 1841), which contains *Orlandino;* Luzio, *Nuove ricerche sul Folengo* (Turin, 1880); Schneegans, *Geschichte der grotesken Satire* (Strassburg, 1894); Zumbini, "Il Folengo precursore del Cervantes," in *Studi di letteratura italiana* (Florence, 1894).

MERLON (Fr. *merlon*, It. *merlo;* perhaps connected with Lat. *mœrus*, *murus*, wall). In fortification, the portion of the parapet between two embrasures. See FORTIFICATION.

MERMAID (from *mere*, AS. *mere*, Goth. *marei*, OHG. *mari*, Ger. *Meer*, OIr., Gael. *muir*, OChurch Slav. *morye*, Lat. *mare*, sea + *maid*, *AS. mægþ*, Goth. *magaþs*, OHG. *magad*, Ger. *Magd*, maid). An imaginary inhabitant of the sea. The upper parts of mermaids are represented as resembling those of beautiful women, while the body terminates in a tail like that of a fish. The *merman* is also heard of, but less frequently. The commonest representation of the mermaid pictures her as holding in her hand a mirror, while in the act of combing her hair. There is an evident affinity between the stories concerning mermaids and those concerning the sirens and tritons, perhaps also the nereids, of the ancients. The probability is that these stories have originated in the appearance of seals, walruses, and the herbivorous cetacea.

MERMAID, The. A famous London club, the foundation of which is ascribed to Sir Walter Raleigh. Its members included Jonson, Beaumont, Fletcher, Selden, and Carew. Shakespeare also is said to have belonged to it. The meeting place was the old Mermaid Tavern on Bread Street.

MERMAID'S GLOVE. A local English name applied to a sponge (*Halichondria oculata*) often cast ashore on the coast of Great Britain and Northeastern America. Its branches are somewhat finger-shaped, giving to the entire animal a rude glove-like appearance. The name is also given to a social polyp, *Alcyonium digitatum*, more aptly and commonly called 'deadman's fingers.'

MERMAID'S HEAD. The popular British name for a spatangoid sea-urchin (*Amphidetus cordatus*).

MERMAID'S PURSE. A shark's egg-case. See Shark.

MERMILLOD, mĕr'mē'lō', Gaspard (1824-92). A Swiss Catholic prelate, whose ecclesiastical history is largely the story of the quarrel between the radical Government of Geneva in the seventies and the Holy See. He was born in Carouge, studied in a Jesuit college at Freiburg, and took holy orders in 1847. He immediately sprang into prominence as an impassioned orator and a leader of the Ultramontanists, in whose behalf he founded *L'Observateur Catholique* and the *Annales Catholiques.* In 1864 he was appointed Vicar-General of Geneva, and in 1865 received full episcopal powers in the canton. In the struggle precipitated by this action, the Genevan Government acted with great bitterness, and in 1873 exiled him. An attempt on the Pope's part in 1879 to restore him was unsuccessful, as the brief forming the Canton of Geneva into an apostolic vicarate was still in force; but in 1883 Mermillod was appointed Bishop of Lausanne and Geneva, and the distasteful title was thus abrogated and the decree of exile consequently withdrawn. He was made a cardinal in 1890. His collected works, sermons, lives of the saints, and political pamphlets, were published in Paris and Lyons in 1893. Consult Lesur and Bournand, *Le Cardinal Mermillod* (Abbeville, 1895).

MERODACH, mē'rō-dăk, or Bel-Merodach. The name of a Babylonian-Assyrian deity, who is generally referred to in the Old Testament as Bel (i.e. 'lord') or Bel-Merodach. The Babylonian form of the name is *Maruduk* or *Marduk.* Originally merely the patron deity of the city of Babylon, he became the head of the Babylonian Pantheon, as Babylon grew to be the capital of a great kingdom. In virtue of this preëminent position, he usurped the rites of older gods, who in earlier periods of Mesopotamian history had been supreme, notably the chief god of Nippur, known as Bel of Nippur or simply Bel. Hence the references to him in the Old Testament as Bel or Bel-Merodach, and, in the Babylonian religious literature, the substitution of Marduk by the Babylonian theologians in hymns and myths which originally spoke of Bel. By virtue of this process, Marduk becomes the creator of mankind as well as the god who brings order into the universe by his conquest of the monster Tiamat. This story of Marduk and Tiamat became known to the Hebrews, among whom it gave birth to such conceptions as Leviathan (q.v.), and plays a prominent part in the Apocalyptic literature. In the legend of Saint George and the dragon we have another transformation of the Marduk and Tiamat myth. Marduk appears originally to have been a solar god, but, as in the case of other gods, his nature is not 'single,' and hence he appears also in the literature as a storm god. In the artificial astronomical system of the Babylonian scholars, which identified the chief deities with the great stars, Marduk is identical with the planet Jupiter of the Romans. As the head of the Pantheon he receives such titles as 'King of the Gods,' 'King of Heaven and Earth,' 'the supreme god,' and the like. The chief temple of Marduk stood in the city of Babylon and was known as E-sag-ila (i.e. 'the lofty house'). It is now being explored by a German expedition. Consult: Jastrow, *Religion of Babylonia and Assyria*, especially chaps. viii. and xxi. (Boston, 1898); Zimmern, *Keilinschriften und das Alte Testament*, pp. 370-96 (Berlin, 1902).

MÉRODE, mā'rōd', François Xavier Marie Frédéric Ghislain, Count de (1820-1874). A Roman Catholic prelate. He was born at Brussels, a grand-nephew of Lafayette. He entered the Belgian army and took part in the Algerian campaign. In 1874 he began the study of theology at Rome, where he was ordained to the priesthood in 1850. Pius IX. made him his chamberlain, and canon of Saint Peter's. In 1860 he was appointed temporary Minister of War, and recruited, chiefly from foreigners, a Pontifical army. In 1865 he went out of office in consequence of a dispute with Cardinal Antonelli. The next year he was made Archbishop of Mytilene and Papal Almoner. In 1869 he resisted the declaration of the doctrine of Papal infallibility; but he acquiesced in the final enunciation of it by the Ecumenical Council. Consult his *Life* by Besson (Paris, 1886).

MEROË, mĕr'ō-ē (Lat., from Gk. Μερόη). The second capital of ancient Ethiopia (q.v.), dominant from the reign of King Ergamenes (about B.C. 250), and the only residence of the kings after the downfall of Napata (q.v.). As *Berua*, it is mentioned as early as B.C. 500; the extensive ruins (described by Cailliaud, and finely illustrated in Lepsius, *Denkmäler*, part v.) are situated at a place now called Begerawieh. Consult: Cailliaud, *Voyage à Méroë* (Paris, 1823-27); Lepsius, *Letters from Egypt, Ethiopia, and the Peninsula of Sinai* (London, 1853).

ME'ROM, Waters of. The scene of the great battle between the Hebrews under Joshua and the allied kings of Canaan (Josh. xi.). The Waters of Merom are commonly identified with the more northern of the two lakes through which the Jordan flows in its course to the Dead Sea, although the identification is not free from difficulty and is disputed. This lake is now called Huleh, or more fully Baheiret el-Huleh, 'the little lake of Huleh.' It is triangular in shape; at its base, toward the north, the Jordan enters and flows out again from its apex toward the south on its descent to the Sea of Galilee. The falling rains and melting snows periodically increase its size, but its average length is about three and one-half miles, and its width at the broadest point about three; its depth is 10 to 16 feet. Josephus calls the lake Semechonitis (*Wars*, iii.-x. 7), and the region about it Ulatha (*Antiquities*, xv., x. 3). The district, which is very fertile, is inhabited by Arabs. Consult Macgregor, *The Rob Roy on the Jordan* (New York, 1870).

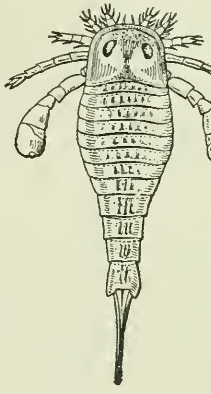
MEROPE, mĕr′ō-pē. (1) A sister of Phaëthon and one of the Heliades. (2) One of the Pleiades, the wife of Sisyphus and mother of Glaucus. (3) The daughter of Cypselus and wife of the Messenian King Cresphontes. All her sons except Æpytus were killed when her brother-in-law, Polyphontes, seized the kingdom. Æpytus fled, and when he had grown up returned and put Polyphontes to death.

MÉROPE, mâ′rōp′. A tragedy by Voltaire (1743).

MEROP′ODA (Neo-Lat., from Gk. μέρος, *meros*, a part, a segment + πούς, ποδός, *pous*, *podos*, a foot). The name given by Packard to a phylum or general group of arthropodous animals comprising three classes, i.e. the diplopod myriapods or 'thousand-legs' (q.v.), the Pauropoda, and the Symphyla. It is equivalent to the *Tracheata progoneata* of Pocock. In the typical forms (Diplopoda) the second pair of mouth-appendages, corresponding to the mandibles of insects, are very different in structure and composed of three segments, since all the head and thoracic appendages are made up of several joints, hence the name *Meropoda*, or jointed-legs. In this phylum all the forms agree in having the genital outlets situated a little behind the head; i.e. in diplopods and pauropods in the third segment behind the head, while in the Symphyla (Scolopendrella) the single opening is in the fourth segment from the head. The young on hatching differ from those of centipedes (Chilopoda) in having but three pairs of legs, but unlike those of insects, either the third or the second trunk-segment in diplopods is footless. See Centipede; Myriapoda.

MER′OSTOM′ATA (Neo-Lat. nom. pl., from Gk. μέρος, *meros*, part + στόμα, *stoma*, mouth). A class of Arthropoda, standing next above the Trilobites and immediately below the Arachnida, these three classes forming a series by themselves and distinct from the Crustacea. They are represented by the king crab (q.v.), or Limulus, the sole surviving member of the class. The merostomes are subdivided into three orders: the *Eurypterida*, represented by Eurypterus; the *Synziphosura*, of which three Paleozoic families are the types; and, third, the *Xiphosura*, type Limulus. The class chiefly differs from Trilobites in having appendages of two types, those of the head being single, those of the abdomen being biramous; in being provided with book-gills, attached to the broad abdominal legs, which are fused together at the base, the head appendages often ending in a forceps, while they differ from the Arachnida in breathing by gills, all the forms being marine, in the nature of the appendages, the brain, the nervous cord enveloped by arteries, and by the reproductive organs. The earliest forms are the Eurypterida. The typical genus Eurypterus, unlike the king-crab, probably actively swam nearer the surface of the sea. The species are found fossil in rocks of Cambrian to Permian age. The form of the body is somewhat like that of a scorpion, though flatter and of larger size. A quadrate headpiece or cephalothorax with rounded front corners bears two large reniform compound eyes, between which are two small eye spots or ocelli. The abdominal portion consists of twelve segments that taper posteriorly and are terminated by a strong, sharp spine or telson. The structure of the ventral surface of the body is quite similar to that of the horse-shoe crab.

The eurypterids appeared first in the Potosi Cambrian limestones of Missouri. At the end of the Silurian period geographic conditions seem to have favored their development, for they expanded rapidly and became the dominant types of the fauna of the inclosed basins in which were deposited the shallow water passage beds between the Silurian and Devonian formations. They appear in great numbers in the water limestones or cement rocks of New York State, and in beds of equivalent age and similar character in Great Britain and the Baltic Provinces; also in the coal measures of Carboniferous age in Pennsylvania, Nova Scotia, and in Europe, where they are associated with the fossil remains of a swamp fauna and flora. The last member of the genus is known from Permian fresh-water beds of Portugal. The genus seems to have been first a marine shallow-water organism and to have changed its habitat through brackish and possibly to fresh water in succeeding geological periods. Several allied genera are found associated with the remains of Eurypterus; of these Pterygotus, Slimonia, and Stylonurus are the most important. See King-Crab; Limulus; Xiphosura.



EURYPTERUS FISCHERI.

Bibliography. Zittell, *Text-Book of Paleontology*, trans. by Eastman (New York, 1900); Woodward, *Monograph of the British Fossil Crustacea of the Order Merostomata* (Palæontological Society, London, 1866-78); Packard, "On the Carboniferous Xiphosurous Fauna of North America," in the *Memoirs of the National Academy of Sciences*, vol. iii. (Washington, 1886); with the writings of De Kay, Hall, Huxley, Salter, Peach, and Laurie.

MER′OVIN′GIANS. The first dynasty of the Frankish Kings in Gaul. The name is derived from Merovæus, the reputed grandfather of the great Frankish King Clovis (q.v.), who in 486 put an end to the Roman dominion in Gaul. Clovis on his death divided his kingdom among his four sons, one of whom, Clotaire I., reunited them under his own sway, in 558. On his death, in 561, the Kingdom was again divided into four parts—Aquitaine, Burgundy, Neustria, and Austrasia. His grandson, Clotaire II., again reunited them in 613. Later there were again three States, Neustria, Austrasia, and Burgundy, which were united in 687. The power of the Merovingian kings was finally reduced to a shadow, the real power having passed into the hands of the major domus (q.v.). The dynasty of the Merovingians terminated with the deposition of Childeric III.

by Pepin the Short (q.v.) in 752, and gave place to that of the Carolingians (q.v.). (See FRANKS.) The chief authority for the earlier parts of the history of the Merovingians is Gregory of Tours. Consult: Thierry, *Récits des temps mérovingiens* (Paris, 1840); Richter, *Annalen des fränkischen Reichs* (Halle, 1873); Sergeant, *The Franks* (New York, 1898).

MER'RIAM, AUGUSTUS CHAPMAN (1843-95). An eminent classical scholar, born at Locust Grove, N. Y. In 1866 he graduated with the highest honors from Columbia College, and from 1868 until his death he was connected with his alma mater as tutor, adjunct professor of Greek, and professor of Greek archæology and epigraphy. He was director of the American School of Classical Studies at Athens, 1887-88, during which year important excavations were carried on. He died January 19, 1895, while on a visit to Athens, and was buried there. His chief publications are: *The Phæacians of Homer* (New York, 1880); *The Greek and Latin Inscriptions on the Obelisk Crab in Central Park* (1883); *The Sixth and Seventh Books of Herodotus* (New York, 1885); *The Law Code of Gortyna in Crete* (New York, 1886).

MERRIAM, CLINTON HART (1855—). An American biologist, born in New York City and educated at the Sheffield Scientific School of Yale (1877) and the New York College of Physicians and Surgeons. He served as naturalist to the Hayden Survey in 1872; was appointed assistant of the United States Fish Commission in 1875, and head of the Biological Survey in 1885; and acted as one of the Bering Sea Commissioners in 1891 and as head of various expeditions. He developed the Biological Survey as a bureau of the United States Department of Agriculture and edited a long and important series of publications relating to the fauna of North America, in the classification of which he became a leading authority. Among his published works are: *The Birds of Connecticut* (1877); *Mammals of the Adirondacks* (1882-84); *Biological Reconnaissance of Idaho* (1891); *Geographic Distribution of Life in North America* (1892); *Flora and Fauna of the Death Valley Expedition* (1893); *Temperature Control of Distribution of Animals and Plants* (1894); and many pamphlets relating to American zoölogy.

MERRIAM, FLORENCE. See BAILEY, FLORENCE MERRIAM.

MERRIAM, HENRY CLAY (1837—). An American soldier, born in Maine. He graduated at Colby College (Waterville, Maine), studied law, entered the United States Army in 1862 as captain in the Twentieth Maine Volunteer Infantry, resigned in 1863, and in the same year was appointed captain in the Eightieth United States colored troops. He served until the close of the Civil War from 1863 with colored troops, was brevetted colonel of volunteers for faithful and meritorious services during the campaign against Mobile and its defenses, and in 1865 led the final attack on Fort Blakely, Ala., with the Seventy-third United States colored infantry. In 1866 he became major in the Thirty-eighth United States Infantry, in 1885 colonel of the Seventh Infantry, and in 1897 brigadier-general. As commander of the departments of Columbia and California in 1898 he organized and forwarded troops for the Philippines expedition. He became commander of the Department of Colorado in 1900, and was retired in 1901. The Merriam infantry pack was invented by him.

MER'RILL. A city and the county-seat of Lincoln County, Wis., 170 miles northwest of Milwaukee; on both sides of the Wisconsin River, and on the Chicago, Milwaukee and Saint Paul Railroad (Map: Wisconsin, D 3). It is laid out with broad and well-paved streets, and has the T. B. Scott Public Library, which is located in a fine building, a commodious opera house, a large and well equipped high school, and a handsome court house that cost over $100,000. The surrounding country possesses valuable hardwood timber, and there are in Merrill very important lumber manufactories, producing sawed lumber, shingles, laths, doors, sash and blinds, etc. Settled in 1875, Merrill was incorporated five years later. The government is vested in a mayor, biennially elected, and a unicameral council. Population, in 1890, 6809; in 1900, 8537.

MERRILL, FREDERICK JAMES HAMILTON (1861—). An American geologist, born in New York City. He graduated at the Columbia School of Mines in 1885, received his Ph.D. there, five years afterwards held a fellowship in geology at Columbia College (1886-90), and was assistant in the New Jersey Geological Survey (1885-89). From 1890 to 1893 he was assistant geologist for New York State. He was director of the New York State Museum in 1894, and he was in charge of the New York exhibit at the Columbian Exposition in Chicago in 1893. He was a member of numerous scientific societies, to whose bulletins and to other periodicals he contributed special articles, and in 1898 he was made State Geologist for New York. To the bulletin of the New York State Museum he contributed such discussions as *Salt and Gypsum Industries in New York* (1893); *Mineral Resources of New York* (1896); and *Road Materials and Road Building in New York* (1897).

MERRILL, GEORGE PERKINS (1854—). An American geologist, born at Auburn, Me. After graduating at the Maine State College (1879) he was assistant in chemistry at Wesleyan University, Conn. (1879-80). In 1880 he was appointed assistant curator at the National Museum. He also served as professor of geology and mineralogy at the Corcoran Scientific School of Columbian University, Washington, D. C. (1893); and was appointed head curator of the department of geology at the National Museum, Washington, in 1897. His chief publications are: *Stones for Building and Decorations, Handbooks for the Department of Geology, United States National Museum,* and a *Report of the Smithsonian Institution* (1890).

MERRILL, LEWIS (1834-96). An American soldier, born at New Berlin, Pa. He graduated at West Point in 1855, was assigned to duty with the First Dragoons, and served in Missouri, in Kansas Territory, and with the Utah expedition. In 1861, as colonel and chief of staff to John C. Frémont, he organized Merrill's Horse to oppose guerrillas in Missouri, and later commanded the Department of Saint Louis, and then that of Northern Missouri. In 1864 he was commander of the cavalry bureau at Saint Louis and took part in the engagements at Franklin, Mo. The next year he was sent against guerrillas in northern Georgia and Alabama, and was brevetted brigadier-general. After various Western assignments he was placed in command of a military district in South Carolina with orders to break up the Ku Klux Klan (q.v.), which was operating boldly. From 1871 to 1873 he succeeded in this so well that when similar conditions arose in the Red River District of Louisiana he was made commander there in 1875, remaining until the following year.

MERRILL, Selah (1837—). An American Congregationalist clergyman, born in Canton Centre, Conn. After studying theology at the Yale Divinity School he was ordained in 1864. During the last year of the Civil War he was chaplain of the Forty-ninth United States colored infantry, and in 1868 went to Germany, where he studied two years. In 1874-77 he was in Palestine as archæologist of the American Palestine Exploration Society, and he returned to Jerusalem in 1882 as United States consul. While there he made important explorations and excavations to discover the second wall of Jerusalem and determine the site of Calvary. He was again consul in 1891-94, and was reappointed in 1898. He taught at Andover Theological Seminary in 1872 and 1879, and became curator of the Biblical Museum there. His works include: *East of the Jordan* (1881 and 1883); *Galilee in the Time of Christ* (1881); *Greek Inscriptions Collected in the Years 1875-77 in the Country East of the Jordan* (1885); and parts of *Picturesque Palestine* (1882-83).

MERRILL, William Emery (1837-91). An American soldier and military engineer. He was born at Fort Howard, Wis.; graduated first in his class at West Point in 1859, and from September, 1860, to July, 1861, was assistant professor of engineering there. In the Civil War he served as assistant engineer in the Army of the Potomac during the Peninsular campaign and in the Northern Virginia campaign; was superintending engineer at Newport and Covington, Ky., at the time of the threatened Confederate attack in September and October, 1862; was chief engineer of the forces in Kentucky from October, 1862, to May, 1863, and of the Army of the Cumberland from August to September, 1863, and again from January to June, 1865; participated in the invasion of Georgia from May to June, 1864; and from July, 1864, to September, 1865, commanded, as colonel, a regiment of 'veteran volunteer' engineers which was charged with the erection of defenses along the military railroads in Tennessee, Georgia, and northern Alabama, and at Chattanooga, Tenn. During the war he received the successive brevets of captain, major, lieutenant-colonel, and colonel for gallant services. In March, 1867, he was raised to the regular rank of major and in February, 1883, to that of lieutenant-colonel. From 1867 to 1870 he was chief engineer on the staff of General Sherman, then commanding the Military Division of the Missouri, and thereafter until his death he was engaged almost continuously on engineering work for the Government. In 1889 he represented the United States Engineer Corps at the International Congress of Engineers at Paris. He published: *Iron Truss Bridges for Railroads* (1870); and *Improvement of Non-Tidal Rivers* (1881).

MER'RIMAC. A river of New Hampshire and Massachusetts. It is formed at Franklin, N. H., by the union of the Winnipisaukee and Pemigewasset, the former being the outlet of the lake of that name, and the latter rising in the White Mountains (Map: Massachusetts, E 2). It flows southward until it enters Massachusetts, when it turns eastward and empties into the Atlantic Ocean through a tidal estuary at Newburyport. Its length, including the Pemigewasset, is 183 miles, and its chief importance is derived from the immense water-power which it furnishes, and which gave rise to the great manufacturing cities of Lowell, Lawrence, and Manchester.

MERRIMAC, The. (1) A United States frigate, sunk with other vessels when the Federal Government abandoned the Norfolk Navy Yard in 1861, and reconstructed as a Confederate ironclad. She was then renamed the *Virginia*. After destroying the *Congress* and the *Cumberland* at Newport News on March 8, 1862, she met the *Monitor* in Hampton Roads on March 9, and after a contest of four hours was obliged to withdraw. She was destroyed when the Norfolk yard was evacuated by the Confederates on May 11, 1862. See Hampton Roads and Monitor.

(2) A collier accompanying the United States fleet investing Santiago de Cuba, in 1898. For the purpose of preventing the escape of the Spanish fleet, she was sunk at the mouth of the harbor on June 3 by Lieutenant Richmond P. Hobson, who, after accomplishing his perilous feat, was captured by the Spanish and held prisoner until July 6.

MER'RIMAN, Henry Seton. The pseudonym of the English novelist Hugh S. Scott (q.v.).

MERRIMAN, Mansfield (1848—). An American civil engineer, born at Southington, Conn. He graduated at the Sheffield Scientific School of Yale University in 1871, was assistant in the United States Corps of Engineers in 1872-73, and instructor in civil engineering at the Sheffield School from 1875 to 1878. In 1878 he was appointed professor of civil engineering in Lehigh University. From 1880 to 1885 he was also assistant on the United States Coast and Geodetic Survey. His researches in connection with hydraulics, bridges, the strength of materials, and pure mathematics are important. His chief publications, widely used as standard textbooks, are: *Method of Least Squares* (1884; 8th ed. 1901); *Mechanics of Materials* (1885; 9th ed. 1902); and *Treatise on Hydraulics* (1889; 8th ed. 1903).

MER'RITT, Wesley (1836—). An American soldier, prominent in the Civil War and the Spanish-American War. He was born in New York City, graduated at West Point in 1860, was assigned as second lieutenant of the Second Dragoons in January, 1861, acted as aide-de-camp to General Cooke from February to September, 1862, and in April, 1862, was promoted to be captain. He participated in Stoneman's famous raid toward Richmond in April-May, 1863; commanded the reserve cavalry brigade of the Army of the Potomac in the battle of Gettysburg and in the Richmond campaign from April to August, 1864; and commanded a cavalry division in the Shenandoah Valley campaign under Sheridan from August, 1864, to March, 1865, and in the final Richmond campaign of

March-April, 1865. For his services he received the successive brevets of major, lieutenant-colonel, colonel, major-general of volunteers, and brigadier-general and major-general in the Regular Army; and on April 1, 1865, was promoted to be major-general of volunteers. He acted as chief of cavalry of the military division of the Southwest from June 9 to July 17, 1865, and commanded the cavalry in the Department of Texas from July 28 to November 8, 1865. In February, 1866, he was mustered out of the volunteer service, and in July was appointed lieutenant-colonel in the Regular Army. He then served on frontier duty at various stations for several years, was promoted to be colonel of the Fifth Cavalry, July 1, 1876, and in the same year served against the Indians in Wyoming and Dakota. From 1882 to 1887 he was superintendent of the United States Military Academy, and in April, 1887, he was promoted to be brigadier-general. He became a major-general in April, 1895; was in command of the Department of the East in 1897-98; was placed in command of the United States forces in the Philippine Islands (q.v.) in May, 1898; and later in the same year was summoned to Paris to assist the American Peace Commissioners there. In June, 1900, he was retired from active service.

MER′RY, Robert (1755-98). An English poet, born in London. He studied at Christ College, Cambridge, and began the study of law, but was never called to the bar. In 1775 he purchased a commission in the Horse Guards, but soon afterwards sold it. After leaving the service, Merry traveled extensively throughout Europe, and in Florence was made a member of the so-called Della Cruscan Circle. He wrote much for the *Florence Miscellany*, and after his return to England published reams of affected and grandiloquent verse over the signature Della Crusca. His ambition was to form a new school, and his style is similar to that of Mrs. Piozzi and Bertie Greatheed. He also wrote a number of incoherent dramas, including: *Lorenzo* (1791); *The Magician No Conjurer* (1792); and *The Abbey of St. Augustine* (1797). From 1796 he resided in the United States.

MERRY, William Walter (1835—). Rector of Lincoln College, Oxford. He was born in Worcestershire; educated at Cheltenham College and Balliol College, Oxford, where he gained the Chancellor's prize for a Latin essay in 1858. He was elected fellow and tutor of Lincoln College in 1859, and rector in 1884; was presented to the Vicarage of All Saints, Oxford, in 1861; was appointed one of the select preachers to the university in 1878-79, and again in 1889; was elected public orator in the university in 1880; and in 1883-84 was, by appointment of the Bishop of London, one of the preachers in the Chapel Royal, Whitehall. He has been prominent in teaching and examining in the university, and has frequently been classical moderator. He has been for many years engaged in the preparation of editions of the classical authors to be published by the Clarendon Press, Oxford. Of these have so far appeared: Homer's *Odyssey* (books i. to xii., second edition, 1886; books xiii. to xxiv., 15th thousand, 1901); and a series of the plays of Aristophanes, begun in 1879. Another work in classical literature is on *The Greek Dialects* (1875).

MERRY DEVIL OF EDMONTON, The. An anonymous comedy acted in 1607 and printed in 1608. It has been attributed on slight evidence to Drayton by Coxeter, and also ascribed to Shakespeare. Fleay thinks the play, originally called *Sir John Oldcastle,* was written by Drayton for the Chamberlain's Men before 1597, and that the prose story of the same title by T. B., 1608, is not to be identified with the play. It was very popular; Jonson remarks that it was the "dear delight of the public." Allusions to it are found in *Grim, the Collier of Croyden,* and probably in *Merry Wives of Windsor* as well. The hero, Fabel, whose tomb was at Edmonton, was said to have sold his soul to the devil, but his wit proved too much for the purchaser.

MERRY ENGLAND. An old popular name of England, in which the word merry has its early meaning of 'pleasant.'

MERRY MONARCH, The. A nickname of King Charles II. of England.

MERRY MOUNT. The name of a settlement made by Thomas Morton within the limits of the present Quincy, Mass. See Morton, Thomas.

MERRY WIVES OF WINDSOR, The. A comedy by Shakespeare, produced probably in 1597, printed complete in 1623. An imperfect copy, entitled *Sir John Falstaff and the Merry Wives of Windsor,* was printed by Thomas Creede in 1602, bearing evident marks of haste. The play was made for a Court performance, and is said to have been written at Queen Elizabeth's command, to show Falstaff in love. Some incidents of the plot are taken from two tales in Straparola's *Notti Piacevoli;* from Tarleton's *The Lovers of Pisa* in his *Newes Out of Purgatorie;* from Brainford's "Fishwife's Tale" in *Westward for Smelts.* The buck-basket found in the tale of Buciolo in Fiorentino's *Pecorone* is in the comedy the basket of soiled linen in which Falstaff hides. It is notably a play of middle-class people, and, like *Much Ado About Nothing,* is mostly prose. A version called *The Comical Gallant* was made in 1702 by John Dennis, who is one authority for Elizabeth's connection with the play. Another is Rowe in 1709.

MERSCHEID, mĕr′shīt. A town of Germany. See Ohligs.

MERSEBURG, mĕr′ze-bo͞ork. A town in the Province of Saxony, Prussia, situated on the Saale, about 20 miles west-northwest of Leipzig (Map: Prussia, D 3). It is ancient in appearance. It has a fine cathedral, begun in the eleventh and finished in the sixteenth century. The Gothic castle, the former residence of the bishops, is now used as an administration building. Other interesting buildings are the Rathaus, the new assembly house, and the chapter house. The gymnasium, founded in 1575, is the chief educational institution. Merseburg manufactures machinery, leather, iron products, toys, textiles, etc. It is considered one of the oldest towns of Germany. As early as the ninth century it was the residence of the counts of Merseburg. During the tenth, eleventh, and twelfth centuries it was the favorite residence of the German emperors and the seat of many diets. Merseburg was the seat of an important bishopric in the Middle Ages. With the introduction of Protestantism the see passed to Saxony. Its fairs were also of great importance. Near Merseburg the German King, Henry the Fowler, won a great victory over the Hungarians in 933. Population, in 1890, 17,669; in 1900, 19,119, chiefly Protestants.

MERSENNE, mâr′sĕn′, Marin (1588-1648). A French theologian and scholar, born at La Soultière (Maine). He studied at the College of La Flèche, where he had as a fellow pupil René Descartes, with whom he always maintained a close friendship. In 1611 he became a Minim Friar. Afterwards he taught philosophy at Nevers from 1614 to 1620, and subsequently lived principally in Paris. He was the Parisian representative of his friend Descartes while the latter was in Holland. Afterwards his studies grew more scientific, and he published a number of treatises on astronomy and mathematics. He also wrote *Harmonie universelle, contenant la théorie et la pratique de la musique* (1636), and a Latin epitome of it, *Harmonicorum Libri XII.* (1636). From these we learn much of the condition of music in the seventeenth century, and his own discoveries in the phenomena of vibration.

MER′SEY. A river of England, separating the counties of Chester and Lancaster (Map: England, D 3). It enters the Irish Sea by a wide estuary forming the Liverpool Channel. This channel is deep and navigable for several miles above Liverpool. By means of a ship canal, which follows for some distance the course of the river, navigation can be continued to Manchester and beyond. See Liverpool.

MERSINA, mĕr′sė-nä′. A seaport town in the Vilayet of Adana, Asia Minor, situated on the southern coast, 41½ miles by rail west-southwest of Adana (Map: Turkey in Asia, F 4). It is well built and surrounded by fine gardens. The harbor, an open roadstead, is not very deep, and steamers usually anchor a long distance from the town. Its commerce amounted to over $5,000,000 in 1900. The United States is represented by a consular agent. Mersina is of recent origin; its population is estimated at over 12,000, about one-half Christian.

MERSON, mâr′sôN′, Luc Olivier (1846—). A French painter, born in Paris. He studied under Chassevent and Pils, and was awarded the Prix de Rome in 1869. He obtained a first-class medal at the Paris Exposition of 1889. His works are on historical and religious subjects, painted with peculiar charm, and his drawings have the same delicate, almost tender, quality. Notable pictures are the two episodes from the life of Saint Louis, for the Palais de Justice in Paris, "Saint Isidore," and the "Repose in Egypt."

MERTHYR TYDFIL, mẽr′thẽr tĭd′vĭl. A manufacturing town in Glamorganshire, South Wales, surrounded by lofty hills and built on the river Taff, about 500 feet above sea-level, 24 miles from Cardiff (Map: England, C 5). Merthyr Tydfil is the seat of the iron trade of South Wales and contains large collieries, celebrated for the excellence of steam coal, the exports of which are considerable. The town has greatly improved since 1850; it owns handsome public buildings, a good water supply, and two profitable sewage farms, and maintains two infectious disease hospitals. Population, in 1801, 7700; in 1891, 59,000; in 1901, 69,200.

MERTON, mẽr′ton, Walter de (?-1277). An English prelate, founder of Merton College, Oxford. He was educated in the priory at Merton, Surrey, and was ordained to the priesthood. Henry III. raised him in 1261 to the lord chancellorship, from which office he was deposed in 1263 by the barons under Simon de Montfort. He returned to that office in 1272, but in 1274 resigned to accept an appointment to the See of Rochester. He founded at Basingstoke a hospital for superannuated clergymen and travelers in distress; but is best known as the founder of Merton College, Oxford, which was completed in 1274. This was originally designed, it would appear, to be for the education of the secular clergy, and offered courses in philosophy, the liberal arts, and theology—*in arte, dialectica, et theologia*, as the Rochester chronicles express it. It became the model of subsequent foundations at both Oxford and Cambridge, and was thus the basis of the collegiate system peculiar to these two English universities.

MERTON COLLEGE. The oldest college of its type in Oxford, and the model of all later secular colleges, in both Oxford and Cambridge. It was first founded as the House of the Scholars of Merton, in 1263 or 1264, by Walter de Merton (q.v.). The original endowment consisted of his manor house and estate at Malden, Surrey, the income from which was to go to the support of scholars in Oxford, the estate being managed by a resident warden and 'brethren.' By various changes between 1264 and 1274, the scholars were moved from a rented house to their own property, Merton Hall, acquired for them by the founder, and were put in charge first of a sub-warden, then of the warden himself, who had come up from Surrey. The number of scholars, who had been originally confined to the members of the founder's family, was increased, and the collegiate idea of the foundation was crystallized in the statutes of 1274. The addition of a system of ecclesiastical patronage, the arrangement of the buildings, and the plan, size, and beauty of the chapel, in addition to the scheme of the statutes, had great influence on later foundations. The college has suffered various changes since its establishment, the last of which was its absorption of Saint Alban Hall in 1882. There were, in 1902, a warden, twenty fellows, several honorary fellows, eighteen scholars, called post-masters, ten exhibitioners, four lecturers, two chaplains, college officers, and, in all, some one hundred and fifty undergraduates. The buildings are among the most interesting in Oxford, comprising, as they do, a considerable part dating from the thirteenth century. Here Henrietta Maria occupied the warden's apartments, while Charles I.'s Court was held at Oxford. Again, in 1665, the year of the plague, Charles II. moved his Court hither, and his Queen occupied the lodgings formerly used by Henrietta Maria. The chapel, though not completed, is of cathedral size, but has no transepts. Among the worthies of Merton may be mentioned Harvey, the demonstrator of the circulation of the blood, Bishops Patteson and Jewell, Anthony Wood, Sir Thomas Bodley, Sir Richard Steele, and Sir H. Savile. Consult Henderson, "Merton College," in *University of Oxford College Histories* (Oxford, 1902). See Oxford University.

MERU, mā'rōō. A fabulous mountain in Hindu mythology, the abode of the gods. It is supposed to stand at the centre of the world, and it towers to a height of 80,000 leagues; the sun, moon, and stars revolve about its summit. Regarded as a terrestrial mountain, it would seem to have been located somewhere to the north of the Himalayas.

MERV, mĕrf. A region in Central Asia now forming a district in the Russian Trans-Caspian province, a short distance from the northeastern corner of Persia (Map: Central Asia, H 2). Its area is estimated at about 49,000 square miles. The northern and larger part is a vast sandy plain with very little vegetation. The southern part is more elevated and watered by the Murghab and its tributaries. The summers are long and hot, and the annual average temperature is from about 57° to 60°, ranging from —6° to 113°. The precipitation is very meagre, especially in the northern part. The chief occupation of the inhabitants is agriculture, which is made possible only by irrigation. Unirrigated regions are utilized to some extent for stock-raising by the nomadic tribes. The chief centre of agriculture is the oasis of Merv, to which the name was formerly confined. The water for irrigation is supplied by the Murghab and a few of its tributaries. Wheat and rye are the chief cereals raised in the irrigated portions of the territory. Transportation is effected principally by the use of pack animals, although the territory is crossed by the Trans-Caspian Railway line. Near the railway line are the Imperial estates of Murghab, with extensive irrigation works. The population of the district was 119,332 in 1897, composed, with the exception of a few Russian Jews and Persians, of Tekke Turkomans, divided into a number of clans. A considerable portion of them are nomadic. They all profess Islam.

The capital of the district, known as New Merv, is situated on the Murghab and the Trans-Caspian Railway. It has a number of schools, churches, a meteorological observatory, and some trade. Population, in 1897, 8727, consisting of Russians, Turkomans, Armenians, Persians, and Jews. About 25 miles east of New Merv are the ruins of three cities, of which one, existing in the time of Strabo, was, according to that historian, of great extent and importance.

Merv is a very ancient settlement, its name (*Mouru*) being mentioned in the Zend Avesta. It once formed a satrapy of the Persian Empire. An archbishopric of the Nestorian Church existed there as early as the fifth century. Occupied by the Arabs in the seventh century, the city of Merv became the capital of Khorassan and a great intellectual centre, rising to still greater importance in the eleventh century while under the rule of the Seljuks. The prosperity of Merv came to an end with the invasion of the Turkomans about the middle of the eleventh century. The district was almost entirely depopulated by the Mongols under Tulai in 1221. At the end of the fourteenth century it fell into the hands of Timur, and after a short occupation by the Uzbeks at the beginning of the sixteenth century was taken by the Persians, under whose rule it remained until 1787, when it was occupied and later entirely devastated by the Bokharians. About the middle of the nineteenth century it was invaded by the Tekke Turkomans, who became the ruling race. In 1884 Merv was annexed by Russia.

MERX, mĕrks, ADALBERT (1838—). A German theologian and Orientalist. He was born at Bleicherode, near Nordhausen, and studied at Marburg, Halle, and Berlin. From 1865 to 1875 he was professor of Semitic philology and theology at different universities. In the latter year he took the chair of theology at Heidelberg. He belongs to the school of liberal theologians, who fully acknowledge the right of unrestricted criticism of the Scriptures. Among his published works are: *Das Gedicht von Hiob* (1871); *Die Saadjanische Uebersetzung des Hohenliedes ins Arabische* (1883); the "Historia Artis Grammaticæ apud Syros," in *Abhandlungen für Kunde des Morgenlandes* (Leipzig, 1889); and *Idee und Grundlinien einer allgemeinen Geschichte der Mystik* (1893).

MÉRY, må'rē', JOSEPH (1798-1866). A French satirical poet, born January 21, 1798, in Aygalades (Bouches-du-Rhône). In 1824 he went to Paris, where he aroused attention through a political satire, *La Villéliade, les Jésuites* (1826), by some Bonapartist poems, and by work on a satirical journal *Némésis*. Later he wrote dramas, romances, and novels remarkable for their exotic descriptions of lands Méry had never seen. Of his once very popular stories, *Héva* (1843) and *Nouvelles nouvelles* (1853) are sufficiently typical. Méry died in Paris, June 17, 1866. Consult Claudin, *Méry, sa vie intime* (Paris, 1866).

MÉRYON, mâr'yôɴ', CHARLES (1821-68). A French etcher, born in Paris. He was educated at the Naval School in Brest, and afterwards rose to the position of lieutenant in the Navy. After making a voyage around the world (1845), he was compelled by failing health to take up etching, which he studied at Paris, achieving the highest success in this art. Though strong and precise, his execution is of rare delicacy, and his art is highly imaginative. After a few years a mental malady developed, and during his second visit to the asylum at Charenton he died. Of his etchings the best known are the series of twenty-three plates, *Eaux-fortes sur Paris* (1850-54), most of which represent old Paris, then rapidly disappearing under the improvements of Haussman. Consult: Wedmore, *Méryon and Méryon's Paris* (London, 1879); Bouvenne, *Notes et Souvenirs sur Charles Méryon* (Paris, 1883); Burty, *L'Œuvre de Charles Méryon*, translated by Huish (London, 1879).

MESA, mā'sȧ. A Spanish word meaning 'table' (cf. Latin *mensa*), and used especially in the Southwestern United States to designate the small, isolated plateaus, usually rising abruptly from the surrounding plains, which are found scattered over the region traversed by the Colorado River. The mesas are remnants of an ancient plain which in a former geological age was uplifted from the ocean-bottom to a height of several thousand feet. This plain was cut down by erosion to its present level except where a hard superficial rock protected the underlying soft strata; such places were left as isolated blocks with steeply escarped sides. The most celebrated of the mesas are the Mesa Encantada and the Mesa Verde.

The Mesa Encantada or Enchanted Mesa, called by the Indians Katzimo, is situated near the village of Acoma in west central New Mexico. It is a perpendicular sandstone rock rising from a grassy plain. It is of elongated shape, 2050 feet long and from 100 to 350 feet wide. Above a sloping talus, 100 to 200 feet in height, towers the perpendicular wall to a height of 430 feet above the plain. The summit is nearly level, and consists of a hard rock very much weathered and supporting a few stunted cedars. The rock is held in superstitious awe by the neighboring Acoma Indians, and a tradition is current among them that their remote ancestors once inhabited the summit. The rock had never been ascended by white men until Professor Libbey scaled it in the summer of 1896. He and F. W. Hodge, who ascended it in 1897, found an artificial stone monument and numerous fragments of pottery and some stone implements.

The Mesa Verde is situated in the extreme southwestern corner of Colorado, on the right bank of the Mancos River. It is a plateau 15 miles long and 8 miles wide. Its talus is 300 to 500 feet high, above which rises a precipitous wall of yellow sandstone 150 to 300 feet farther, the top of the mesa being 400 to 800 feet above the plain. It derives its name (*Verde* = 'green') from the fact that its entire upper surface is covered with a dense growth of cedars and piñon trees. The summit is more accessible than that of the Encantada, being intersected by the numerous ramifications of a cañon which opens into that of the Mancos River. The rock walls of the Mesa Verde are interrupted by numerous horizontal ledges occupied by the ruins of ancient cliff dwellings, some in a remarkable state of preservation. Large numbers of stone implements, pot-sherds, and some mummies have been found among the ruins. Consult Nordenskjöld, *The Cliff-Dwellers of the Mesa Verde,* translated by Morgan (Stockholm, 1893). See Cliff Dwellers.

MESAGNE, må-sä′nyå. A town in the Province of Lecce, Southern Italy, situated about 10 miles by rail southwest of Brindisi (Map: Italy, M 7). It is an ancient town, picturesquely situated in a fertile region, producing oil, wine, grain, and fruit. Population (commune), in 1901, 12,105.

MESCALA, må-skä′lå, or **MEXCALA.** A river of Mexico, rising in the State of Tlaxcala, 60 miles east of Mexico City. Its general course is westerly, bending southward shortly before emptying into the Gulf of Lower California at the port of Zacatula. It is known in the first part of its course as the Atoyac, and in its lower course, where it serves as the boundary line between the States of Guerrero and Michoacân, as the Rio de las Balsas. The current is exceedingly swift, and the river is not navigable, but it furnishes power to a number of textile and other mills.

MESCALERO, må′skå-lā′rō. A small Athapascan tribe. They receive their name from their use of mescal bread prepared from the maguey root by roasting under cover until it softens into a white, sticky, and sweetish mass, which is said to be extremely nutritious. They formerly ranged over the arid Pecos and Staked Plain region of Texas and New Mexico, and were constantly at war with the Ute and Navaho, while maintaining a precarious friendship with the Kiowa and Comanche. They lived entirely by hunting and depredation upon the frontier settlements of Texas and Mexico, in company with other roving tribes, and were distinguished for their warlike and cruel disposition. Their shelters were mere wikiups of boughs; they planted nothing and went nearly naked. Since about 1865 they have been confined upon a reservation in southeastern New Mexico, shut in by mountains and well supplied with timber and water, where they are now making some advance in farming, stock-raising, and civilization, although still greatly addicted to *tiswin,* a sort of sour beer manufactured from corn. In 1855 they were estimated at about 750. They number now 470.

MESDAG, mĕs′däg, Hendrik Willem (1831-1902). A Dutch marine painter, born in Groningen. He was a pupil of Alma-Tadema in Brussels, and afterwards lived at The Hague. He is one of the best of modern Dutch marine painters. His style is naturalistic, and his work is characterized by breadth, atmospheric effect, and sober color. His pictures include: "Sunrise on the Shores of Holland," in the Rotterdam Museum; "Return of the Fishing Boat" (1875), in The Hague Museum; "Evening;" and "Seashore" (1889). He received a gold medal and the cross of the Legion of Honor in 1889.

MES′EMBRYA′CEÆ, Aizoaceæ or Ficoideæ (Neo-Lat., from Gk. μεσημβρία, *mesēmbria,* midday, from μέσος, *mesos,* middle + ἡμέρα, *hēmera,* day; so called because the flowers of many species open only during midday). An order of dicotyledonous succulent herbs or shrubs. As defined by some botanists, it includes the orders Tetragoniaceæ, Sesuviaceæ, etc. Of the more restricted Mesembryaceæ about 400 species are known, embraced by eighteen or twenty genera, a few of which are natives of the south of Europe, some of America. The greater number belong to South Africa and the South Sea Islands. The perianth is usually 5-parted; stamens 5 or many; ovary 3-celled with numerous ovules. The leaves of some species, when burned, yield soda in great abundance. Large quantities of barilla are made from them in the Canary Islands, in Spain, and in Egypt. The seeds of some, as the ice plant (*Mesembryanthemum crystallinum*), and of Mesembryanthemum geniculiflorum, are ground into flour to make bread. Mesembryanthemum geniculiflorum is used as a pot-herb in Africa. The fruit of Mesembryanthemum edule (known as Hottentot's fig) is eaten in South Africa, and that of Mesembryanthemum æquilaterale (pig's-faces) in Australia. Mesembryanthemum anatomicum is called *kou* by the Hottentots, who beat and twist up the whole plant, allow it to ferment, and chew it like tobacco. When nearly fermented it is narcotic and intoxicating. Some species of Mesembryanthemum are common annuals in flower gardens. The principal genera are Mollugo, Sesuvium, Aizoon, and Mesembryanthemum.

MESEN, mā′zyĕn. A river in Russia. See Mezen.

MES′ENTERY and its Diseases. The mesentery derives its name from being connected to the middle portion (Gr. μέσον,) of the small intestine (ἔντερον). It is a broad fold of peritoneum (the great serous membrane of the abdomen), surrounding the jejunum and ileum, and attached posteriorly to the vertebral column. Its breadth between the intestinal and vertebral borders is about four inches; its attachment to the vertebral column is about six inches in length, and its intestinal border extends from the duodenum to the end of the small intestine. It serves to retain the small intestines in their place, while it at the same time allows the necessary amount of movement, and it contains between its layers the mesenteric vessels, the lacteal vessels, and mesenteric glands. These glands are 100 to 150 in number, and are about the size of an almond. They exert an organizing action on the contents of the lacteals, the chyle being more abundant in fibrine and in corpuscles after it has passed through them. The most important affection of these organs is their tubercular degeneration, which gives rise to the disease known as *tabes mesenterica*, a disease most common in childhood, but confined to no period of life. In the great majority of cases it is associated with other results of tubercular infection, such as pulmonary consumption, tubercular peritonitis, caries of the spine, rickets, etc.; but sometimes the mesenteric glands seem almost exclusively affected, in which case the disease becomes sufficiently distinct to allow of easy detection. The leading symptoms are those of early tuberculosis, with loss of color and flesh, derangement of the digestive organs (constipation or diarrhœa, and occasional vomiting), a steady pain in the region of the navel, increased by pressure; but perhaps the most characteristic symptom is tumefaction and hardness of the abdomen, with general emaciation. The enlarged glands can sometimes be detected by a careful examination with the hand, especially in advanced cases. The progress of the disease is generally slow, but at length hectic fever sets in, the emaciation becomes extreme, dropsical effusion appears, and the patient dies exhausted, if not cut off by the access of some acute inflammation.

The treatment mainly consists in the administration of cod-liver oil, iodide of potassium, and laxatives. When the disease has advanced to a considerable extent, medicines are of little use, except to palliate some of the more urgent symptoms.

Independently of the disease that has just been noticed, inflammation of these glands is by no means uncommon when the mucous membrane of the small intestine is ulcerated, as, for example, in typhoid or enteric fever.

The mesentery may be the site of hemorrhages, as in aneurism or some infectious diseases, as smallpox; of embolism or thrombosis; of cysts or of tumors.

ME′SHA (Heb. *Mēsha‘*). King of Moab during the reigns of Ahab and his sons, Ahaziah and Jehoram, kings of Israel (II. Kings iii. 4, 5). Either on the death of Ahab (according to the biblical account, l. c.), or while the latter was still reigning (according to the Moabite stone), Mesha shook off the yoke of Israel and freed himself from the heavy tribute imposed upon him. Subsequently, however, Jehoram secured the aid of Jehoshaphat, King of Judah, his father's ally, or vassal, and the united armies of the two kings were joined by the forces of the King of Edom. The Moabites were defeated, and the King took refuge in Kir-hareseth, his last stronghold (II. Kings iii. 6-25). Having in vain attempted to force his way through the besieging army, he withdrew to the wall of the city, and in the sight of the allied host offered up his first-born son and successor as a propitiatory sacrifice to Chemosh, the national god of the Moabites. The biblical narrative suggests (ib. 26-27), though in a vague way, that Chemosh turned to the succor of Mesha; at all events, the Moabites remained masters of the situation, and the attempt to reduce them to subjection failed, though their land suffered much in the struggle. See Moabite Stone.

MESHED, mĕsh′ĕd. A city of Persia. See Meshhed.

MESHHED, mĕsh′ĕd, or **MESHED.** Capital of the Province of Khorassan, Persia, situated on an elevated plain in the extreme northeastern part of the country (Map: Persia, C 3). It owes its chief importance to the fact that it contains the tomb of the Imâm Riza, a son of Ali, the founder of the Shiites. The tomb is contained in a mosque which is one of the most magnificent buildings in the East, richly ornamented with gold, silver, and marble. It is visited annually by more than 100,000 pilgrims. The city is also the centre of several important caravan routes, and had a very extensive transit trade with India and Central Asia, which, however, has greatly decreased since the completion of the Russian railroad from the Caspian Sea to Samarkand and the adoption of adverse customs regulations by the Russian authorities. The town still manufactures and exports fine silks, carpets, shawls, and sword-blades. Population, about 60,000.

MESHHED-HOSEIN, mĕ′shĕd hō-sān′. A town of Asiatic Turkey. See Kerbela.

MES′MER, Franz, or Friedrich-Anton (1733-1815). A physician and founder of the doctrine of animal magnetism, or mesmerism, (q.v.), born at Iznang, on Lake Constance. He studied at Vienna, and there took the degree of doctor of medicine in 1766. About 1772 he began, along with Father Hell, to investigate the curative powers of the magnet, and was led to adopt the opinion that there exists a power similar to magnetism, which exercises an extraordinary influence on the human body. This he called animal magnetism, and published an account of his discovery and of its medicinal value in 1775. Honors were conferred upon him in Germany. In 1778 he went to Paris, where he attracted much attention and made a fortune by his famous magnetic cures. His system obtained the support of members of the medical profession, as well as of others; but he refused an offer of an annual pension of 20,000 livres (about $4000) to reveal his secret; and this, combined with other circumstances, gave rise to suspicion, and induced the Government to appoint a commission, composed of physicians and scientists, whose report was unfavorable to him. He now fell into disrepute, and after a visit to England retired to Meersburg, where he spent the rest of his life in complete obscurity.

MESMERISM. The name of the process by which, toward the end of the eighteenth century, Franz Anton Mesmer, promulgator of the doctrine of 'animal magnetism,' induced the so-called mesmeric trance or sleep. Since Mesmer's day the subject has been transferred from the domain of charlatanism to that of scientific research. The mesmeric trance is identical with the condition known to-day as 'induced somnambulism,' or 'hypnotism,' or the 'hypnotic state;' it has presented to the observer many highly interesting phenomena. In persons who are favorably disposed for passing into the hypnotic state, the condition is easily induced by weak, long-continued, and uniform stimulation of the nerves either of sight, of touch, or of hearing. This state is, on the contrary, almost always easily capable of being terminated by some strong or suddenly varying stimulation of the same nerves.

The scientific study of the phenomena presented by hypnotized persons is of great interest and importance; but it is very doubtful indeed if the systematic induction of such a state can ever be used as a legitimate or potent means for curing disease, or even for the alleviation of certain distressing symptoms. The investigations that have been made of recent years are far from being decisive in favor of the method as a remedial agent, especially when taken in conjunction with the actual harm which may result from its induction in some nervous and impressionable persons. Now and then a minor operation may be done under the influence of hypnotism, or by its aid a fixed idea may be removed and a delusion dispelled. Under ordinary circumstances, however, the number of those susceptible to its influence is so small that its general use is impossible. In hysteria, as elsewhere, it is most decidedly a two-edged weapon, and the patient may emerge from hypnosis instituted for a minor difficulty and go into severe hysterical convulsions. One delusion may be removed, but another and a more serious one may be implanted in its stead. For obvious reasons, women should never be hypnotized without reliable witnesses, and the public use of hypnotism can only appeal to the morbid. Hypnotism tends to destroy self-reliance and to make patients imaginative, weak-minded, and neurasthenic. Suggestion (q.v.) is a mighty aid to the physician, and without producing hypnosis, positive and intelligent assertion can accomplish all that is likely to be done by hypnotism short of the somnambulistic stage. A fair realization of the part suggestion plays in therapeutics is one of the recent achievements of the most progressive medical minds. See ANIMAL MAGNETISM; HYPNOTISM; SPIRITUALISM; SOMNAMBULISM; SUGGESTION.

MESNE (mēn) **LORD.** In English law, a landlord who is himself tenant to some superior lord. The lord of a manor containing freehold lands which are held of him in fee, and who in his turn holds his lands of the Crown, answers that description at the present time; the superior lord, in this case the King, being the lord paramount. See FEE; FEUDALISM; TENURE.

MESNE PROCESS. All writs, process, or orders made or issued in an action between its commencement by original writ, summons, or other primary process and the final process by which the judgment of the court is enforced. This term is not employed under modern practice acts, as such process is now included in that covered by the term interlocutory orders. See EXECUTION; JUDGMENT; ORDERS; SUMMONS; WRITS.

MESNE PROFITS. The reasonable value of the use and occupation of real property during the period in which a trespasser remains in possession, and which may be recovered by the true owner when he is restored to possession. The mesne profits are estimated by taking the fair and reasonable net rental value of the premises between the original entry by the trespasser and the restoration of the owner in possession, and deducting therefrom all reasonable and necessary expenses for repairs and improvements incurred by the trespasser, and the amount of any taxes or assessments paid by him. See DAMAGES; EJECTMENT.

MES'OHIP'PUS (Neo-Lat., from Gk. *μέσος*, *mesos*, middle + *ἵππος*, *hippos*, horse). A name sometimes applied to one of the fossil horses of Miocene age. See HORSE, FOSSIL.

MES'OLITE (from Gk. *μέσος*, *mesos*, middle + *λίθος*, *lithos*, stone). A hydrated sodium-calcium-aluminum silicate that is intermediate in composition between natrolite and scolecite, and crystallizes in the monoclinic and triclinic systems. It occurs crystallized, in fibrous masses, and sometimes massive, with a vitreous lustre, and in color is white or of light shades of gray or yellow. Mesolite is found in amygdaloid and other volcanic rocks, especially in Iceland, Scotland, in Pennsylvania and Colorado in the United States, and in Nova Scotia.

MESOLONGHI, mĕs'ȯ-lŏṉ'gė. A town of GREECE. See MISSOLONGHI.

MESONERO Y ROMANOS, mā'sȯ-nā'rȯ ė rȯ-mä'nȯs, RAMON DE (1803-82). A Spanish essayist, born at Madrid. He entered first upon a mercantile career, and while thus engaged he collected the material for his *Manual de Madrid.* As a journalist he collaborated on the *Cartas españolas,* and in 1836 he established the *Semanario pintoresco español,* which he continued to direct until 1842. The best of his essays are to be found in the volumes entitled *Escenas matritenses* and *Memorias de un setentón.* Those contained in the former collection give faithful pictures of older Madrid, and therefore have a decided antiquarian value; those included in the *Memorias* present much matter that is now very useful to an understanding of the political, social, and literary aspects of the time. Consult the edition of his *Obras* (Madrid, 1881).

MES'ONYX (Neo-Lat., from Gk. *μέσος*, *mesos*, middle + *ὄνυξ*, *onyx*, nail). A fossil creodont mammal found in the fresh-water Eocene formations of Wyoming and New Mexico. A complete skeleton has been mounted in the museum of Princeton University. It shows the animal to have had a large head, with strong jaws and stout teeth which were able to crush bones. The body is more bulky in front and smaller and weaker behind, with a remarkably long and powerful tail. It resembled in some superficial respects the modern Tasmanian wolf.

MESOPH'ILOUS PLANT (from Gk. *μέσος*, *mesos*, middle + *φίλος*, *philos*, dear, from *φιλεῖν*, *philein*, to love). An objectionable term for plants which grow in intermediate conditions. Mesophytic is preferable. See MESOPHYTE.

MES'OPHYLL (from Gk. *μέσος*, *mesos*, middle + *φύλλον*, *phyllon*, leaf). The tissue of the foliage leaf which is bounded by the two epidermal layers and which the veins traverse. The mesophyll cells for the most part contain chlorophyll (the green pigment), and are the nutritive cells of the leaf. See LEAF.

MES'OPHYTE (from Gk. *μέσος*, *mesos*, middle + *φύλλον*, *phyllon*, leaf). A name given to plants which grow naturally in conditions of intermediate soil moisture. The term is thus in contrast with hydrophyte and xerophyte (qq.v.). To this group belong the most common plants of the forest and grass lands of equable climates. Cultivated areas with very few exceptions are mesophytic. Hydrophytes and xerophytes, then, may thus be regarded as extremes, the one adapted to an extreme of moisture, the other of dryness. On account of the almost uniformly favorable conditions, mesophytes are able to survive without any striking adaptations such as are to be found among xerophytes and hydrophytes. However, with the exception of a few remarkably plastic hydrophytes, they exhibit maximum plasticity. It is perhaps not surprising that plasticity is found developed to a high degree among them, the sequence of periods of extreme moisture or extreme dryness tending to fix adaptability. The vegetation of mesophytic areas is much more dense than that in xerophytic or even in hydrophytic regions, and there is a far greater wealth of species. The struggle for existence is thus more keen, and fewer representatives of the various species may be found, while a xerophytic or hydrophytic plant society may often be characterized by the dominance of one or two species. The keen competition which exists in mesophytic regions may perhaps account for the survival of forms with a high degree of plasticity. Another feature of mesophytic conditions is the richness of the soil, which doubtless accounts for the great diversity of plant forms, and for luxuriance which here reaches its climax in the plant world. The various mesophytic societies are treated under the following heads: FOREST; PRAIRIE; MEADOW; and PASTURE.

MES'OPOTA'MIA (Lat., from Gk. *μεσοποταμία*, sc. *γῆ*, *gē*, country, country between the rivers, from *μέσος*, *mesos*, middle + *ποταμός*, *potamos*, river). In the widest sense, all the country between the Tigris and Euphrates rivers from Armenia to the Persian Gulf; in a narrower and more common usage, the northern part of this territory, called to-day by the Arab name *El-Jezirah* (the Island Peninsula), the southern portion (Babylonia) being known as *Irak Arabi*. In the Old Testament this territory is called *Aram Naharayim* (the Aram of the Two Rivers), of which the Greek name is probably a translation; and *Paddan Aram* (the Plain of Aram). The name, in the form *Nahrima*, is found in Egyptian inscriptions and in the Amarna letters, though limited to the northwestern district between the Tigris and Belik. In the earliest times Mesopotamia seems to have been under native rulers, and to have developed a civilization of its own which may have been the source of many features commonly attributed to the Assyrians. About B.C. 1300 Rammannirari I. made it a part of Assyria. Aramæans from the south invaded the land and settled there in the course of the Semitic migrations of the succeeding centuries. In B.C. 538 it passed under Persian rule, and later belonged successively to the Macedonian, Syrian, and Parthian empires. The Romans made it a province. In 363 Jovian surrendered most of it to Persia. In the seventh century it came into the hands of the caliphs. After 1055 much of the land was ruled by petty Seljukian sultans. These were in turn conquered by the Mongols, who captured Bagdad in 1258 and put the Caliph to death. The Osmanlis began their conquest early in the sixteenth century, and in 1638 the land passed completely into their power. At present the population is mainly Arab; most of the tribes are as independent of the Turkish Government as their brethren in Central Arabia, though the country is nominally divided between several Turkish vilayets. There are a few Kurds in the north, and a small number of Armenian and Syrian Christians. The land is hilly in the north, but low and sandy to the south. After the Euphrates and Tigris, the chief rivers are the Khabur, Jaghjagha, and Belik. Bitumen is common, and a few petroleum wells are found. The most important towns are Urfa, Mardin, Nesibin, Mosul, Ed-Deir, and Rakka. In early times, when a good irrigation system was maintained, the land was fertile, populous, and the home of an advanced civilization. Owing to its situation, it was open to influences from both the east and the west, from Babylonia and Asia Minor. Perhaps its most prosperous time was under Assyrian and Babylonian rule, but in the early Christian centuries it contained important cities, such as Edessa and Nisibis, and under the caliphs the country also thrived. To-day it is desert and uninhabited except along the banks of the natural watercourses. Consult: Oppert, *Expédition scientifique en Mésopotamie* (Paris, 1856-59); Lady Anne Blunt, *The Bedouin Tribes of the Euphrates* (London, 1880); Sachau, *Reise in Syrien und Mesopotamia* (Leipzig, 1883); Oppenheim, *Vom Mittelmeer zum persischen Golf* (Berlin, 1899). See ASSYRIA; BABYLONIA.

MES'OZO'A (Neo-Lat. nom. pl., from Gk. *μέσος*, *mesos*, middle + *ζῷον*, *zōon*, animal). A group of animals regarded as intermediate between the Protozoa and Metazoa. The name was proposed in 1876 by E. van Beneden for a group of filiform bodies living in the liquid bathing the 'spongy bodies' or venous appendages (kidneys) of cephalopods. They resemble Infusoria, but are two-layered, and pass in their development through a gastrula stage. They were named Dicyema by Kölliker, who, with others, considered them as parasitic worms. Van Beneden regarded these forms as constituting the type of a distinct branch or phylum of the animal kingdom. These mesozoans are represented by two types of individuals, differing externally; one ('nematogene') producing vermiform embryos, the other form ('rhombogene') infusoriform (but many-celled) young. Packard suggested that Dicyema and allies may be degenerate parasitic platyhelminths derived originally from some low cestoid or trematode worm. Parker and Haswell (1897) treat of them in an appendix to the Cœlenterata, and state that it has been proposed to call them the Planuloidea, from the resemblance which they bear to the planula larva of the cœlenterates. Sedgwick (*Text-Book of Zoölogy*, 1898) is inclined to regard them as allied to the Trematoda, to the miracidium larva of which he asserts "they do present some considerable resemblance." Consult Lankester (editor), *A Treatise in Zoölogy*, Part IV. (London and New York, 1903).

MES'OZO'IC ERA. One of the main divisions of geologic time, following the Paleozoic era and preceding the Cenozoic era. It is subdivided into the Triassic, Jurassic, and Cretaceous periods. See GEOLOGY.

MESPELBRONN, Julius Echter von. See Julius Echter von Mespelbronn.

MESQUITE (mĕs-kē′tȧ) **GRASS** (Sp. *mezquite;* probably of Mexican origin). A name applied to a number of low-growing tufted grasses that occur in greater or less abundance upon the extensive ranges of the western and southwestern parts of the United States. Species of Aristida and Bouteloua are among the mesquite grasses. Curly mesquite is *Hilaria cenchroides.* It forms a dense sward with leafy stems a few inches to a foot high. It matures standing, as do the other species, and is excellent fodder until rotted by the winter rains. While valuable for grazing, it is too low growing to be cut for hay.

MESQUITE TREE (*Prosopis juliflora*). A shrub or tree belonging to the natural order Leguminosæ, found from central Texas to eastern California, and southward through Mexico and Central America to Chile and Argentina, and also in Jamaica. It is also known as honey locust, honey pod, algaroba, and has been introduced in the Hawaiian Islands, where it is highly prized for its timber, shade, and for its pods, which are an important stock food. In the United States the tree attains its best development in the valleys of western Texas, New Mexico, and Arizona. In some places it is the only tree. According to its surroundings, the mesquite varies from a straggling, spiny shrub to a widely branched tree 50 feet high and 3 feet in diameter, the latter size being attained in rich valleys, where water is available to the deeply penetrating roots. When once established it withstands extreme heat and drought. The wood is exceedingly durable, and is much used for posts, house foundations, and similar structures, as well as for fuel. The leaves, which are eaten by stock, have about the same composition as alfalfa hay. The pods, which grow in clusters of from 2 to 10, and are from 4 to 8 inches long, are slender, white or yellow, contain a number of small hard seeds, and are rich in sugar, on which account they are eagerly eaten by cattle, horses, and mules. When eaten without preparation, much of the nutritive value is lost, since the seeds are voided without being digested; but when gathered, dried, and ground, their value is greatly increased, since the nitrogenous beans are saved. Two forms of gum are produced by the mesquite tree. One, resembling gum arabic, exudes as small clear or amber-colored drops from the trunks. It makes an excellent mucilage, and has been employed in laundries and for confectionery. The other, obtained from wounds in the trunks, occurs in black, brittle, larger masses. It contains as much as 20 per cent. of tannin, and with some form of iron is used by the Mexicans as a black dyestuff. During the flowering period, which lasts for about two months, the trees are visited by bees for the abundant nectar, which makes a clear honey of very agreeable flavor. Mexicans make a cathartic by pounding the inner bark in water and adding salt to the mixture. A second species, *Prosopis pubescens,* is known as the screw bean or curly mesquite. It is a shrub or small tree growing in situations similar to the previous one. Its pods are spirally curled into close rigid cylinders. The uses of this species are very similar to those described above.

MESQUITE TREE.

MESS (OF. *mes,* Fr. *mets,* It. *messo, messa,* course at table, from Lat. *missus,* past part. of *mittere,* to send). A military and naval term originally signifying a dish or portion of food, but now used in the sense of a number or association of officers or men taking their meals together. The officers' mess of an army post in the United States Army can only be established, or have quarters assigned for such purpose, when a majority of its officers, who must be not less than three in number, unite in a mess. Whenever possible the enlisted men mess together by companies. An officer appointed by the post commander has charge of the general mess affairs, makes necessary purchases, and cares for the mess fund.

The system of messing, as regards the soldier, is practically the same throughout Europe, varying in comfort and food according to the country and army organization.

On board men-of-war the admiral messes alone or with the captain, if agreeable to both. The ward-room mess includes all ward-room officers. The junior officers (ensigns—if not in the ward room—naval cadets, pay clerks, etc.) have a separate mess room, as have also the warrant officers (boatswains, gunners, carpenters, warrant machinists, pharmacists). The enlisted force in most ships forms the 'general mess.' The men are divided into convenient units or messes, according to the size of the tables; the chief petty officers and those of the first class have their own tables, and when possible are granted special privileges in their messing arrangements. In ships on board which the 'general mess' system has not been established, the crew is divided into several messes, according to the number.

Each officers' mess is allotted a cook, steward, and servants, the number of the latter depending upon the number of officers in the mess. The servants (or *mess attendants,* as they are called) are not merely waiters and personal attendants, but in action they are ammunition passers.

MESSA DI VOCE, mĕs′sȧ dē vō′chȧ (It., setting of the voice). A term used in the art of singing, meaning the gradual swelling and again diminishing of the sound of the voice on a note of long duration.

MESSA′LA CORVI′NUS, MARCUS VALERIUS (c. 70 B.C.-c. 1 B.C.). A Roman soldier, orator, and patron of letters. He was educated in part at Athens, and, having returned to Rome after Cæsar's assassination and previous to the formation of the second triumvirate, became a member of the Senatorial Party. He was third in command of the Republican army at Philippi, and stormed the camp of Octavius, whom he almost captured. Having escaped, with a fairly well organized force, to the island of Thasos, he later accepted terms from Antony, against whom, however, at Actium, he brilliantly commanded the centre of Octavius's fleet, and whose abrogated consulship he filled (B.C. 31). Appointed proconsul of Aquitainia, he completed the reduction of that province and received a triumph. He was also at one time a prefect in Asia Minor, and became a special member of the College of Augurs. He was reckoned, with Gaius Asinius Pollio, the last orator of the old school. Consult Wiese, *De Corvini Vita et Studiis Doctrinæ* (Berlin, 1829).

MES′SALI′NA, VALERIA. The most infamous woman in the annals of the Roman Empire. She was the daughter of M. Valerius Messala Barbatus, and third wife of the Emperor Claudius, whom she married before his accession in A.D. 41. (See CLAUDIUS.) Taking advantage of the weakness and stupidity of the Emperor, she indulged in the most wanton and flagrant atrocities, both moral and political. If we are to judge by the Roman historians, her character was unspeakably vile, and her boundless ambition could be satisfied only with the destruction of all who seemed to thwart her plans. The best blood of Rome flowed at her pleasure. She retained her influence over the Emperor, who remained unaware of her infidelities; but when, during a short absence of Claudius from Rome, she actually committed the folly of going through the forms of a public marriage with C. Silius, a young man of whom she had become enamored, the affair was brought to the Emperor's attention by the freedman Narcissus, and Claudius, not without reluctance, gave orders for her death. She was killed by a tribune of the guards, A.D. 48.

MESSA′PIA (Lat., from Gk. Μεσσαπία). The name applied by the Greeks to Calabria (in the classical sense), a peninsula in the southeastern part of Italy, extending from Tarentum to the Iapygian Promontory. The Messapii, inhabitants of this part of the country, were known also as the Iapyges, or Iapygii.

MESSENE, mĕs-sē′nē (Lat., from Gk. Μεσσήνη). Capital of Messenia, in the Peloponnesus, founded by Epaminondas (B.C. 369). It was situated at the foot of Mount Ithome, and surrounded by a stone wall, 5½ miles long, and of great strength. It is still well preserved in places, especially at the Arcadian Gate, which is an exceptionally fine example of Greek fortification. The stadium, theatre, and other ruins can be easily traced, and excavations in 1895 by the Greek Archæological Society brought to light a fine colonnade and other remains of the ancient agora.

The town was settled by the descendants of the ancient Messenians, and was therefore the hereditary enemy of Sparta, contributing not a little to the continual internecine strife which marks the history of the Peloponnesus from the middle of the fourth century B.C. to the Roman conquest. The modern Messene, or Nisi, is some distance from the ancient site, which is partly occupied by the little village of Mavromati.

MESSE′NIA (Lat., from Gk. Μεσσηνία). A district in the southwest of the Peloponnesus, bounded on the east by Laconia, on the north by Arcadia and Elis, and on the south and west by the sea. It was composed chiefly of extensive plains, watered by the Pamisus and other streams. These plains were famous for their fertility, and particularly for their wheat harvests. At an early period, after the Doric conquest, it rose to power and opulence. Its chief cities were Methone and Pylos. In late times Messene was the capital. Messenia is chiefly noted for its two wars with Sparta, known as the Messenian wars, the first of which seems to have occurred in the eighth, the second (of which Aristomenes is represented as the hero) in the second half of the seventh century B.C., though our accounts of both rest on no satisfactory authorities. In both instances the Messenians were defeated, and after the second war a part of the population emigrated to Sicily. The peopling of Messana was much later. The remainder of the inhabitants were reduced to the position of helots. A revolt of the latter, who fortified themselves on Mount Ithome and held out for ten years, is known as the Third Messenian War (B.C. 464-455). The invasion of the Peloponnesus by Epaminondas in 370-369 led to the return of the Messenians to their land and the revival of their old State, which continued independent, though in alliance at times with the Macedonians, until the Roman conquest (B.C. 146). Messenia is the name of one of the nomarchies of the modern Kingdom of Greece.

MESSIAH (Gk. Μεσσίας, *Messias*, or Μεσίας, *Mesias*, from Aramaic *Meshīkha*, equivalent of Heb. *ham-Māshīakh*, the anointed). A title given to the King or Pontiff in ancient Israel because of his anointment as vice-gerent of the deity and ruler of the people; and in later times a designation of the expected deliverer from foreign oppression and founder of a world-wide Jewish empire. Saul (I. Sam. xii. 3, 5; xxiv. 7, 11). David (II. Sam. xix. 21; xxiii. 1), and Zedekiah (Lam. iv. 20) are spoken of as Yahweh's Anointed. In Isa. xlv. 1, Cyrus is regarded as Yahweh's vice-gerent on earth. During the Persian period some hold that the High Priest as head of the State was referred to as the Messiah, the Anointed One (Lev. iv. 3, 5, 16). The same custom, according to the same view, continued in the Greek period, as Joshua ben Jozadak is alluded to as the Anointed Prince in Dan. ix. 25, and Onias III. as an Anointed One in Dan. ix. 26. It is natural that the priest-kings of the Asmonæan family (see MACCABEES) should receive this title. Ps. xviii. 50; xx. 6; xxviii. 8; lxxxiv. 10; lxxxix. 39, 52 clearly refer to some of these rulers, though it is doubtful in some instances whether one of the actual kings, Aristobulus I. and Alexander Jannæus, or a princely pontiff like Jonathan, Simon, or John Hyrcanus is meant. From the critical point of view there is no reference in the Old Testament to a future deliverer of Israel described as the Messiah, and the conception of a coming Messiah meets us for the first time in the *Psalter of Solomon*, written soon after the conquest of Palestine by Pompey in B.C. 63.

But the elements out of which the Messiah as an eschatological magnitude was formed had long been in existence. There had been a tendency to attach much importance to the anointing of rulers. From Saul to Zedekiah, from Joshua to Aristobulus II., the leader of the State, whether king, pontiff, or priest-king, had been consecrated with oil. Originally unction was an application of sacrificial fat. The pouring of oil upon the stone in which the divinity dwelt was a sacrifice. The King was a holy being to whom this offering was made. With the anointing a spirit entered into him (I. Sam. xvi. 13); he was sacrosanct, his body must not be touched (I. Sam. xxiv. 10); he was gradually removed from the gaze of the people and seen only by his officials (II. Kings xix. 15). The pontiff as ruler of Israel was Yahweh's anointed, a 'son of oil' (Zech. iv. 14), having access to the celestial court (Zech. iii. 7). It is held by some that in the Asmonæan age the priest-king by virtue of his anointment was regarded as Yahweh's 'Son' and as a 'god' sitting on his throne (Ps. xlv., lvii., lxxxii.). It is not considered strange by those holding this view that a victorious king engaged as it seemed to his admirers in the conquest of the world should at that time have been addressed as 'god' by a court-poet (Ps. xlv. 6). There had also been a tendency to repose extraordinary faith in the dynasty founded by David. The reason for this may have been its remarkable longevity; perhaps also its promised prosperity. As long as princes of this family lived and received signal honors at the hands of Chaldæan and Persian kings, as was the case with Jehoiachin, Sheshbazzar, and Zerubbabel, the hope of national independence naturally connected itself with these shoots of the old stock. Thus the elevation of Jehoiachin from his dungeon to royal dignity in B.C. 561 and the birth of his son, Sinapaluzur (Sheshbazzar), seem according to some to have led a poet to express the hopes of Isaiah ix. 1-6, xi. 1-6, and the presence of Jehoiachin's grandson, Zerubbabel (q.v.), as Governor in Jerusalem at the beginning of the reign of Darius Hystaspis raised expectations of his restoring the old dynasty (Hag. ii. 23; Zech. viii. 8; iv. 6 sqq.; vi. 12). The gradual disappearance of prominent members of the Davidic family no doubt gave room for independent aspirations. Sanballat (q.v.) may have been right when he declared that prophets in Jerusalem had announced Nehemiah as the coming King (Neh. vi. 7). Simon became prince as well as high priest, and Aristobulus I. king, without belonging to the Davidic family. But the strength of the legitimist feeling may be seen both in the fiction by which the occupant of David's throne was designated as his son, and in the indignant protest of the Pharisees against this fiction. This loyalty to the legitimate line and the increasing difficulty of finding a leader who should also be a genuine descendant of David, necessarily removed into the future the *Messianic King*. Of great importance was also the tendency, always strong in Israel, to look beyond present conditions for better things to come. While the great prophets before the Exile announced impending judgment, there were always those who held up cheerful pictures of the future to the people. After the Exile, it was especially the author of Isaiah xl.-xlviii. who inspired hope and courage by his promises of good. He indeed did not look forward to a Messiah, but he did much to develop that apocalyptic mood out of which this figure was born. The same is true of the Book of Daniel, written about B.C. 165. It reveals a marked growth of the apocalyptic imagery, but it is contended by many that the Messiah holds as yet no place among its eschatological figures. The man-like being appearing on the cloud (ch. vii.) is probably Michael, the celestial representative of Israel. The Maccabean uprising and the establishment of a native dynasty encouraged this disposition to map out the future. But while Yahweh's anointed actually sat upon the throne of David and was conquering the neighboring nations, there was no reason for putting the Messiah in the future. The atmosphere of the Psalter is saturated with a desire for divine judgment upon the heathen nations and breathes a pathetic confidence in the dynasty occupying the Davidic throne. The enthusiasm seems to have been shared by the Egyptian Jews. Isaiah xix. 16-25 shows how the recognition of Jonathan by Alexander Balas on the occasion of his marriage to Cleopatra in B.C. 150 affected the Jewish colony at Leontopolis. (See ONIAS'S TEMPLE.) Jonathan is probably the deliverer of verse 20. In the *Sibylline Oracles* (iii. 652 sqq.) there seems to be a reference to Simon as a god-sent king who will put an end to evil war. From the standpoint of the Erythrean Sibyl, Simon may be said to be a king, sent 'from the sun,' even as Cyrus is called a king 'from heaven' (iii. 286). The passage was probably written in the time of Ptolemy IX., Euergetes II. (B.C. 145-117). Neither the apocalypse in Isaiah xxiv.-xxvii., written c.128 B.C., nor Ethiopic Enoch i.-xxxvi., written later in the reign of John Hyrcanus (B.C. 135-105), contains any allusion to a king, and Ethiopic Enoch xc. 37, 38 seems to be a late addition to the book lxxxiii.-xc., which apparently was written c.106 B.C. An elaborate eschatology had thus been developed before the Roman period in which the Messiah, according to this view, held no place. But the way was prepared by veneration for the anointed ruler of the State, loyalty to the old dynasty, and speculation about the world's future. Roman oppression caused a fusion of these elements. The anointed king that was needed must be a genuine son of David, and as no claimant to the throne of the legitimate line presented himself, he necessarily belonged to the future. The Roman yoke was all the more galling as the Jewish people had for a century indulged in a dream of empire and imagined itself in the midst of the actual conquest of the world. But even this cruel disenchantment could not quench the spark of ambition. The Pharisees saw the cause of the calamity in the Asmonæan usurpation of the throne of David, as the *Psalter of Solomon* shows, and looked to God to provide the genuine 'Son of David,' strengthening their faith by the prophetic word. They understood the Psalms of David to be songs indited by the great monarch, and naturally interpreted the language in which the actually reigning King had been referred to as prophecies of the coming Messiah. Similarly the words of ancient prophets originally referring to their contemporaries of the Davidic family or to the dynasty itself were explained as divine announcements of the coming deliverer. But in spite of this support in the popular exegesis of the Bible, the Messianic hope seems to have been cherished only in limited circles. Whether the idea was influenced at the outset by Mazdayasnian thought is doubtful; in its later development it may have borrowed some features from the Saoshyant (q.v.). This Persian Messiah has no political character. He was expected to raise the dead and to renew the world (*Yasht*, xix. 92 sqq.). The Messianic idea seems to have had little hold upon the Alexandrian Jews. It is not certain that the translators of Isaiah ix. 5 and Psalm cx. 3 had the Messiah in mind; in Numbers xxiv. 7 the Davidic house is meant, and the rendering of Genesis xlix. 10, 'he is the expectation of the nations,' is not likely to be original. It is doubtful whether *Sibylline Oracles* iii. 46-62, 75-92 belongs to the time of the First Triumvirate and Cleopatra, or to the time of Galba, Otho, and Vitellius; in the latter case the 'widow' is Rome, and the 'holy ruler' may be none else than the 'immortal God' and 'great king' mentioned in the same connection. The Book of Wisdom contains no allusion to the Messiah. Philo declares that the Israelites shall return to Palestine 'led by a divine or more than human apparition' (*De Execrationibus*. iii. 437), and that if the future kingdom of peace shall be disturbed a man will come, according to the promise, to subdue the nations, God granting to the pious auxiliaries in psychic power and physical strength (*De Præmiis et Pœnis*, ii. 421-428). But he seems to have thought of the divine glory and of deliverance through manly qualities rather than through a man. The *Slavonic Enoch* knows nothing of a Messiah. The same silence concerning this figure is found in such Palestinian works as Ecclesiastes, written c.30 B.C.; the *Assumption of Moses* (i.-vi.), written in the beginning of our era; the *Book of Jubilees;* and the original *Testaments of the Twelve Patriarchs.* It is held by many that aside from the *Psalter of Solomon* there is no unmistakable reference to the Messiah in any literary production that can be dated with certainty as earlier than the time of Jesus. But the description given in this work (xvii., xviii.) of the coming king shows with sufficient clearness that some men in Israel in the first century B.C. looked forward to the appearance of a descendant of David, who would be a conqueror of nations and a righteous ruler and whom they called the Messiah. According to Matthew xxii. 15, 16 (Mark xii. 13) there was a party of 'the Herodians.' Tertullian declares that 'the Herodians said Herod was the Christ' (*Præser.* 45). It is not improbable that the king who built the most splendid temple Jerusalem had ever had and restored the Davidic kingdom, even though it was by the favor of Rome, was thus looked upon as the promised Messiah by his courtiers. Judah of Gamala in Galilee seems to have been regarded as the Messiah by many and undertook an insurrection in A.D. 7. (See JUDAS OF GALILEE.) He was supported by Zadok, a disciple of Shammai. The immediate cause of the rebellion was the census of Quirinius on the accession of Archelaus. He was put to death, but his followers continued as a sect (Josephus, *Wars*, ii., 118).

Jesus of Nazareth was crucified by Pontius Pilate as a political criminal claiming, in defiance of the authority of Rome, to be 'King of the Jews.' It is believed by some that he never claimed himself to be the Messiah. The Synoptic Evangelists believed, indeed, that he was the Messiah. But this belief may have been based on his resurrection from the dead. For a time at any rate he avoided assuming any distinctive Messianic title, and on several occasions forbade his disciples to say that he was the Messiah. From their point of view they could explain this attitude only as a persistent attempt to keep his Messiahship a secret. This secret was known to God, who might in due time reveal it, and to the demons, who were punished for prematurely announcing it, but not to men. The disciples seem, however, to have regarded the term 'Son of Man' as a self-designation of Jesus by which he intended to hint at his Messianic claims without directly disclosing them. But this belief, it is argued, may have been erroneous, and so indefinite a term as 'man' cannot have been a Messianic title and is not found in Jewish literature as such. The life and teaching of Jesus offended all influential parties in the nation, while the enthusiasm and indiscretion of his disciples readily furnished immediate excuse for a false accusation. Pilate could scarcely avoid regarding him as a disturber of the peace, and executed him on the ground of the loose charge preferred against him. Similarly there is no evidence that John the Baptist regarded himself as the Messiah, though his disciples at a later time seem to have considered him as such.

It is only just, however, to state that from the traditional Jewish and Christian standpoint, the Messianic belief was imbedded in Hebrew history and interwoven with the deepest life of the people. The promises which formed and fed it are thought to reach back to the earliest Jewish annals and the belief itself is thought to rest upon sacred traditions coeval with the origin of the human race. According to this view the Messianic idea was inseparably connected with the provision for the redemption of man after the fall and was gradually unfolded through the history of the chosen people of God. The hope of a Messiah was centred in a single race. With the establishment of the kingdom came at once an enlargement of the conception of the Anointed One's person and work and a narrower limitation of the stock from which he was to spring. One family was selected from the chosen tribe and the 'sceptre' fell to the House of David. With the later development of the kingdom and the idolatrous faithlessness of the people came the clearer conception of Messianic teaching. The captivity completed the circle of Messianic hopes by turning the eyes of the people to the divine glory of the coming king and the universal extent of his kingdom. The son of David acquired the wider title of 'the Son of Man' and his kingdom appeared as the last, but mightiest, of the monarchies of the world.

According to this traditional view the evolution of the Messianic idea may be traced through four distinct epochs, three within the limits of the Hebrew canon and the fourth outside it. The *first* of these ends with Moses. In the protevangelium we have the primal promise. 'The seed of the woman' is to bruise the serpent's head. This promise takes shape in the family of Abraham, in whose seed all the nations of the earth are to be blessed. Saint Paul argues in Gal. iii. 16 that the 'seed' is a personal Messiah. His characteristics are gradually unfolded in the 'Shiloh' of the dying Jacob (Gen. xlix. 10), in the 'Star' of Balaam (Num. xxiv. 17) and the 'prophet' of Moses (Deut. xviii. 18, 19), who was to be the lawgiver, teacher, and deliverer of Israel. The *second* period centres in the reigns of David and Solomon; the promise of a kingdom to David and his house 'forever' could not be literally fulfilled by any mere continuation of his dynasty on an earthly throne. It implied a superhuman royalty of which we have a series of pictures in the Messianic psalms, which are believed to be pervaded with the expectation of a coming deliverer, based on definite promises of God and confirmed by His repeated assurances. In Ps. ii., xlv., lxxii., and cx., for instance, we have depicted not only the Messiah's inheritance and the blessings and extent of his kingdom, but the King himself reigning among men and bringing to his subjects righteous judgment, salvation, and redemption. He is both priest and king. He is David's Lord as well as his son. His empire is spiritual. Its rule is world-wide and time-embracing. He is to reign until his enemies become his footstool. These Psalms, as is widely contended, cannot be applied exclusively to Solomon or any temporal ruler without exegetical violence and the New Testament interpretation of the regal triumph over the rebellious heathen (Heb. i. 8) referred it to the anointed Saviour. The *third* period extends to the close of the Hebrew canon and includes, according to tradition, the richest mine of Messianic prophecy in the Old Testament. Messiah, as the 'servant of God,' is the central figure of Isaiah's prophecies. This expected king, this 'root of Jesse,' will 'stand for an ensign of the people.' He will be the rallying-point of the world's hopes, the true centre of its government (Isa. xi. 10). He is portrayed as 'the mighty God, the everlasting Father, the Prince of Peace' (Isa. ix.) The picture of the suffering Messiah in the fifty-third chapter is so accurate in its prophetic anticipations of the events in the judgment hall of Caiaphas and before Pilate's bar as to have given Isaiah the title of the 'Evangelical prophet.' Jeremiah depicts the future deliverer as a king executing judgment and justice in the earth (Jer. xxiii. 5) and Zechariah paints him as an enthroned priest (Zech. vi. 13). Daniel is taught that at the anointing of the most holy, God will 'make reconciliation for iniquity' and 'bring in everlasting righteousness' (Dan. ix. 24). In chapter vii. he applies, according to this view, to the coming Messiah the title 'Son of Man,' whose dominion is 'an everlasting dominion which shall not pass away.' Finally Malachi speaks of him as 'the angel of the covenant' whom Israel was seeking and who would 'suddenly come to his temple' (Mal. iii. 1). The *fourth* epoch extends from the close of the Hebrew canon to the beginning of the Gospel era. Among the Jews of Alexandria the Messianic hope at this time is supposed to have deteriorated, while among the Palestinian Jews it survived and flourished. The Hellenized peoples would naturally be absorbed in the current speculations regarding the Sophia and the Logos and long absence from Palestine, and a hesitancy to avow startling beliefs among unfriendly critics would tend to quench all interest in the future of Jewish nationality. Nevertheless the expectation of a Messiah was a prominent feature of both the popular and the intellectual mind at the beginning of the Christian Era. The Galilean peasantry and the Pharisees alike expected the fulfillment of the national hopes. An oppressed and suffering people naturally looked for a secular prince who would free them from the heathen yoke, and when Jesus entered upon his public ministry, Messiahship meant to the masses and the classes of Jewry simply emancipation from Roman rule. But Jesus did not lend himself to this narrow and perverted type of Messiahship. He claimed to be the divine Messiah of David and Isaiah. At Cæsarea Philippi (Matt. xvi.; Mark viii., Luke ix.) he clearly accepted the recognition of himself as the Messiah-King of the Old Testament. The term 'Christ' or Anointed is synonymous with Messiah, and Saint Peter's confession "Thou art Christ—the Christ of God (Luke), the Son of the living God (Matt.)" expresses in unmistakable language the supernaturally imparted recognition of Jesus as the Messiah. The same designation of him was used by the Samaritan woman (John iv. 25, 26) and accepted by Jesus, and Andrew said to his brother Simon: "We have found the Messiah (which is being interpreted) the Christ" (John i. 41 sqq.).

According to the traditional view, the title 'Son of Man' was the Christ's self-chosen designation of himself, and with two exceptions was applied to him by his own lips. To Jewish ears it is thought to have been a clear assertion of Messiahship. Some suppose that in consequence of the prophecy of Daniel it became a popular and official title of the Messiah. In one part of the Book of Enoch (q.v.), which, however, is of uncertain date, the judgment day of Messiah, identified with Daniel's 'Son of Man,' stands in the forefront of the eschatological picture. Jesus, when standing at the tribunal of Caiaphas, said to his judges: "Hereafter shall ye see the son of man sitting at the right hand of power and coming in the clouds of heaven" (Matt. xxvi. 64), and he uttered a similar prediction in his prophecy over Jerusalem (Matt. xxiv. 30). Those who accept the genuineness of these sayings think that it was no merely generic title, but the constant setting forth of his Messianic claims and that, coupled as it was with his repeated assertions of his divine origin, it brought down upon him the wrath of the scribes and Pharisees. The Sanhedrin, the highest court of Jewry, condemned him because he claimed divinity. "We have a law and by our law he ought to die because he made himself the son of God," said the members of this court to the Roman Governor. "He hath spoken blasphemy," cried the High Priest (Matt. xxvi. 63). This was the culmination of the Nazarene's offense against the current conceptions of Messiahship. "They all condemned him to be guilty of death." But having lost the power of capital punishment, in their subjection to the Roman Government, the Jews had to go to Pontius Pilate to attain their ends, and Jesus was crucified by order of the Governor.

It should also be stated that between the critical estimate first given and the traditional interpretation just outlined many scholars have assumed a mediating position, rejecting the bulk of supposed Messianic prophecy and the accuracy of the New Testament interpretation of it, while still maintaining that Jesus regarded himself as the Messiah and gave to the Messiahship as to the kingdom a more spiritual significance.

In A.D. 37 a Samaritan appeared as a leader of a rebellion in Tirathana. Precisely what claims he made for himself is not clear from the account of Josephus (*Ant.* xviii. 85 sqq.). There are many indications that after this time a more transcendental character was given to the Messianic conception, not only among the Jews who looked forward to a return of Jesus as the Messiah, but also in other circles of Jewry. Theudas, who announced himself as the Messiah in the reign of Claudius, did not depend upon military strength or political diplomacy, but looked for a miraculous establishment by God of the Kingdom of Israel in place of the Roman Empire. He was beheaded by Cuspius Fadus in A.D. 46 (Josephus, *Ant.* xx. 97 sqq.). The Egyptian (c.58 A.D.) mentioned by Josephus (*Ant.* xx. 169 sqq.) probably only claimed to be what the historian calls him—a prophet. But Menahem, son of Judah, the Galilean, who appeared during the siege of Jerusalem, led the attack upon the Roman garrison clothed in royal garments, and fell a victim of his Messianic pride and arbitrariness. An apocalyptic fragment of Jewish origin, preserved in Revelation xi. 1, 2, xii., sets forth figuratively how the Messiah has already been born, but is hidden secure against Roman persecution, to appear in due time. This idea that the Messiah has been born in the Jewish community, but has already as a child been translated, is similar to the conception found in the Babylonian Talmud (*Sanhedrin*, 98 b), where the Messiah is a deceased descendant of David who rises from the dead to accomplish the delivery of Israel. Both of these notions were due to the conviction that God would provide a genuine son of David. A translated hero would naturally return on the clouds of heaven. Thus in the *Apocalypse of Baruch*, written after the fall of Jerusalem, the Messiah is 'revealed' (xxix. 3; xxxix. 7), and 'returns in glory' (xxx. 1) to rule until the world of corruption is at an end (xl. 3), sparing some and putting others to death (lxxii. 2-6). In the *Apocalypse of Ezra*, written in A.D. 97, the Messiah is to be revealed during four hundred years and then die together with all men, whereupon the present age will end and a new world begin, after seven days of silence, with the resurrection of the dead and the appearance of the Most High on the judgment seat (vii. 28 sqq.). The woman that brings forth a child, as in Revelation xii., loses him when she is about to give him a wife and flees into the wilderness (ix. 43 sqq.). The lion rebuking the eagle is said to be the Messiah who has been preserved for the end from the seed of David (xii. 3 sqq.). Finally the manlike or angelic being that rises from the sea and flies with the clouds of heaven, destroying an army with the fire proceeding from his mouth, is declared to be the Messiah (xiii.). In spite of the marked influence of Jewish-Christian thought, the emphasis is strongly put upon the assertion that God is not to judge His creation through any one (v. 56, vi. 6). It is possible, however, that even this step was taken by the Jewish interpolator of the hortatory addresses of Enoch (*Ethiopic Enoch*, 37-71. (On the composite character of this section of the book, consult Schmidt, article "Enoch," in the *Jewish Encyclopædia*.) In the original vision God alone is the judge, and there is no Messiah; but the book seems to have been annotated and expanded by a writer who looked forward to the revelation of a chosen instrument, not merely for the punishment of the nations, but for the judgment of the world—a man destined to sit upon a glorious throne to judge angels and men (xlv. 3, 4; xlvi.; li.; liii. 6; lv. 4; lxi. 8, 9). This picture has finally been retouched by a Christian hand. The Aramaic original is lost, but even the Ethiopic translation renders it possible to distinguish between the early passages, where a *bar nasha* in the generic sense of 'man' occurred, and the places where the Christian title has been subsequently introduced. The Jewish expansion probably took place in the reign of Domitian. After this a reaction against the transcendental Messianic idea set in. This was developed in Christianity as it separated itself from Judaism. The Messianic idea became fused with metaphysical speculation of Greek origin to such an extent that ὁ χριστός, 'the anointed one,' the etymological equivalent of 'the Messiah,' finally conveyed a meaning absolutely foreign to the original conception.

The figure of Simon bar Kozeba (or Bar-Cochba was probably as close a realization of the popular Jewish ideal of a Messiah as history ever produced. Of him alone can it be said that he was not only recognized by his people as the Messiah at a time when the Messianic idea had reached its full development and regarded himself as such, but also succeeded temporarily in redeeming Jerusalem from foreign oppression. In less than a year he conquered 50 fortified cities and 945 towns and villages. His army consisted of 200,000 men. For two years and a half he reigned as king. Only after 52 battles could Julius Severus vanquish him in A.D. 135. There is something sublime in this King of Zion bidding Imperial Rome defiance. The terrible persecutions that followed the Hadrianic insurrection did not quench the Messianic hope. This is shown by the "Eighteen Prayers" by Trypho, who told Justin Martyr that all Jews believed the Messiah would come, a man born of men; and by Celsus, who in A.D. 178 no doubt correctly represented his Jew as cherishing this expectation. The Targums also indicate its continuance. The idea of a Messiah ben Joseph who is to rule until Messiah ben David comes may be an early Jewish concession to the Ebionitish Christians who believed that Jesus was the son of Joseph. Only in late writings is there any reference to a suffering Messiah, though the notion of sufferings of Israel previous to the establishment of the Messianic kingdom is common. The end of the Roman Empire and the victories of the Mohammedans naturally stirred afresh the hope of a return to Palestine and the coming of the Messiah. In 716-721 Serenus, a Galilean, appeared as a Messianic reformer, after the fashion of Mohammed, rejecting certain Rabbinic regulations as to food and marriage and gaining many followers. But when he was brought to task by Yezid, the Caliph, he lacked the courage of his convictions, and was handed over to the Jewish authorities for punishment. From 745 to 755 Abu Isa exercised a great influence as a reformer, abolishing the law of divorce and the sacrificial cult, and maintaining himself with a large army against Merwan II. and Abdallah. After his death he had followers into the tenth century. Yudghan of Hamadan, on the other hand, pursued no political ends. He sought only to reform Judaism, being an ascetic and a believer in the transmigration of souls and the allegorical interpretation of the Bible. He died c.800 A.D., though his followers believed him to be still living and destined to return in the appointed time. In 1160 David Alrui, of Amadia, Persia, proclaimed himself to be the Messiah in Azerbaijan. His plan was to use the weakness of the caliphate for the establishment of a free Jewish State, and he attracted to himself large masses of Jews; but he was murdered by his father-in-law before he could carry out his vast enterprise. A Messianic cult-community, the Menahemites, cherished long his memory and ideal. Abraham ben Samuel Abulafia, of Saragossa, announced himself as the Messiah in 1280. He was a mystic, and occupied himself much with cabbalistic speculations. The expulsion of the Jews from Spain drove many earnest minds to the prophetic writings. Even such a statesman as Isaac Abarbanel wrote works in which he announced that 1503 would be the year of redemption. In the sixteenth century David Reubeni and Solomon Molko appeared in the rôle of the Messiah. The former pretended to be the brother of a prince reigning in Arabia, and was received with great honor by Pope Clement VII. The latter, born in 1500, was a Christian who became a convert to Judaism and seems to have sincerely believed in his mission. He is said to have prophesied accurately the inundation of Rome in 1530 and the earthquake in Portugal in 1531, and thereby gained a great reputation. He was saved from death in Rome by Clement VII. substituting another man for him, but suffered martyrdom courageously in 1532. His followers long believed that he had escaped death this time also. The most important Messiah after Solomon Molko was Sabbathai Zewi (1626-76). He was born in Smyrna, and belonged to a family of Spanish Jews. His brother was the agent in Smyrna of an English mercantile house, and through him Sabbathai became acquainted with the speculations of Christian pietists who expected the second advent of Christ in 1666. He was an eager student of cabbalistic works. His personality was very attractive, and in all lands Jews were drawn to him and accepted him as their heaven-sent leader. The enthusiasm was boundless, and the hope of a return to Palestine filled thousands of hearts. Sabbathai intended to abrogate the law, establish a new code based on the Cabbala, introduce the doctrine of a Trinity consisting of three persons—the Ancient of Days, the Messiah, and the female Shechinah. In the year 1666, however, he was ordered to appear before the Turkish authorities at Constantinople. Here he finally abandoned the Jewish faith and became a Moslem. The disenchantment was great, but a sect of Sabbatians continued to honor him as the Messiah. It is obvious that the Messiahs of Judaism have sometimes been mystics, obeying what seemed to them a divine call, sometimes political leaders taking up a heroic struggle for liberty, sometimes men of personal ambition and unscrupulous methods. But Jews, Christians, and Mohammedans owe much moral vigor and spiritual uplift to the Messianic hope.

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MESSIAH, THE. (1) A poem by Alexander Pope, which appeared in the *Spectator*, May 14, 1712. It is a sacred eclogue, imitating Vergil's *Pollio*. (2) An epic poem by Klopstock (q.v.). (3) An oratorio by Handel, composed in 1741, and given first in Dublin, April 13, 1742, in aid of charity. The words were arranged by Handel's friend Charles Jennens, and this ever-popular masterpiece may be described as a musical counterpart of Milton's *Paradise Lost*.

MESSIDOR, mĕs'sē'dôr' (Fr., from Lat. *messis*, harvest + Gk. δῶρον, *dōron*, gift). The tenth month of the French Revolutionary Calendar, beginning on June 19th in years one to seven, and on June 20th in years eight to thirteen.

MESSINA, mĕs-sē'nȧ (anciently *Messana*). The capital of the Province of Messina, and, after Palermo, the most important city of Sicily. It is in the northeast corner of the island, on the Strait of Messina, 59 miles by rail northeast of Catania (Map: Italy, K 9). It is situated between a sickle-shaped harbor on the east, with its two sightly lighthouses, and a chain of abrupt conical peaks on the west, rising to a height of 3700 feet. The climate is very even. The mean temperature is 66° F. Messina is substantially built, is fortified, and has some fine lava-paved thoroughfares, which afford views of the bay and of Calabria across the strait. The city itself has no very famous attractions for sightseers, having retained few of its striking antiquities, owing to a rather calamitous career. It has suffered especially from earthquakes. The most interesting structure is the cathedral, dating from Norman times (1098). Little of the original edifice, however, remains; it is a mixture of different architectural periods.

Among the leading secular edifices are the municipal palace, completed in 1829, and the Villa Rocca Guelfonia, with Norman remains. The museum in the Convent of San Gregorio contains a few paintings, some marbles and other antiquities, and a collection of majolica vases. The fish of the neighboring waters are highly esteemed, as well as the Mamertine wines of the district. The manufacturing interests are not extensive. The chief products are hardware, silk, muslin, and linen. Messina has some fame for satins and damasks. The commerce is important, though not as great as formerly. The harbor is very busy at all times. Silk, oil, wine, coral, fruit essences, argol, oranges, lemons, and other articles are dealt in. The town ranks fourth among Italian cities in the volume of its commerce, the total tonnage entered and cleared in 1900 being over 3,300,000. The imports were about $4,000,000, the exports $10,000,000. There is direct steamship communication with Naples and Marseilles. The university, opened in 1538, is attended by some 600 students. There is also a technical institute in the city. The municipal hospital is a vast structure built prior to 1600. Messina is the seat of an archbishop. Population (commune), in 1901, 149,778.

The outskirts and environs are delightful, affording magnificent views of the sea as well as of Mount Etna. On the west rises the former fort of Castellaccio, and not far away to the south is Fort Gonzaga, on a historic spot. The new Campo Santo is beautiful, with its graceful Greek colonnades and wonderful views. The Telégrafo—the summit of a pass near Messina—is much visited for its scenery. Here was supposed to be the Charybdis of the familiar legend, opposite Scilla, on the Calabrian coast.

History. Messina is a town of great antiquity, its foundation being ascribed to pirates from Cumæ in the eighth century B.C., when it was known as Zancle (a sickle), in allusion to the shape of its harbor. At the end of the fifth century B.C. the town was occupied by fugitives from Samos and Miletus, and it soon after passed to Anaxilas, the tyrant of Rhegium, who introduced there Messenians from the Peloponnesus, by whom the name of the city was changed to Messana. After the death of Anaxilas, Messana became a republic, and maintained that status until its destruction by the Carthaginians during their wars with Dionysius of Syracuse at the beginning of the fourth century B.C. It was rebuilt by Dionysius, but soon fell again into the hands of the Carthaginians, who were finally expelled by Timoleon in B.C. 343. During the war between Agathocles of Syracuse and Carthage, Messana sided with the Carthaginians. The First Punic War left Messana in the possession of Rome, and the town subsequently attained considerable commercial importance. In A.D. 831 the town was taken by the Saracens, and in 1061 was conquered by the Normans. The town became a flourishing seat of trade in the Middle Ages, and received important privileges from Charles I. of Spain, which added greatly to its prosperity. During the struggle between the aristocratic faction, or Merli, and the democratic faction, or Mavizzi, the Senate, in 1674, appealed for aid to the French, who occupied the city, but soon abandoned it, after having defeated the combined fleet of Spain and Holland. Left in the hands of the Spaniards, the city was deprived of its political liberties, and soon lost its commercial importance. The plague of 1743 and the earthquake of 1783 carried off a considerable part of its population. In 1860 the place was occupied by Garibaldi, and in 1861 became a part of united Italy.

MESSINA, Strait of (It. *Faro di Messina*, Lat. *Mamertinum fretum*). The channel separating Sicily from the southern point of Italy, and connecting the Ionian with the Tyrrhenian Sea. It is 24 miles in length, and from 2 to 12 miles in breadth. Regular tidal currents run through the strait, which is of great depth, in some places exceeding 4000 feet. See Scilla and Charybdis.

MESSMATES, Animal. See Commensalism.

MESSUAGE. A legal term employed in conveyancing as substantially equivalent to the phrase 'dwelling house and appurtenances,' and most commonly construed as meaning the curtilage, court-yard, and an orchard, if there is one. See Appurtenance; Curtilage.

MESTIZO, mĕs-tē′zō (Sp., mongrel, from Lat. *mixtus*, past part. of *miscere*, to mix). The ordinary term in use in Spanish American countries to denote the offspring of white and Indian parentage, and usually understood to mean the offspring of a white father by an Indian mother. The equivalent term in French Canada is *metis*, and in the United States half-breed. The offspring of an Indian and a *mestizo* is called *mestizo-claro*, of a negro and mestizo a *mulato-oscuro*, of a mulatto and mestizo a *chino*.

MES′TOME (from Gk. *μέστωμα*, *mestōma*, fullness, from *μεστός*, *mestos*, full). The conducting portion (hadrome and leptome) of a vascular bundle. The term does not include the bast fibres, libriform cells, or pericycle.

MESTRE, mĕs′trȧ. A town of Northern Italy, in the Province of Venice, five miles northwest of the city of Venice, on the border of a lagoon (Map: Italy, G 2). It is connected with Venice, Padua, and other places by railway. There are many villas around the town and along the road to Padua. Mestre has a considerable transit trade. There are manufactures of machinery. Population (commune), in 1901, 11,680, including Malghera.

MESTU′RUS (Neo-Lat., from Gk. *μεστός*, *mestos*, full + *οὐρά*, *oura*, tail). A fossil actinopterygian fish of the family Pycnodontidæ, found in the Jurassic rocks of Europe. The body was flat and high, and was covered with rhombic ganoid scales that are most peculiar in being united to each other by jagged sutures. The mouth is small and provided with powerful grinding teeth on the palate and sharp cutting teeth in the jaws. See Fish; Ganoidei.

MÉSZÁROS, mā′sä-rōsh, Lázár (1796-1858). A Hungarian patriot. He was born at Baja, studied theology and law, and in 1813 joined the Hungarian army in the campaign against Napoleon. He was colonel of a Hussar regiment in 1848, when Batthyányi called him to be Minister of War in his Cabinet. In the same year Mészáros took command of an expedition against the Rascians in his native county of Bács. This proved a complete failure, and in January, 1849, his army was defeated with great loss before Kaschau. For a brief time he was nominally commander-in-chief of the Hungarian forces, and shared with Dembinski in the defeats at Szöreg and Temesvár. He then fled to Turkey. After residing for some years in England, France, and the island of Jersey, Mészáros emigrated to the United States. He died at Eywood, Herefordshire, England, on his way to Switzerland.

META, mā′tȧ. One of the principal tributaries of the Orinoco. It rises in the Eastern Cordillera of the Colombian Andes, near Bogotá, and flows in a northeasterly direction to its junction with the Orinoco, on the boundary between Colombia and Venezuela (Map: Colombia, D 2). Its length is about 700 miles, for the greater part of which it is navigable for small steamers, though its channel is filled with numerous islands.

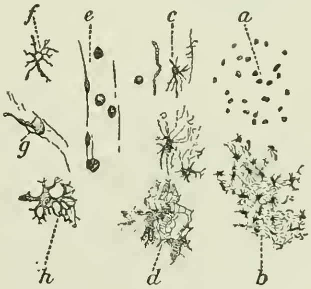
METABETCHOUAN, mĕt′á-bĕt-chōō-än′. The principal southern affluent of Lake Saint John (q.v.), Canada. It is 90 miles long and near its mouth occur its fine falls 236 feet high.

METAB′OLISM (from Gk. *μεταβολή*, *metabolē*, change, from *μεταβάλλειν*, *metaballein*, to change, from *μετά*, *meta*, beyond + *βάλλειν*, *ballein*, to throw). The continual molecular or physico-chemical changes taking place in the protoplasm of organisms, during growth and throughout life. Upon it the life-processes rest. Verworn says that it is solely a process that distinguishes the living organisms from the dead organism, and not from inorganic substance; it occurs also among inorganic bodies. Verworn defines it as the thing in which the living organism differs from the lifeless, and says that it consists in the continual self-decomposition of living substance, the giving off to the outside of the decomposition-products, and, in return, the taking in from the outside of certain substances, which give to the organism the material with which to regenerate itself and grow by the formation of similar groups of atoms, i.e. by 'polymerization.' This is characteristic of all living substance. During the process of metabolism the living cell-substance is being continually broken down and reformed by the continual giving off and taking in of material. The metabolism of living substance, says Verworn, upon which all life is based, is conditioned by the existence of certain very labile compounds, which stand next to the proteids and on account of their elementary significance in life are best termed 'biogens.' Their continual decomposition and reformation constitute the life-process.

In plant physiology the term metabolism is used in essentially the same sense as in animal physiology. Two series of processes are distinguishable: (1) Processes which result in the upbuilding of complex substances, particularly such as contain a greater amount of potential energy than the ones from which they are constructed. These processes are designated as 'constructive' metabolism or 'anabolism.' (2) Processes which result in the decomposition of complex substances into simpler ones, designated as 'destructive' metabolism or 'katabolism.' Special discussions of metabolic processes will be found under the following heads: ASSIMILATION; DIGESTION IN PLANTS; FERMENTATION; NUTRITION; PHOTOSYNTHESIS; RESPIRATION. Consult Verworn, *General Physiology: An Outline of the Science of Life* (New York, 1899).

METACENTRE (from Gk. *μετά*, *meta*, after + *κέντρον*, *kentron*, centre). It is shown in hydrostatics that a floating body is acted on by two equal forces in opposite directions; one, vertically down through the centre of gravity of the body itself; the other, vertically up through the centre of gravity of the volume which was occupied by the liquid now displaced by the body. If the body is at rest, these two forces must lie in the same vertical line; but the question of the stability of this equilibrium depends upon what happens when the floating body is tipped slightly. If the forces bring it back to its former position, the equilibrium is stable; if they make it tip still farther, the equilibrium is unstable. Imagine a line drawn in the floating body so as to pass through the centres of gravity of the body and of the displaced liquid, when the body is in equilibrium; this line is called the 'axis.' Now imagine the body tipped slightly, thus making the axis inclined to the vertical; the line of action of the vertical upward force will intersect this line at a point called the 'metacentre.' If the metacentre lies above the centre of gravity of the body, the two forces will form a couple tending to restore the body to its former position, where the equilibrium was stable. If, on the other hand, the metacentre is below the centre of gravity of the body, the forces form a couple tending to tip the body farther, and so the equilibrium was unstable. An elongated floating body like a ship has a *transverse* metacentre and a *longitudinal* metacentre. The former is the one most commonly considered. The metacentric height is the vertical distance between the centre of gravity and the metacentre. It is evident that this must always be a positive quantity; for if the centre of gravity were above the metacentre there would be no force tending to keep the vessel upright and it would capsize. See SHIPBUILDING.

MET′ACHRO′SIS (from Gk. *μεταχρωννύναι*, *metachrōnnynai*, to change color, from *μετά*, *meta*, after + *χρωννύναι*, *chrōnnynai*, *χρώζειν*, *chrōzein*, to color, from *χρῶσις*, *chrōsis*, color, from *χροιά*, *chroia*, *χρόα*, *chroa*, skin, color). Color-change, as that of the chameleon, in adaptation to surroundings, and due to changes in the size of the pigment-cells of the inner layer of the skin. These specialized pigment-cells are called 'chromatophores,' and the remarkable changes in the color of the skin of the chameleon, of the tree-toad, the squid, etc., depend on the distribution of these pigment-cells, which dilate (becoming highly ramified) and contract under certain kinds of irritation. The pigment (q.v.) varies in color in different species and in different parts of the body, being black, brown, yellow, and sometimes even red or green. In the goby Heincke found that the chromatophores which are yellow or greenish-yellow when distended become orange-colored when contracted, while the orange or red ones when shrunk become brown or even black; and he detected in the goby a special kind of chromatophores which were filled with iridescent crystals of marvelous deli-

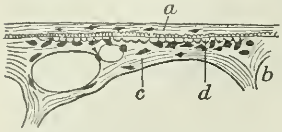


CHROMATOPHORES OF A FROG.

a, Wholly contracted; *b*, *c*, half relaxed; *d*, wholly relaxed; *e*, wholly contracted (a capillary vessel); *f*, *g*, *h*, expanded color-cells.

cacy, appearing when dilated as specks of metallic sheen.

These changes may be due to the direct influence of the stimulus of light, or indirectly through the eyesight. Semper says that Lister demonstrated as long ago as 1858 that the activity of the chromatophores depends solely on the healthy condition of the eye. As soon as the eyes are destroyed or the optic nerve is divided, the chromatophores do not function. He was confirmed in this view by Pouchet's experiments on fishes and crabs, showing that the chromatophores lost their power of contraction if the two sympathetic nerves were destroyed at the root.



SECTION OF A FROG'S SKIN.

a, Epidermis; *b*, cutis, with black, star-shaped, deep-seated cells; *c*, *d*, yellow pigment cells in a thick, single layer close under the epidermis.

Heincke's observations in some respects contradict those of Pouchet. Biedemann (1892), on the other hand, has claimed that the color-cells change their shape owing to the direct action of the light and of temperature. He shows that the slightest change of temperature affects the mutual disposition of the pigment-cells, and consequently the color, of the frog. It is enough to keep the animal in the hand to provoke a contraction of its black cells. The amount of blood-supply also has a definite effect. Steinach also (1891) has proved that light acts as a direct stimulus. Biedemann therefore appears to have proved that the chief agency of changes of color is not in the sensations derived from the eyes, but in those derived from the skin.

It is well known that the under side of flatfish is white or colorless. This is due to absence there of pigment-cells. These, however, are present in very young flounders, but as they grow unsymmetrical the fish turns the left side upward, and the chromatophores disappear from the right or under side. Cunningham experimented with young flounders by placing a mirror below the aquarium at an angle of 45°, and cut off the light from above. In the larger number of specimens thus treated, after several months, more or less of the skin of the lower side was pigmented. He thus proved that the absence of pigment on that side in the normal fish is due to its position in shadow. It thus appears that the absence of the pigment or of color is due to the absence of light, a mechanical or physical cause.

BIBLIOGRAPHY. Semper, *Animal Life as Affected by the Natural Conditions of Existence* (New York, 1881); Biedemann, "Ueber den Farbenwechsel der Frösche," in *Archiv für die gesammte Physiologie*, vol. li. (Bonn, 1892); Gadow, *Amphibia and Reptiles* (London and New York, 1902).

MET'AGEN'ESIS. See ALTERNATION OF GENERATIONS.

MET'AKINE'SIS (Gk. *μετακίνησις*, transposition, from *μετακινεῖν*, *metakinein*, to transpose, from *μετά*, *meta*, after + *κινεῖν*, *kinein*, to move). A term suggested by Jaekel to express the results of cenogenetic modification, since the process involves a thoroughgoing modification of a form in a way impossible in the adult, and only possible in a larval or early stage, in which the various organs are not yet specialized and are still more or less plastic. Consult Jaekel, *Ueber verschiedene wege phylogenetischer Entwickelung* (Jena, 1902; reviewed in *Science*, vol. xvii. p. 380, New York, 1903). Compare PALINGENESIS.

METAL. In heraldry, one of the three classes of tinctures, the others being colors and furs. See HERALDRY.

METAL-CASTING. See FOUNDING.

METAL'DEHYDE. See ALDEHYDE.

METALLIC PAINT. See MINERAL PAINT.

MET'ALLUR'GY (from Gk. *μεταλλουργός*, *metalloargos*, metal-working, from *μέταλλον*, *metallon*, metal, mine + *ἔργον*, *ergon*, work). That branch of applied science which has for its object the preparation of metals from their ores. The operations of metallurgy are partly mechanical and partly chemical. The mechanical operations of metallurgy are fully described under ORE-DRESSING, and the chemical operations, which differ in detail for each metal, are described in the articles on the various metals. Briefly stated, ore-dressing consists in separating the valuable ore or mineral from some of the barren rock with which it is mixed upon coming from the mines and in otherwise rendering it by mechanical means, such as crushing, sorting, and washing, better fitted for the smelting or other operations of extraction which follow. The processes of extraction may be separated into: (1) Smelting processes, in which the metal is extracted from its ore by fire; (2) amalgamation processes, in which the metal forms an amalgam with mercury, the mercury being afterwards distilled off, leaving the metal; (3) extraction by aqueous solutions, in which the metal is dissolved by suitable chemical solutions and then precipitated in solid form by suitable precipitants; (4) electrolytic processes, in which the metal is separated from its impurities by electrolysis. Two or more of these processes are often combined in the metallurgy of a single metal. See ALUMINIUM; COPPER; GOLD; IRON AND STEEL; LEAD; NICKEL; PLATINUM; MERCURY; SILVER; TIN; ZINC; etc.

METALS AND METALLOIDS. See PERIODIC LAW.

METAL TRADES ASSOCIATION, THE NATIONAL. An association composed of about 200 firms in the metal trades, organized in August, 1899, for the purpose of resisting what the association regards as the excessive demands of labor organizations. The declaration of principles disavows "any intention to interfere with the proper functions of labor organizations," announces that "no discrimination will be made against any man because of his membership in any society or organization," indorses arbitration, but asserts that the following questions must be decided by the employer alone: (1) the selection or rejection of workmen for the performance of particular tasks; (2) the number of apprentices, helpers, and handy men to be employed; (3) the method of wage payment, whether by time, piece, contract, or premium rate. The association further declares that its members will not arbitrate any question after employees have gone on a strike; neither will the association countenance a lockout on any arbitrable question, unless arbitration has failed.

METAL WORK. A term usually applied to artistic work in metal. The metals generally used for this purpose are gold, silver, copper, iron, and lead, and the principal methods of treatment employed are casting and repoussé. (For a description of these processes, see FOUNDING and REPOUSSÉ.) By reason of its scarcity and value, gold has been generally used in the fine arts for small objects of luxury and adornment, although the Greeks frequently used it, in connection with ivory, for statues of great sanctity. (See GOLDSMITH'S WORK; JEWELRY.) The use of silver is also thus limited, though to a less extent. Although copper in a pure state was used for ecclesiastical ornaments from the twelfth to the fifteenth century, its chief use has always been as an alloy with tin in the form of bronze. In this form it is the metal most used in the fine arts, being more used than any other material except marble, both in statuary and relief. This is due to the fact that its high fluidity when melted, its slight contraction upon cooling, and its hardness render it peculiarly adapted for casting. (See BRONZE.) Brass, an alloy of copper and zinc, was also used during the Middle Ages for sepulchral slabs, the image being engraved upon the brass plate. (See BRASSES, SEPULCHRAL.) By reason of its great contraction upon cooling, iron is less adapted to casting; but its extreme malleability and adhesive qualities when heated render it easy to forge under the stroke of the hammer. From the thirteenth century to the eighteenth it was extensively used with high artistic success for screens, gates, and the like, though the attempted revival in our day cannot be pronounced equally successful. (See WROUGHT IRON.) Steel is also extensively used in the beautiful inlay work of Oriental nations. See DAMASKEENING; INLAY WORK; INDIAN ART.

BIBLIOGRAPHY. The authorities on the technique and history of the special kinds of metal work will be found under the titles cited above. Among the special manuals on the subject, which have been written at different periods, are: The treatise of the Monk Theophilus, "Diversarum Artium Schedula" (twelfth century), published in *Quellenschriften für Kunstgeschichte, VII.* (Vienna, 1877); Cellini, *Trattati dell' orficeria e della scultura*, ed. Milanesi (Florence, 1856); Vasari, *Tre arti del disegno*, pt. ii., ed. Milanesi (ib., 1882); Garnier, *Manuel du ciseleur* (Paris, 1859); Codron, *Travail des metaux dans les ateliers de construction mécanique* (ib., 1901); Haas, *Der Metallarbeiter* (Landeshut, Schlesien, 1902); *Lexicon der Metaltechnik* (Vienna, 1900).

METAL-WORKING MACHINERY. The number and variety of metal-working machines are very large, the term comprehending practically all machines by which metals are wrought into useful shapes. For ordinary purposes metal-working machines may be divided into the following classes: Planing machinery or planers; turning machinery or lathes; boring machinery or drills; punching machinery or punches; milling machines; shearing machines or shears; riveting machinery or riveters; presses; bending machinery; saws; and special machinery.

PLANING MACHINES. Planing machines or planers are employed for working metal surfaces to accurate planes by cutting off the projections by the planing or cutting action of a suitable tool, past which the work reciprocates or revolves in a fixed plane. One of the most common forms of planing machines is shown by the illustration. (Fig. 3, Plate of METAL-WORKING MACHINERY.) The tool is carried by a tool head having a sliding motion on a cross-bar which can be moved up or down on two vertical guides. The table which carries the work clamped to it slides back and forth between the two vertical guides, and thus brings the work against the tool, which takes off a narrow, thin shaving of metal. By a succession of such shavings following each other like the furrows of a plowed field, a plane surface is secured. Machines of this character are built in various sizes, some of them having tables 21 feet long and 7 feet wide. In rotary planers the work has a rotary motion with respect to the tool instead of a rectilinear motion. Planes for smoothing the edges of metal plates usually have the work clamped fast while the tool is carried along the edge taking off a thin shaving. Power is usually supplied to planing machines from shafting by means of belt transmission, and the rotary motion of the belt is transformed into the reciprocating motion of the table by means of gearing. When in operation the motion of the table and the motion of the tool head necessary to produce successive cuts are automatic.

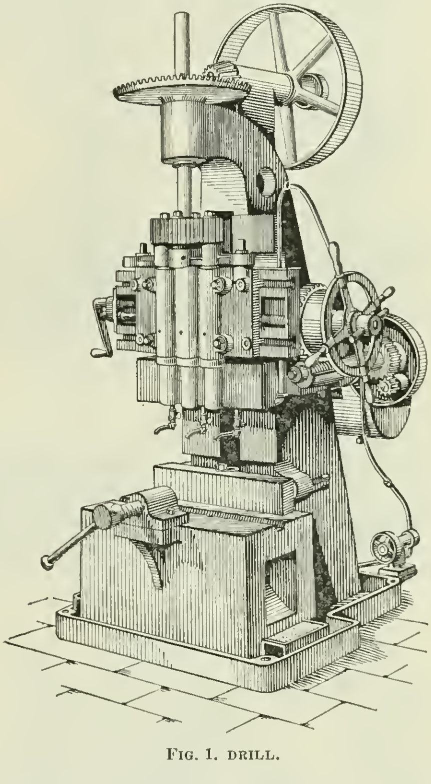


FIG. 1. DRILL.

TURNING MACHINERY OR LATHES. Lathes are tools for producing cylindrical surfaces by rotating or turning a bar before a cutting tool. The bar to be turned is clamped between a fixed point at one end and a rotating disk at the other end, while the tool head and carriage move parallel with the axis of the bar, the tool removing a spiral shaving from the surface of the bar. Lathes are driven by belts from shafting or may be operated by electric motors. They are built in a multitude of forms and of various sizes, from the small machine used by jewelers to the large gun and ingot lathes capable of turning a cylinder 10 feet in diameter. See Fig. 2 on Plate of METAL-WORKING MACHINERY.

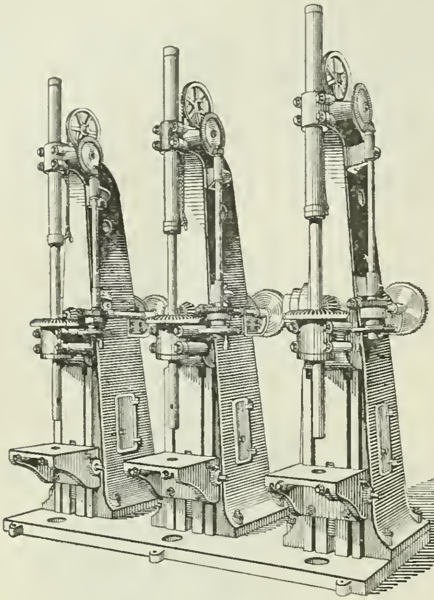


FIG. 2. THREE-SPINDLE BORING MACHINE.

BORING MACHINES. Boring machines are tools for boring cylindrical holes by means of an axially rotating tool; they vary greatly in form according to the purpose for which they are used, being made with from one to a dozen or more spindles, and for drilling horizontal or inclined holes. Boring machines for boring holes of large diameter, such as engine cylinders, ordnance, hollow shafting, usually have a cylindrical tool head in which two or more separate tools are clamped. They are designed to drill horizontal, vertical or inclined holes. Fig. 2 shows a three-spindle vertical boring machine. Drills and boring machines are often used for reaming holes made by punching or for giving an exact cylindrical interior surface to a hollow casting, as, for example, an engine cylinder.

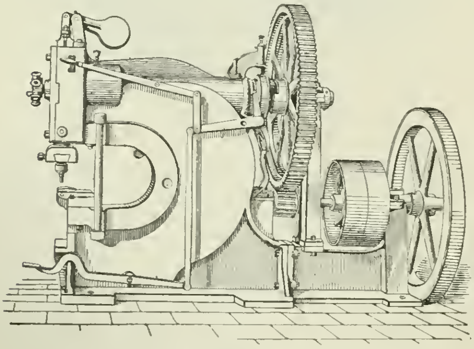


FIG. 3. PUNCH.

PUNCHING MACHINES OR PUNCHES. Punches are used like drills for perforating metal plates and shapes for riveted connections, the hole being made by the thrust of a cylindrical punch instead of by a rotating drill. Single and multiple punches are built capable of punching one or several holes at once. For light work punches are usually driven by belts, but for heavy work individual steam-engines or hydraulic cylinders are the motive powers used. Where holes are to be punched at regular intervals automatic spacing tables are often used in connection with punches. Fig. 3 shows a single punch of familiar construction. Horizontally acting punches are also constructed.

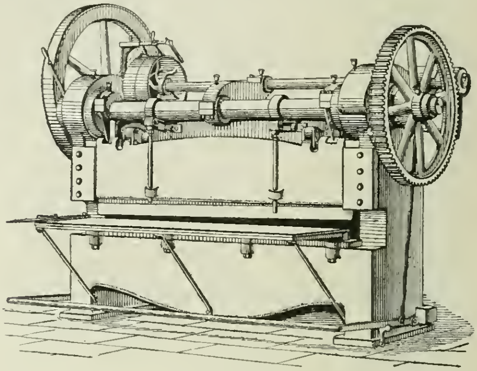


FIG. 4. SHEARS.

SHEARING MACHINES. Shears are used for cutting off or shearing metal plates and shapes, and resemble punches in construction and operation except that the punching tool and die are replaced by cutting edges which slide past each other like the blades of ordinary shears or scissors. Fig. 4 shows a familiar construction of plate shears; machines of this type are built wide enough to shear plates 10 feet wide. For shearing angle iron and other shapes special forms of shears are often made.

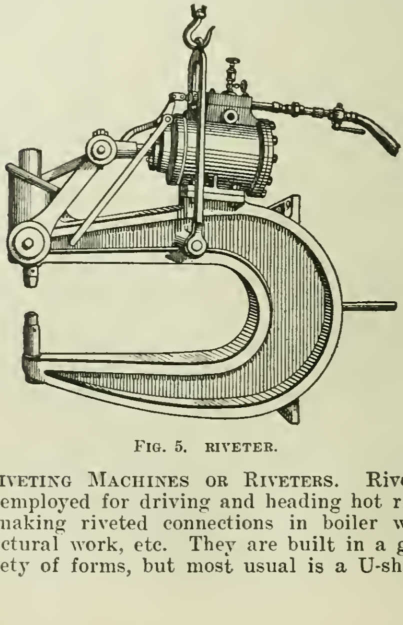
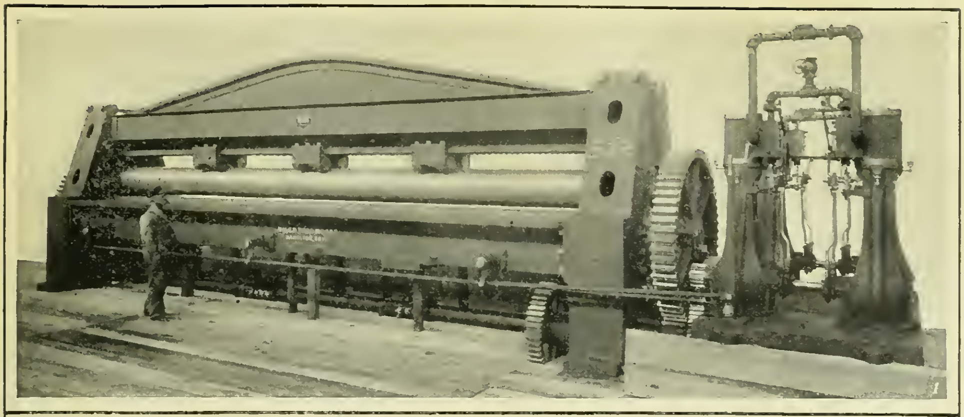
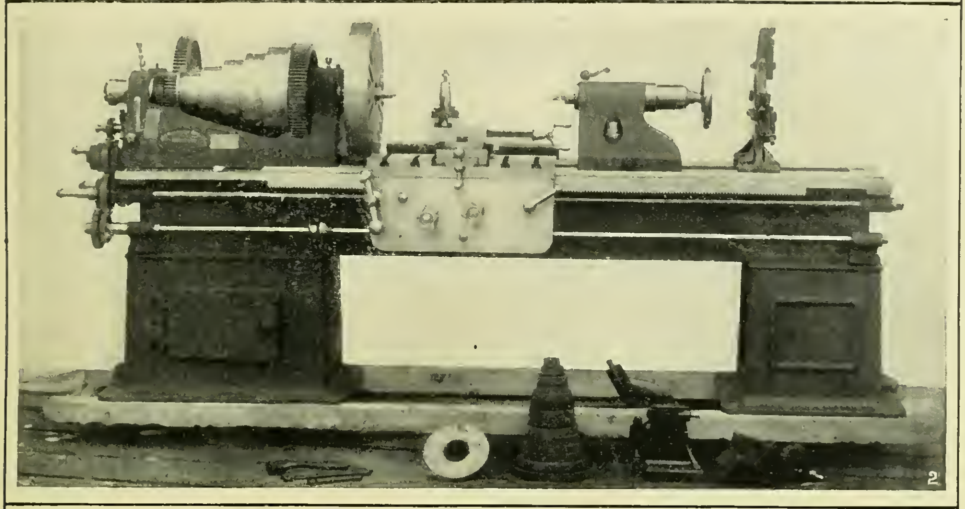


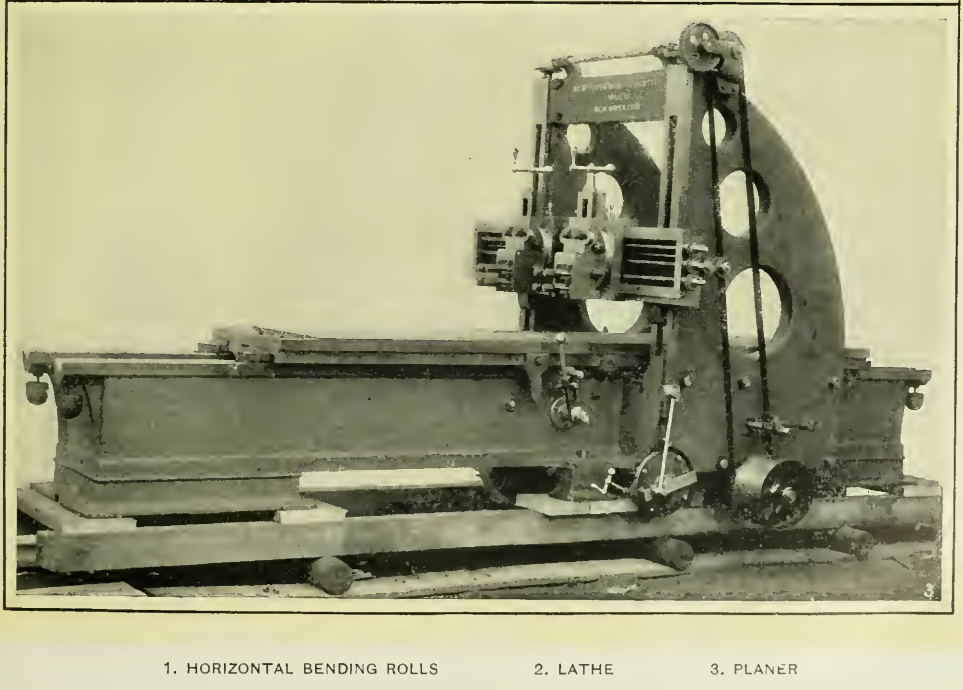
FIG. 5. RIVETER.

RIVETING MACHINES OR RIVETERS. Riveters are employed for driving and heading hot rivets in making riveted connections in boiler work, structural work, etc. They are built in a great variety of forms, but most usual is a U-shaped

METAL-WORKING MACHINERY







1. HORIZONTAL BENDING ROLLS 2. LATHE 3. PLANER

frame or yoke having at the ends of the arms interiorly projecting dies one of which is stationary while the other has a reciprocating motion. The rivet after being inserted in the hole is squeezed endwise between these two dies until it clamps the work together and a head is formed. Fig. 5 shows a common form of riveter. The moving die is operated by means of a steam or compressed air cylinder. Riveters are made stationary as well as portable; stationary riveters are usually employed for heavier work and are often operated by hydraulic power.

PRESSES. Presses are used for forming sheet metal into utensils of various forms by means of pressure between dies. They may be operated by steam, hydraulic, or other power. Fig. 6 shows a hydraulic press for such work as watch-case making, which is operated by a belt-driven pump. The operation of presses of this style is described in the article on HYDRAULIC PRESS. Presses are made for both the hot and cold working of metals. A form of hot-working press, generally horizontal in action, used in bending structural shapes, is called a bulldozer. The illustration shows a familiar form of bulldozer press.

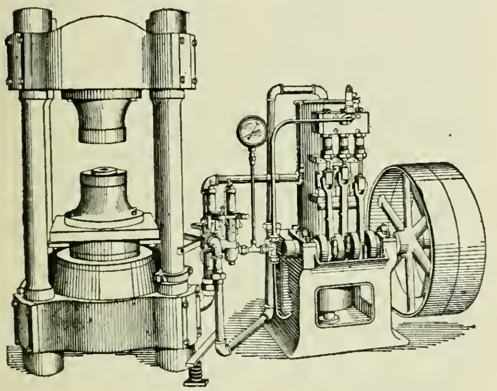


FIG. 6. HYDRAULIC PRESS.

BENDING MACHINES. Bending rolls are used for bending metal plates to suitable curves for boiler and tank work. They usually consist of three rolls arranged in the form of a triangle between which the plate is drawn by the rotation of the rolls. The relative adjustment of the rolls determines the curve to which the plate is bent. The accompanying plate shows a horizontal bending roll operated by a special steam-engine and used by the United States Government for bending 1 inch thick steel plates. These rolls will take in plates 24 feet wide. Vertical rolls of similar construction are also made.

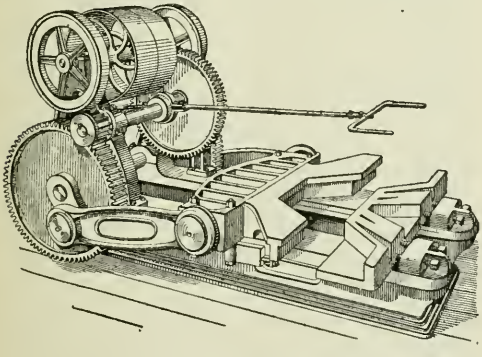


FIG. 7. BULLDOZER PRESS.

SAWING MACHINES. Saws are used extensively in metal-working for cutting plates and shapes into shorter lengths. They are built in a large number of forms both portable and stationary. In the illustration (Fig. 8) a familiar form of toothed saw for cutting off steel beams and similar shapes is shown; the beam is clamped to a carriage and moved into contact with the edge of a circular saw as is done in sawing lumber by similar saws. The toothless cold metal saw consists simply of a plain soft steel or iron disk without teeth, about 42 inches in diameter and three-sixteenths of an inch thick. The velocity of the circumference in operation is about 15 feet per minute. One of these saws will cut through an ordinary steel rim in about one minute. In this saw the iron or steel is ground off by the friction of the disk, and is not cut as with the teeth of an ordinary saw. It has generally been found more profitable, however, to saw iron with disks or band saws, fitted with cutting teeth, which run at moderate speeds and cut the metals as do the teeth of a milling cutter such as is described in the succeeding section. A novel application of the cold saw is known as Rose's fusing disk. This saw is used to cut iron or steel in the form of bars, tubes, cylinders, etc., and the

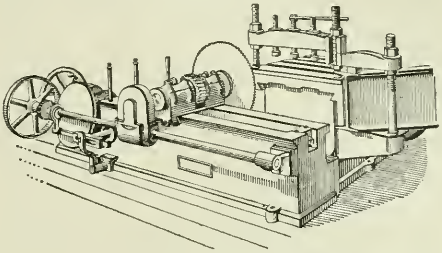


FIG. 8. COLD METAL-SAWING MACHINES.

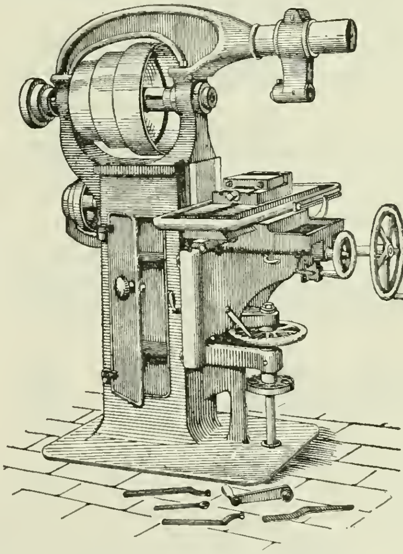


FIG. 9. PLAIN MILLING MACHINE.

piece to be cut is made to revolve as well as the saw, but at a slower speed. By this means only a small surface of the bar to be cut is presented at a time to the circumference of the saw. The saw is about the same size as the cold saw described above, and is rotated at a velocity of about 25,000 feet per minute. The heat generated by the friction of this saw against the small surface of the bar exposed to its action at one time is so great that the particles of iron or steel in the bar are actually fused and the 'sawdust' welds into a solid mass as it falls. This disk will cut either cast iron or wrought iron or steel.

Milling Machines. Milling machines are used for forming exact surfaces of various forms by means of revolving cutting tools or cutters. By means of different shaped cutters an almost unlimited variety of surfaces can be cut by milling machines. They are used extensively for shaping small articles such as sewing-machine and gun parts. They vary greatly in form, being vertical, horizontal, and universal, with one or several cutters. Fig. 9 shows a form of plain milling machine with a horizontal spindle, and Fig. 10 shows representative forms of cutters and tools, of which there are many special shapes.

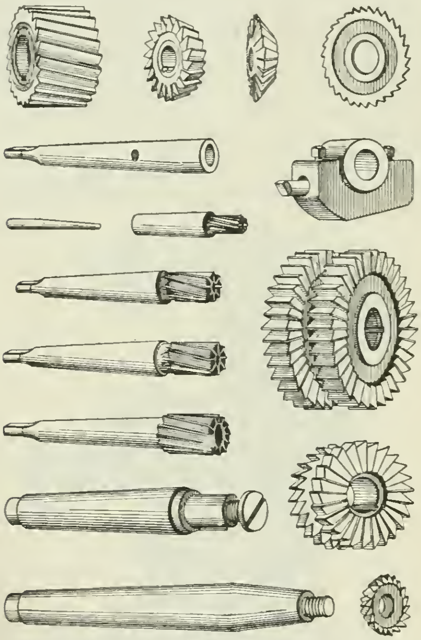


Fig. 10. MILLING CUTTERS AND TOOLS.

Special Machines. The term special machines includes all metal-working machines for tapping nuts, threading bolts, and making pins, screws, nails, rivets, pens, etc. The use of metal-working machines has largely replaced hand labor in metal-working in all countries, but it has become particularly extended in the United States.

METAM'ERISM (from Gk. μετά, *meta*, after + μέρος, *meros*, part). A term equivalent to segmentation, as seen in the worms whose body is divided along the primary or longitudinal axis into segments, homologous with each other, which are technically called 'somites' or 'metameres.' Each metamere or segment contains a chamber or compartment of the body-cavity, and a section of the alimentary canal and other organs. The external appendages or the so-called 'segmental organs' are said to be segmentally or metamerically arranged. Metamerism is most obviously exhibited in worms and arthropods, as the lobster, myriapods, and insects. Vertebrate animals, also, in the vertebral column, and some of the other organs, show a tendency to a repetition of segments, i.e. to metamerism.

METAM'MEH. A town of Galabat (q.v.).

METAMORPHIC ROCKS. One of the three great divisions of the rocks (see Rock) characterized generally by a foliated or schistose structure and including: (1) rocks which have been shown to be altered (metamorphosed) igneous rocks (q.v.); (2) rocks which have been shown to be altered sedimentary rocks (q.v.); and (3) rocks which, while resembling one or both of these types, do not allow of a definite determination of their origin. This implies that the product of metamorphism acting upon a sedimentary rock may be indistinguishable from the result of the same agencies acting upon an igneous rock. There are, however, certain limits of composition fixed by the laws of consolidation of rock magmas that restrict somewhat the composition of metamorphic rocks which can have had an igneous origin, the processes of metamorphism having been shown in the great majority of instances not to have altered in an important way the ultimate composition of the rock as a whole. The metamorphic rocks are as a class those of which the processes involved in their alteration have been active within the crust of the earth, and are exclusive of those formed through the chemical action of the atmospheric agencies, the latter class being generally designated residual rocks (q.v.). See Metamorphism.

Metamorphic Sedimentary Rocks. The principal metamorphic sedimentary rocks are definitely related to the unaltered sedimentary rocks, principally, however, in respect to composition. Thus marble (q.v.) and crystalline limestone (q.v.) are metamorphosed limestone, and dolomitic marble is the product of metamorphism of dolomite. Quartzite (q.v.) and quartz schist result from the metamorphosis of arenaceous rocks, and by the recrystallization of contained iron ore or by the impregnation by ferruginous material they become jaspilite (q.v.) or hematite rock. The argillaceous rocks produced by the same processes are slate, phyllite, mica schist, hornblende or actinolite schist, garnetiferous schist, staurolitic schist (q.v.), and the rarer types of hornfels or hornstones (q.v.), albite schist and chiastolite schist.

Metamorphic Igneous Rocks. The types included under this head may generally be recognized by the partial preservation of the peculiar textures of igneous rocks; such, for example, as the granitic, porphyritic, vitreous or glassy, spherulitic, pearlitic, etc. (See Igneous Rocks.) These structures are, however, almost always obscured by the presence of parallel or approximately parallel sets of fissile planes which are collectively referred to as the schistosity of the rock. (See Metamorphism.) There may be several sets of these fissile planes, but when two or more are present it is generally impossible to determine whether the rock had an igneous or sedimentary origin, and it would be relegated to the third class of metamorphic rocks. It has been found that igneous rocks which were originally glassy in texture are liable to devitrification, the product of which process is a rock of microcrystalline or crypto-crystalline texture. Metamorphic rocks of this derivation are named in terms of the rocks from which they have been derived with the addition of the prefix *apo;* as, for example, aporhyolite from rhyolite (q.v.). If, however, the induced texture is that of schistosity or foliation alone, a structure which must be referred to the processes known as dynamic metamorphism, the original name of the igneous type is joined to the textural term gneiss; as, for example, *granite-gneiss* from metamorphism of granite (q.v.). *Granitoid gneiss* is the equivalent of granite-gneiss. The third class of metamorphic igneous rocks owe their origin chiefly to the chemical alteration (recrystallization) of igneous rock types with the abundant development of new minerals out of old ones. Such rocks are steatite (q.v.) or soapstone, from the development of talc, and serpentine rock (q.v.), from the development of serpentine, in rocks of dominant magnesian composition.

Consult: Rosenbusch, *Elemente der Gesteinslehre* (Stuttgart, 1898); Zirkel, *Lehrbuch der Petrographie*, vol. iii. (Leipzig, 1894); Diller, "The Educational Series of Rock Specimens Collected and Distributed by the United States Geological Survey," in *Bulletin 150, United States Geological Survey* (Washington, 1898).

MET'AMOR'PHISM. A term commonly used by geologists to indicate the profound changes which some rocks have undergone. The term is not applied to the changes induced by weathering (q.v.) and decomposition, but is applicable only to the profound modifications that are usually accompanied by an increase in hardness and degree of crystallization from the original conditions. Metamorphism may lead also to the mineralogical reconstruction of rocks. In a way it may be contrasted with weathering, which tends to break down the surface strata and thus promotes their removal to the sea by rivers; metamorphism, on the other hand, consolidates the sediments when they are deeply buried. The phenomena of metamorphism are commonly met with in nature particularly in the regions underlain by ancient rocks, where the processes of upheaval and subsidence and volcanic forces have operated through long periods of time. The degree to which rocks have been changed varies from mere hardening in some cases to an extreme marked by complete alteration in structure and composition.

KINDS OF METAMORPHISM. Strata in the vicinity of igneous intrusions, as dykes and bosses of granite, are more or less metamorphosed and show an increase in hardness and crystallization. In this kind of metamorphism, called *contact metamorphism*, the amount of change effected depends upon the character of the invading rock and the rock that has been invaded, and also upon the proximity to the contact. Deep-seated igneous masses exert greater influence than surface flows of lava, doubtless because of the greater heat and longer period of cooling; while those of acid composition in which there are large quantities of occluded gases and vapors are more effective than basic types. The character of the strata invaded by the igneous rock largely determines the extent to which new minerals are found; sandstone usually shows no change beyond a hardening or recrystallization of the quartz particles, but clay rocks, such as shales and slates, exhibit a complete rearrangement of the chemical constituents with the formation of new minerals.

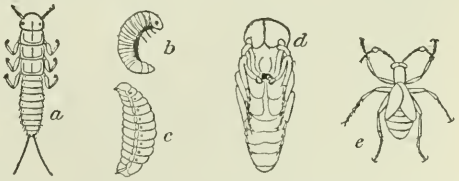
A second form of metamorphism by which rocks have been influenced over wide areas depends upon the energy developed by the great stresses and movements within the earth's crust; this is called *regional* or *dynamic metamorphism.* The first stages of regional metamorphism are indicated by hardening and the loss of volatile substances; but, as the strains of compression and shearing increase, the rock assumes a schistose structure and its constituent minerals are more or less completely recrystallized. The change effected may amount to a thorough transformation, as from an unaltered sediment to a homogeneous crystalline mass resembling an igneous rock.

CAUSES OF METAMORPHISM. Heat, pressure, and moisture are the most effective agencies in producing the changes known as metamorphism. The influence of heat is shown in igneous contacts, but it is also an accessory in regional metamorphism, although pressure is here the dominant factor. Moisture which is present in all classes of rocks assists in decomposing minerals and in the formation of new compounds. The phenomena of metamorphism have been imitated in an experimental way by subjecting specimens of various rocks to the influence of heat and pressure. Consult Geikie, *Text-Book of Geology* (London, 1893). See GEOLOGY; METAMORPHIC ROCKS.

MET'AMOR'PHOSIS (Lat., from Gk. *μεταμόρφωσις*, from *μεταμορφοῦσθαι*, *metamorphousthai*, to be transformed, from *μετά*, *meta*, over + *μορφή*, *morphē*, form). In the mythology of the ancients, those transformations of human beings into beasts, stones, trees, and even into fire, water, etc., in fables of which that mythology abounded. See OVID; FOLK-LORE; WERE-WOLF.

METAMORPHOSIS (in animals). A change of form in the post-embryonic life of an individual animal. The term is also applied to the change in form of homologous parts in different species.

The young of many animals pass through a series of changes of form, in each of which the animal is adapted to changes in its surroundings, involving alterations in its mode of life, slight if the change of body-form is slight, thorough-going and radical if its body becomes profoundly modified. As examples of a complete metamorphosis may be cited the life-histories of the jellyfish (q.v.), the starfish, mollusks, crustaceans, insects, and also the salamanders, toads, and frogs. Most shrimps and crabs undergo a complicated metamorphosis, for in the different



METAMORPHOSIS OF OIL-BEETLE.

a, First larva; *b*, second larva; *c*, third larva; *d*, pupa; *e*, mature beetle.

stages they lead different lives and are subjected to different environments, the larvæ for the most part being free-swimming and living near the surface of the water, while the parents are stationary. The result of this change of habits and form undoubtedly is to prevent the extinction of the species, since if at a given moment the parents were swept out of existence, the young, living under very different circumstances, would survive, develop, and represent the species. Again in the marine species of worms, crustacea, etc., the free-swimming young (larvæ) are borne about by oceanic and tidal currents, and in this way what in adult life are the most sedentary forms become widely distributed from one part of the world to another. On the other hand, the larval forms of fixed marine animals serve as food for fishes, especially young fishes, and numerous invertebrates. Thus were it not for the metamorphoses of animals, many species would become extinct sooner than they do, while the great overplus of larval forms gives to many other species of animals a secure hold on existence.

As an example of metamorphosis we may cite that of a butterfly, fly, or bee. Their life is divided into four stages, the embryo passed within the egg, the larva, pupa or chrysalis, and imago. An insect after hatching lives, so to speak, three different lives, having distinct bodily structures and existing under very different conditions as regards food, enemies, etc. The caterpillar, for example, has big jaws, which in the winged or adult state are entirely wanting. Other radical changes are observable in the body and appendages, and also in the internal organs. The term 'larva' (q.v.), as applied to the first stage of animals, is a very variable and indefinite one, that of insects in general being a much more highly organized animal than the larva of a worm, starfish, or crustacean. Wingless insects (synaptera) do not pass through a metamorphosis. That of winged insects is said to be 'incomplete' or 'complete.' An example of incomplete metamorphosis is that of locusts and grasshoppers. In these insects the freshly hatched young differs from the adult only in being without wings. The different stages of metamorphosis are not primitive, inherited from some early form, but are acquired characters; the nauplius stage of most crustacea, and the caterpillar, maggot, or grub of insects, are forms which were adaptations to changed modes of life, inducing use or disuse of certain organs. At first insects were ametabolous, and it was not until perhaps the middle of the Paleozoic era that insects with a metamorphosis began to exist.

Hypermetamorphosis. A condition in insects wherein they pass through more than the three normal stages. The best known examples are the supernumerary stages of Meloë, Stylops, etc. In the oil-beetle (Meloë) the freshly hatched young is an active, minute campodia-like larva, which inhabits the nests of wild bees, feeding upon the eggs of their hosts. This sedentary mode of life reacts upon the organism, and after molting in the second larval stage it is grub-like, the body thick, soft and fleshy (carabidoid stage), and it feeds on honey. At the next molt the insect is motionless and nearly footless (semipupal stage). It then changes to a third larval form, when it resembles the maggot or larva of a bee. It then transforms into a genuine pupa, and finally into the beetle. It will be seen that at nearly each stage its mode of life, kind of food, etc., change.

Suppressed Metamorphosis. This phenomenon, or 'direct development,' is a curtailment or absolute loss of primitive larval characters, or a forcing back of larval features or structures, until they are either passed through in the embryo before hatching or entirely lost, due to the lapse of heredity. Thus in all the insects with a metamorphosis there exists what is called 'polypody' in the embryo, except in the Diptera, where it has been known to exist only in one case. The embryos of other metabolous insects than flies at a certain period have abdominal legs, showing their descent from a Peripatus or myriapodous ancestry. The campodeoid characters of the larva of Coleoptera also become suppressed and lost in the more specialized moths, bees (Hymenoptera), and Diptera. This is explained by their being crowded out, due to the acquisition of later acquired characters better adapted to their changed, new mode of life.

This abbreviated metamorphosis is seen also in the Crustacea, as the lobster (q.v.), and more especially in certain shrimps and crabs, which, owing to changed conditions, hatch in the adult form, passing through the nauplius and zoëa stages in the embryo. It is also seen in the frogs (q.v.), where the different degrees of metamorphosis are plainly due to great differences in the conditions of life. See Nidification.

Causes of Metamorphosis. These are obscure, but it is plain that the different stages are exaggerated or pronounced periods in the growth of the animal, and that the fundamental causes are the same as those which have initiated and controlled the origin of species. This is plainly seen in aquatic larvæ, the young of forms whose larvæ were originally terrestrial. The numberless contrivances and temporary larval organs, especially seen in dipterous larvæ, are evidently adaptations to the needs of the insect during its temporary aquatic life, these being cast aside when the animals pass to a different medium.

Bibliography. Weismann, "Die nachembryonale Entwicklung der Musciden," in *Zeitschrift für wissenschaftliche Zoologie*, vol. xiv. (1864); Korschelt and Heider, *Text-book of the Embryology of Invertebrates* (London, 1895-1900); Lubbock, *The Metamorphoses of Insects* (ib., 1874); Packard, *Text-book of Entomology* (New York, 1898).

METAMORPHOSIS (in plants). Goethe's doctrine which seeks to account for the observed connection between the different organs of a leafy nature in the same plant, and chiefly developed and applied to what may be called foliar organs. The stem came into consideration only as carrying leaves, and the root was almost entirely disregarded. The theory assumes for foliar structures an ideal fundamental organ, from which different leaf forms could be derived. In its application this ideal form came to mean to most botanists an ordinary foliage leaf, and foliar structures have been in the main presented from this standpoint. For example, the parts of the flower are commonly spoken of as modified or metamorphosed leaves; and when petals or stamens are abnormally replaced by foliage-like structures they are said to revert to the primitive condition and to prove derivation from leaves by modification. Morphology long ago disproved this idealistic metamorphosis, and it does not regard the occasional replacement of a usual organ by an unusual one as any argument in favor of such a view. Consult Sachs, *Geschichte der Botanik vom 16. Jahrhundert bis 1860* (Munich, 1875), trans. by Garnsey (Oxford, 1890).

METAPHOR (Gk. μεταφορά, *metaphora*, a transference). A figure of speech by means of which one thing is put for another which it only resembles. Thus, the Psalmist speaks of God's law as being "a light to his feet and a lamp to his path." The metaphor is a kind of comparison in which the speaker or writer, casting aside the circumlocution of the ordinary similitude, seeks to attain his end at once by boldly identifying his illustration with the thing illustrated.

METAPHYSICS (Lat. *metaphysica*, from Gk. μετὰ τὰ φυσικά, *meta ta physika*, following the physics; because of the position this subject occupied in Aristotle's collected works). The name given to the science which deals with ultimate reality. Metaphysics or ontology is a term used to designate a branch of philosophy, but much difference of opinion prevails as to the precise character and function of this philosophic discipline, and even as to its possibility. Its possibility naturally depends upon its task and scope. According to the older view, metaphysics had to do, not with the world of experience, but with a metempirical world—i.e. a world other than the world of experience, and supposed by some to be more real than the latter. But there are many, especially in modern times, who take a different view of the task of metaphysics. They regard it as a science dealing with the world of experience as every other science does, but studying that world with a view to answering certain questions which the so-called natural sciences do not raise. The natural sciences take up certain isolated aspects of experienced reality, and by means of this specialization are able to obtain much more detailed knowledge. But this knowledge does not pretend to go beyond appearances. The question is always left open whether after all the things may not be a surface show while true being lies below in unfathomable deeps. This question some modern metaphysicians take up and claim to answer in the negative, not dogmatically, but scientifically. According to this school the proper point of departure for metaphysical inquiry is the epistemological conclusion that knowledge and reality are two sides of one and the same concrete experience. (See KNOWLEDGE, THEORY OF.) Any attempt to divorce reality from knowledge involves the logical fallacy of supposing that what is always validated to us by experience can be sundered from experience and yet remain real. The error is of the same kind as would be committed by one who should say that because color and extension are distinguishable, therefore color can exist when separated from extension. According to this school, metaphysics is the science which draws conclusions as to the nature of reality from the scientific findings of epistemology. As epistemology is an experiential and inductive science, metaphysics is based on experience; it is not an attempt to spin cobwebs in the brain. Among metaphysical problems are those as to the nature of cause (see CAUSALITY), of time and space (q.v.), of substance (q.v.), of infinity (see INFINITE), of the absolute (q.v.), of the freedom of the will (see DETERMINISM), of mechanism and teleology (q.v.), of monism and pluralism (q.v.), and of the relation between mind and body. See DUALISM and MATERIALISM.

As Külpe has remarked, the bibliography of metaphysics is that of philosophy (q.v.) itself. Some systematic treatises on the subject may be mentioned here: Deussen, *Elemente der Metaphysik* (Aix-la-Chapelle, 1877; 2d ed. 1890; Eng. trans., London, 1894); Dietrich, *Grundzüge der Metaphysik* (Freiburg, 1885); Bowne, *Metaphysics* (2d ed., New York, 1895); Ladd, *A Theory of Reality* (ib., 1899); Lotze, *System der Philosophie*, part ii., *Metaphysik* (Leipzig, 1879; Eng. trans., Oxford, 1884, 1887); Bradley, *Appearance and Reality* (2d ed., London, 1897).

METAPLASM. See ETYMOLOGY, FIGURES OF.

MET'APON'TUM, or **METAPONTIUM**. (Lat., from Gk. Μεταπόντιον, *Metapontion*). An ancient city of Magna Græcia, Italy, 24 miles from Tarentum and 14 from Heraclea. It was founded at the instigation of the Sybarites, who wished to check the advance of Tarentum, by Achæan and probably Messenian emigrants, early in the seventh century B.C. To this place the philosopher Pythagoras was said to have retired, and here his tomb was shown. In B.C. 415 we find the inhabitants allies of the Athenians in their invasion of Sicily, and for some time previous the town had evidently been in a condition of constantly increasing prosperity. In the wars waged against Rome by Pyrrhus and Hannibal, the Metapontines were hostile to the Imperial city. At the end of the war of Pyrrhus they were subjugated completely by the Romans, but in B.C. 212 succeeded in throwing off the yoke by admitting the Carthaginians. After the withdrawal of the Carthaginians the city was deserted, and soon fell into ruin. In the neighborhood of the modern railway station are some remains of ancient temples, and excavation has brought to light some inscriptions and architectural fragments. Consult Lacava, *Topografia e storia di Metaponto* (Naples, 1891).

METAR'GON (Neo-Lat., from Gk. μετά, *meta*, after + Eng. *argon*). A name applied by Ramsay to what he erroneously thought to be a new chemical element contained in minute quantities in atmospheric air.

METASTASIO, må'tå-stä'zē-ō (originally TRAPASSI), PIETRO (1698-1782). One of Italy's most admired poets. He was born at Rome, January 13, 1698, of humble parents, and gave early evidence of his genius by his boyish improvisations. Metastasio having attracted the casual notice of Gravina, a famous jurisconsult of the day, the latter undertook the entire education and career of the youth, whose paternal name of Trapassi had thenceforward the Greek form Metastasio. In 1724 he published one of his most celebrated dramas, *La Dione abbandonata*, which, with *Il Catone* and *Il Siroe*, conferred on the poet a European name. In 1730 Metastasio accepted the post of Court poet at Vienna. During his sojourn in Vienna Metastasio composed his *Giuseppe riconosciuto*, *Il Demofoonte*, and the *Olimpiade*. Among the best of his pieces are the melodramas *Clemenza di Tito* (1734) and *Attilio Regolo*, this latter being usually considered his masterpiece. He died at Vienna, April 12, 1782. Metastasio was distinguished for the generosity, integrity, and candor of his nature. His works enjoy unexampled popularity among all grades of his countrymen; in their pure classical subjects and forms the educated student finds instruction and delight, while their facile musical grace and verbal simplicity adapt them to the popular appreciation. They were translated into many languages and set to music by celebrated composers. The best edition of Metastasio is that of Paris (12 vols., 1780), with useful supplements in the *Opère postume* (Vienna, 1795), and in the Florentine editions of 1820 and 1826. Consult: Vernon Lee, *Studies of the Eighteenth Century in Italy* (1880); Mussafia, *Pietro Metastasio* (Vienna, 1882); Carducci, *Lettere disperse e inedite di Pietro Metastasio* (Bologna, 1883); Antona-Traversi, *Lettere inedite e disperse di Piétro Metastasio, con un' appendice* (Rome, 1886); O. Tommasini, "Pietro Metastasio e lo svolgimento del melodramma italiano," in his *Scritti di storia e critica* (ib., 1891): Masi, "Pietro Metastasio," in his *Parrucche e Sanculotti nel secolo XVIII.* (Milan, 1886).

METAS'TASIS (Neo-Lat., from Gk. *μετάστασις*, removal, change, from *μεθιστάναι*, *methistanai*, to remove, change place, from *μετά*, *meta*, after + *ἱστάναι*, *histanai*, to place, stand). A change in the seat of a disease from one part of the body to another. Rheumatism and gout are examples. Muscular rheumatism is more or less movable, changing from one set of muscles to another. Arthritic rheumatism is more liable to change persistently from one joint to another, or it may pass to an analogous tissue in another kind of organ, as to the serous membranes of the heart, or pericardium. Gout is well known for its flights from one point to another. A gouty manifestation, such as eczema, may disappear and be replaced by an attack of asthma. In mumps (q.v.) metastasis may take place to the ovaries in girls or to the testicles in boys, with resulting ovaritis or orchitis respectively. In abscess, metastasis may take place to distant points as a joint or the kidneys. The courses of metastasis are obscure.

ME'TA SU'DANS (Lat., dripping goal). A great fountain facing the Coliseum at Rome, said to have been erected by Domitian and completed in A.D. 97. Representations on medals and references in literature, however, seem to indicate that Domitian enlarged a fountain already in existence. Its name was given from its shape, which represented the goal of a circus. Only the partially restored brick interior of the fountain remains.

MET'ATHE'RIA (Neo-Lat. nom. pl., from Gk. *μετά*, *meta*, after + *θηρίον*, *thērion*, diminutive of *θήρ*, *thēr*, wild beast). The order Marsupialia, or marsupial mammals. In the classification of the Mammalia prepared by Huxley (*Proceedings of the Zoölogical Society of London*, 1880), the marsupials were placed in a class 'Metatheria' (compare DIDELPHIA), between the Prototheria, or monotremes, below them, and the Eutheria, or ordinary mammals, above them, and equivalent to both in rank. He enumerated eleven characters as distinguishing the Metatheria and giving it the rank he proposed. Subsequent investigations, however, have shown the invalidity of some of the supposed facts relied upon, and the preponderance of evidence that the marsupials cannot be separated from the higher mammals by any such a gap as separates them from the Prototheria. The term Metatheria is now retained, therefore, only as the designation of a section of the subclass Eutheria embracing the marsupials. Consult Beddard, *Mammalia* (London, 1902).

METAURUS, mė-ta̤'rŭs (It. *Metauro*). A small river of Central Italy, emptying into the Adriatic, 4 miles south of Fano (Map: Italy, G 4). It was the scene of the defeat of Hasdrubal, brother of Hannibal, by Caius Nero and Marcus Livius in B.C. 207.

MÉTAYER, mȧ'tȧ'yȧ' (Fr. *métayer*, farmer who tills the land for half the produce). An agricultural tenant who works the land with capital owned by the landlord, and pays as rental a fixed proportion of the crop. It may in general be said to be the resource of a community where cultivators are without capital. In the United States such a system of renting land on shares prevails mainly in the South, but as time progresses money rents are substituted more and more for share rents, and this seems to be the natural tendency where the economic position of the tenants improves. The system of métayage is still very common in Italy, parts of Austria and Russia, and in Portugal and in the West Indies. It is, however, less common at present than it was formerly, the system of leasing land for a cash rental tending to displace it as agricultural capital becomes more plentiful. Métayage is a system which possesses marked social advantages, but equally marked economic disadvantages. The métayer cannot be rack-rented; bad seasons cannot drive him into bankruptcy; the increase in value of produce due to improved means of transportation redound to his advantage as well as to that of the landlord. Métayage, therefore, tends to create a class of peasantry who are in large measure independent of the price movements which are so great a source of anxiety to the small farmer who is compelled to make periodic money payments for rent. But, on the other hand, there is slight inducement for either métayer or landowner to make improvements, since one-half of the resulting increase in product goes to the other party on the division of the crop. Métayage has for this reason tended to perpetuate primitive conditions of agriculture. This evil is, however, not necessarily inherent in the system, since it would be quite possible for landowner and métayer to unite in making improvements, and this practice is not uncommon in France. It is also possible to make an agreement as to a separate return for the capital invested. The economic disadvantages of divided responsibility would still remain, and for this reason métayage can hardly survive in highly advanced economic conditions. Its existence in so large a part of Europe is probably to be explained by the persistency of custom among the agricultural population. See Cruveilhier, *Etude sur le métayage* (Paris, 1894). An excellent account of the system in practice is to be found in Higgs, "Métayage in Western France," in *Economic Journal* (March, 1894). See also article on "Métayage" in Palgrave, *Dictionary of Political Economy*. The standard works on political economy usually devote some attention to the merits of métayage. Consult: Especially, Adam Smith, *Wealth of Nations;* Mill, *Political Economy.*

MET′AZO′A (Neo-Lat. nom. pl., from Gk. *μετά*, *meta*, after + *ζῷον*, *zōon*, animal). The name applied to all the animals above the Protozoa. The animal kingdom is thus subdivided into two divisions, namely, the Protozoa, or one-celled animals, and the Metazoa, or many-celled animals. The latter include all the branches or phyla of the animal kingdom from the sponges (Porifera) to the Vertebrata. Each metazoan, however, develops from a single cell, the egg.

The Metazoa have been defined as "Animals in which the ordinary (so-called adult) form of the species has always more than one nucleus, and in which the nuclei are for the most part arranged regularly and with a definite relation to the functional tissues of the animal (so-called 'cellular arrangement'). Special conjugating individuals of the form of ova and spermatozoa are always formed." Metazoa reproduce by ova and spermatozoa. These reproductive products originate by a process of unequal fission from their parent, and may both be produced by one or different individuals. When they are both produced by the same individual, that individual is said to be *hermaphrodite.* When they are produced by different individuals, that parent giving rise to the egg is called *female,* and that producing sperm cells or spermatozoa is called the *male,* and the individuals are said to be 'unisexual' and the species 'diœcious.' In certain forms, probably under given conditions of food or temperature, the ova may develop without being fertilized by a sperm cell, the process being called 'parthenogenesis' (q.v.). Reproduction by ova and spermatozoa is called 'sexual reproduction,' and that by parthenogenesis 'asexual reproduction.' Consult Bourne, *The Cœlomate Metazoa* (London and New York, 1901). See Classification of Animals.

MET′CALFE, Charles Theophilus, Baron (1785-1846). A British statesman, born in Calcutta, India. At an early age he was sent to England, where he was educated in a preparatory school at Bromley, and then at Eton. After holding various other positions, he became a member of the Supreme Council of India in 1827, and from 1835 to 1836 was Provisional Governor-General. He was next made Lieutenant-Governor of the Northwestern Provinces, but resigned in 1838 and returned to England. The next year he was sent out as Governor of Jamaica, where he succeeded in bringing about better relations between the planters and the emancipated blacks. In 1842 he returned to England, and the next year was made Governor-General of Canada, where he soon came into conflict with the Executive Council and the Representative Assembly. In consequence of his refusal to admit their right to be consulted about official appointments, all the members of the Council save one resigned, and for some time he was without a full Council; but in the election of November, 1844, the Government received a small majority, and he was able to fill the vacancies with men of his own views. In 1845 he was created Baron Metcalfe of Fern Hill, but in the same year an incurable disease forced him to return to England, where he died. Consult Kaye, *Life and Correspondence of Charles, Lord Metcalfe* (rev. ed., London, 1858).

METCALFE, Frederick (1815-85). An English scholar and educator. He graduated at Saint John's College, Cambridge, in 1838, and was elected fellow of Lincoln College, Oxford. In 1848 he became head-master of Brighton College, an institution founded in 1847 for the sons of noblemen. In 1844 he published a translation of Professor W. A. Bekker's *Gallus,* with notes and excursus, considered of great historical value (2d ed. 1853). In 1845 followed his translation of Bekker's *Charicles,* a tale similarly illustrative of private life among the ancient Greeks, also with notes and excursus. He published a *History of German Literature* (1858); *The Oxonian in Norway* (1856); and *The Oxonian in Iceland* (1861).

METCHNIKOFF, měch′nĭ-kôf, Iliya (1845—). A Russian embryologist and cytologist, born in the Province of Kharkov, May 15, 1845. He was educated at Kharkov, and afterwards studied at Giessen and at Munich. He was appointed to the chair of zoölogy at Odessa in 1870, but resigned in 1882 to devote himself to private researches. In 1884, as the result of work on sponges and polyps, he published an epoch-making memoir on the intracellular digestion of invertebrates. He found that the individual cells of sponges took in solid particles of food and digested them in order to provide material for the growth of the young; and he saw the amœba-like eggs of a polyp (Tubularia) eat and digest the neighboring follicular cells. He also established the fact that certain wandering amœboid cells attack, ingest, or absorb parts of the body which become either useless or septic and thus harmful to the organism; and even hard objects, as also microbes or disease germs and the bacteria which have entered a wound. He called these microbe-eaters 'phagocytes' (q.v.). He boldly (1884) threw out the remarkable theory that inflammation in the vertebrates is due to the struggle between the white or amœboid corpuscles of the blood and the disease germs within it. He went to Paris, became *chef-de-service* in Pasteur's Institute in 1892, and at the death of Pasteur in 1895 succeeded him as the director of the Pasteur Institute. He is a foreign member of the Royal Society of London. Metchnikoff has shown the value of and the close relation between studies in the development of the lower animals and physiological and medical studies and practice. His chief later works are: "Untersuchungen über die intracelluläre Verdauung bei wirbellosen Thieren," in *Arbeiten aus dem zoologischen Institut der Universität Wien,* vol. v. (1883; ib., 1884); "Ueber die Beziehung der Phagocyten zu Milzbrandbacillen," in *Virchow's Archiv für pathologische Anatomie und Physiologie,* etc., xcvii., p. 502 (1884; ib., 1892); *Leçons sur la pathologie comparée de l'inflammation* (Paris, 1892).

METEL′LUS. The name of a Roman family of the plebeian gens Cæcilia, which rose to be one of the first families of the Roman nobility. One of the most distinguished members of the family was Quintus Cæcilius Metellus Macedonicus, who received his surname from his victory over Andriscus, a claimant to the throne of Macedonia (B.C. 148). His life was considered by ancient writers an example of the greatest felicity. He died B.C. 115.—Quintus Cæcilius Metellus Numidicus twice defeated Jugurtha in Numidia (B.C. 108), but was superseded in his command by Marius. He was celebrated for his integrity.

His son, Quintus Cæcilius Metellus, surnamed *Pius*, joined Sulla in B.C. 83, but sought to moderate the severity of his proscriptions. He, too, bore a distinguished character for virtue.—Quintus Cæcilius Metellus Creticus conquered Crete, and reduced it to a Roman province (B.C. 67).—Quintus Cæcilius Metellus Pius Scipio, sometimes called Quintus Scipio, and sometimes Scipio Metellus, was a son of Publius Cornelius Scipio, who was adopted by one of the Metelli, and became the father-in-law of Pompey, and his zealous partisan. He commanded under him at Pharsalia, maintained war on his behalf for some time in Africa, and after the battle of Trapsus (B.C. 46) died by his own hand.

METEM′PSYCHO′SIS (Lat., from Gk. *μετεμψύχωσις*, from *μετεμψυχοῦν*, *metempsychoun*, to make the soul pass from one body to another, from *μέτα*, *meta*, over + *ἐμψυχοῦν*, *empsychoun*, to animate, from *ἔμψυχος*, *empsychos*, animate, from *ἐν*, *en*, in + *ψυχή*, *psyche*, soul). Transmigration of souls, or, more accurately, the reincorporation of a soul. In a crude form this is the usual belief of all animistic forms of religion, and is not a religious, but a philosophical opinion. That is to say, it is not believed that any religious factors, such as the state of the soul, or the will of the deity, decide the soul's fate, but that every soul necessarily finds another habitation after death in a body similar to the one it has just quitted or has been accustomed to occupy. To the primitive mind the soul is air, breath, and at death disappears from one body either to be lost in general air or to hold together, as before, separated from other air and screened by a new body. But as any soul during a man's life may enter at will the body of a beast, so after death the soul of the departed may find shelter either in a man's body or in the frame of a beast. Some savages believe that at the instant when one dies one's soul enters a new body. Others believe that the spirit can remain for some time disembodied, and that it seeks reincarnation, not from necessity, but for pleasure. At the same time it is believed that souls may take quite different habitations, such as trees, streams, and stars, sometimes remaining there forever, and sometimes descending or ascending to be born again. The next stage is where this animistic belief appears sporadically in a much more developed environment and is evidently a reversion. Thus in the midst of the nature-gods of the Teutons we find once in legend and often in folk-lore a reversion to the belief that men are often liable to be reborn on earth either in human or in animal bodies. Sometimes no rebirth is necessary, but the soul leaps from one body and drives out the soul of the animal whose body it enters. All these beliefs, more or less confused and vague, but persistent through various stages of social development, are found in Europe, India, Asia, and America, while in Africa, where very little social change has taken place, and in Polynesia, where the same holds good, it may be said to be in its crudest form the usual faith of the people.

Quite different are the complex systems of metempsychosis built upon this animistic basis. Three such systems are known. The latest in time, that of the Greeks, has been derived by various scholars from the Egyptian system on the one hand, and from the Hindu system on the other. Others hold that it was indigenous. The correct opinion must be based upon considerations often neglected in the discussion. These are, first, that the Greek belief differs essentially from both the Hindu and Egyptian systems; second, that Pythagoras traveled in the East, but did not invent the notions nor borrow the plan of his own system; third, that metempsychosis to the Greeks was always as a system a matter of poetry and philosophy, whereas in India and in Egypt it was a national belief. Herodotus says that the Greek system was derived from the Egyptian; but he adds that the Greeks have made it their own, and in this he is probably right. The chief differences between the three systems are as follows: The Hindu system is an outgrowth from a general belief in transmigration of souls. There was at first no notion of retribution connected with this belief. The soul that sinned perished. The good soul persisted in a new body, or, if it chose, lived in heaven in a 'body of light.' About the seventh century B.C., however, arose the doctrine of Karma (q.v.), which turns this belief into a system based on morality. According to this system, the soul is doomed to expiate by future rebirths in low forms of life the sins committed in this life. On the other hand, a highly moral life results in one being reborn in a higher plane, either as an aristocrat, a king, or a priest, or even as a godling. By incessant and unrelaxing endeavors in every new birth a soul may, however, finally reach emancipation, and become pure and one with God, no longer to be reborn. In this system the length of the series of rebirths depends wholly upon the individual, who works out his own salvation by his own acts. As Buddhism denies the existence of a soul, metempsychosis in India is confined to Hinduism. But Buddhism had an analogous belief in the transmigration of character-entities, also conditioned by acts, ending, if at all, in Nirvana, unconscious existence or extinction of personality resulting from extinction of desire, volition, the animating principle in Buddhistic psychology. The Egyptian system puts a term of years to the series of rebirths. Further, the soul at the end of this series of three thousand years returns to its first corporal environment, an idea not found in India. Again, what was sporadic in India, namely, the termination of the series by divine favor, is customary, according to the Egyptian doctrine. But the third difference between the two systems is most important. In Egypt, namely, metempsychosis is not the fate of the good, but of the sinful, the good being united with Osiris, and even this is only very generally true, for the sinful are simply deprived of union with the good, while even the good may, if they will, continue on the round of existences, or if they prefer may live in Elysium. So, too, in the Greek system, the Elysian fields are the reward of the good, but transmigration is here the necessary consequence of sin. Moreover, both in India and in Greece the whole system of metempsychosis was crossed by the belief in hell, and amalgamated with it rather roughly. In India, for example, the soul first expiates its sins in hell and then enters upon rebirth. Roman writers adopted the Greek idea, but it seems to have taken little hold on the people either in Greece or in Rome.

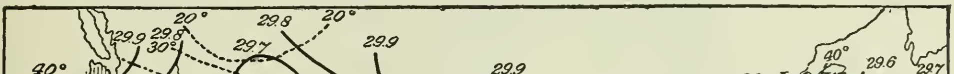
Metempsychosis has always had an attraction for some minds. It has even been attributed in a refined form to Christ, and the Church fathers were not uninfluenced by it, just as the Jewish rabbis adopted it in holding that Adam was reincarnated as David. It has been held by Christian sects at various times since the Neo-Platonists' doctrine was received by the Gnostics, but always in the form of a belief that a man's soul has preëxisted in the soul of some previous man; seldom in the form of Hindu belief, that an animal as well as a man may receive the soul of a man that has just died.

Consult: Hopkins, *Religions of India and Egypt* (London, 1880); Renouf, *Religions of Ancient India* (Boston, 1898); Zeller, *Grundriss der Geschichte der griechischen Philosophie* (4th ed., Leipzig, 1893); Jevons, *Introductions to the Study of Religion* (London, 1896).

METEORIC STONE. See Aërolite.

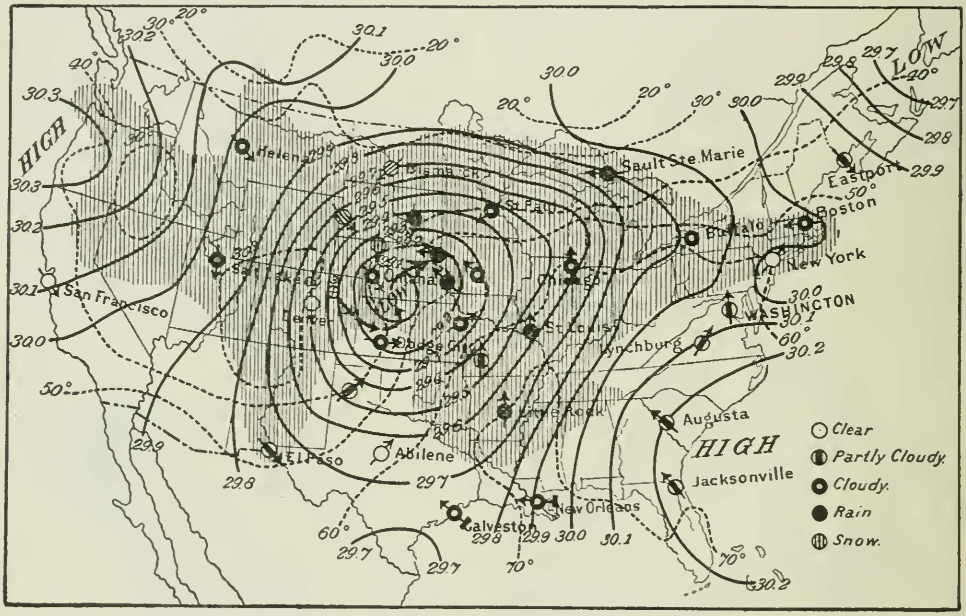
METEOROLOGICAL SOCIETY, The Royal. A learned association established in 1850 and incorporated in 1866. The society has its headquarters in London. The objects are the promotion of meteorology in all its branches, and the record of data and theories relating to the subject. Its membership consists of fellows and honorary members, the latter being foreigners of distinction. The two quarterly publications of the society are the *Quarterly Journal* and the *Meteorological Record.*

ME′TEOROL′OGY (Gk. *μετεωρολογία, meteōrologia*, treatise on celestial phenomena, from *μετεωρολόγος, meteōrologos*, discussing celestial phenomena, from *μετέωρον, meteōron*, meteor + *λέγειν, legein*, to say). The study of the atmosphere and its phenomena. Efforts are being made by every civilized nation to apply to the benefit of mankind the knowledge we possess of meteorology, especially to foretell the winds and weather from day to day and the general character of the seasons from season to season. About fifty official governmental weather bureaus receive reports from their stations by telegraph daily, compile weather maps, issue forecasts, and publish weekly, monthly, or annual climatological summaries, together with frequent special meteorological memoirs. Among the most prominent of these, on account of the extent of their territory and the value of their publications, are those of Austria-Hungary, Great Britain, France, Germany, Italy, Russia, India, Argentine Republic, Canada, and the United States. The total annual expenditure by all Government services on meteorological work is not less than three million dollars, to which should be added an equal sum to represent the great amount of work that is done without pay by voluntary observers. Several private meteorological establishments are maintained by wealthy lovers of science, most prominent among which are those of Vallot, on Mont Blanc; A. Lawrence Rotch at Blue Hill, near Boston; L. Teisserenc de Bort at Trappes, near Paris. There are also numerous municipal observatories, prominent among which are that of the New York City Central Park, Dr. Daniel Draper, director, and those of Montsouris and the Tour Saint Jacques in Paris, of which Dr. J. Joubert is director. Observatories are also maintained by special associations, such as those on the Santis. Austria, the Jesuit observatories of Saint Helier, Havana, Zikawei, Manila, and the one recently destroyed at Antananarivo, in Madagascar. Special mention should be made of Symons's British Rainfall System, to the development of which his life was devoted and the perpetuity of which is now assured by the terms of his will. Over three thousand stations are maintained in the British Isles. Organized systems of rainfall stations have also been maintained in Mauritius, Jamaica, Barbadoes, Antigua, and Saint Kitts.



WEATHER MAP FOR SUNDAY, APRIL 3, 1892, 8 A.M.

In addition to its material progress in observers and apparatus, theoretical meteorology has especially profited by the labors of eminent physicists. Those who have, since 1850, contributed most to our knowledge of the mechanics and physics of the atmosphere may be enumerated as follows: Adolph Erman, who published in 1868 a memoir on the distribution of winds and pressure over the globe; J. C. Redfield, who showed the mechanism of extended hurricanes; James P. Espy, who published several reports and a volume on the philosophy of storms, explaining in general how atmospheric moisture, by its condensation into cloud and rain, disturbs the equilibrium of the atmosphere and produces both local and general storms; William Ferrel, who published numerous papers developing the laws of the motions of the earth's atmosphere and its general and local phenomena as resulting from the rotation of the earth on its axis, the evaporation and condensation of aqueous vapor, and the general influence of the solar heat; Lord Kelvin, who first gave the laws of thermal convective equilibrium for dry air; Peslin, who gave the laws of thermal equilibrium for moist air; Von Helmholtz, Willy Wien, Oberbeck, Guldberg and Mohn, Margules, Diro Kitao, Rayleigh, Pockels, Sprung, and F. H. Bigelow have made important contributions to the hydrodynamic problems of the atmosphere; Prof. H. Hertz, W. von Bezold, and Marcel Brillouin have contributed greatly to the perfection of our knowledge of the thermodynamic problems. The most recent contributions in this field include that of Pockels, on the Theory of the Formation of Rain in slowly ascending currents of moist air (see *Wiedemann's Annalen*, January, 1901); Prof. F. H. Bigelow's tables in his reports on International Cloud Work (Washington, 1900); his report on Barometry (Washington, 1902); Neuhoff's memoir on Adiabatic Changes in the Atmosphere (Berlin, 1900); Berson and Assmann's *Scientific Balloon Ascensions*, 3 vols., quarto (Berlin, 1900); all which respectively contain highly important investigations.



WEATHER MAP FOR MONDAY, APRIL 4, 1892, 8 A.M.

Our knowledge of meteorological conditions has been obtained for the most part by observation of the clouds or by stations on mountain tops. More recently it has been found desirable to study conditions at considerable altitudes above stations and places. In order to obtain better data for the lower atmosphere, at least partially to meet the needs of the case, Americans have developed the art of obtaining meteorographic records by sending up meteorographs on kites to heights of one or two miles; on the other hand, Europeans have given attention to the development of the balloon and especially the small sounding balloon which can carry a meteorograph to an elevation of six or eight miles above sea level, where man cannot live. The exposure of meteorological apparatus so that the records from different stations on the earth's surface and from vessels on the ocean and from kites or balloons in the atmosphere shall be comparable with each other offers many difficult problems, but the progress toward uniformity throughout the world has been appreciable during the past twenty-five years. Every first-class weather service now keeps close watch of the condition of its apparatus and the correctness of the methods in vogue at its stations. Although much remains to be done, yet the contrast between the condition of affairs in 1850 and that in 1900 is very great, and the present outlook is very encouraging.

In some cases the larger portion of the funds and forces of a weather service is spent upon observations and climatological work, but in most cases the daily forecast work takes precedence, since that promises immediate results in saving life and property. In order to carry on this work properly, numerous stations must be connected by telegraph with the central bureau, at which several simultaneous observations must be received daily from the observers, and weather charts must be promptly made out showing the isobars, isotherms (qq.v.), state of the wind and weather, moisture and clouds over a large region of country. The accompanying charts, for April 3d, 8 A.M., and 4th, 8 A.M., 1892, show the general character of such daily weather maps; they will easily be understood by studying the respective legends. On these charts the reader will see the development of a storm that began with an area of low pressure in Colorado and rapidly developed into the great storm centre shown on Chart 2; the latter then passed northeastward over the Lake Region and the Gulf of Saint Lawrence and was followed by an extensive area of clear cool weather on April 5th. The movements and changes of storms and weather will undoubtedly be fully understood only in proportion as we have better knowledge of the facts and of the mechanical and physical laws that govern the atmosphere, but their approximate prediction from day to day is expected and demanded by reason of the many interests that depend upon the wind, temperature, and weather. At present such forecasts are generally based on the evident trend of events, as shown by comparing together the two or three latest weather maps, and in part also on empirical rules or generalizations, based on the study of similar types of maps in preceding years; but in some cases also one may be guided in part by general physical principles that must apply to the case in hand. The generalizations relative to storm movements for the United States, that is to say, the statistics of storms, have been presented in three memoirs by Prof. Elias Loomis, and printed in the *Memoirs of the National Academy of Sciences.* Similar data for the Northern Hemisphere as a whole were published in 1893 in *Bulletin A* of the United States Weather Bureau; this compilation is mostly the work of Prof. E. B. Garriott and is based upon ten years of daily maps (1878 to 1887), originally published in the *Bulletin of International Simultaneous Observations.* In this volume the paths of the storm centres are classified by different types and displayed on charts that show the frequency with which storm centres pass over each square of latitude and longitude.

Charts of storm paths for Europe, Asia, and Japan have been published by Germany, Russia, and Japan respectively, and monthly charts for the United States have been published regularly since January, 1873. By means of these charts one may, in a general way, anticipate the path and velocity of a storm centre when once it has appeared in any part of the Northern Hemisphere. In the Northern Hemisphere such centres move westward when they lie between the equator and the parallels of 25° or 30° N.; they then curve poleward and move northeastward with increasing rapidity toward the parallel of 60° or 70°. The variations from this general rule can best be understood by studying the charts of storm frequency. A similar rule holds good for the Southern Hemisphere, substituting only south for north. But little is known about the tracks of storms within the Arctic Circle. The region of greatest storm frequency extends in a narrow belt east and west from Lake Superior to Newfoundland and its prolongation eastward ends in the interior of Northern Russia. The region of next greatest storm frequency covers the islands of Japan. The north polar region of cold air, whose tendency is to flow outward toward the equator, is inclosed within an oval curve extending from Luzon over Japan, Southern Alaska, British Columbia, the region of the Great Lakes, Newfoundland, the Hebrides, Northern Norway and Sweden, and ending in Siberia at latitude 60° and longitude 90° east of Greenwich. South of this oval the prevailing winds are west and southwest; north of it they are north and east in the stormy season of the year.

The great whirls that we call general storms occur in connection with these polar and equatorial currents, but not necessarily between them. The whirls are explained as partially due to mechanical reactions between the northern and southern currents, but they are not merely hydrodynamic phenomena, since they have also an additional thermodynamic relationship which is quite as important. The warm, moist southerly winds are underrun by the colder and drier northerly winds. This enforced elevation of the southerly winds is accompanied by a corresponding expansion and cooling of the air that is thus elevated, and generally it is soon cooled to its dew point or below. This is followed by condensation of aqueous vapor and the formation of cloud, rain, hail, or snow with a great liberation of latent heat. Consequently the cloudy region will be warmer, but especially will it have a much smaller specific gravity than before.

In very small storms, such as tornadoes, waterspouts, etc., this process gives rise to very rapid uprising currents, a very rapid whirl around the central axis and a very low barometric pressure at the centre, but in extensive storms the vertical current is not so conspicuous, although the buoyancy of the central air tends very strongly to maintain the disturbance. The storm centre undoubtedly has a tendency to move toward the region in which the temperature and buoyancy are most disturbed; but as this region is always moving in advance, the storm centre will remain in the rear and its path will advance somewhat to the left of the direction of the greatest disturbance. But the uplifting of the lower moist air may be greatly intensified if the southerly winds on the eastern half of the storm area are being pushed up over high lands, or it may be almost wholly annulled if these winds must necessarily descend from the high lands to the ocean level. Therefore the relation of the storm's motion to the continents must be carefully worked out.

As regards weather prediction, it is evident at once that the descending winds and those that are coming from the north southward are being warmed up, and therefore in their presence the storm disappears and the weather clears away. For the Atlantic coast of North America rain is to be forecasted only when a south and east wind prevails, and especially when it is blowing on the coast. The actual effect of mountains, plateaus, continents, and the underflow of cold air varies so much on every occasion that the best one can do in forecasting is to familiarize himself thoroughly with the illustrations and exceptions that appear on every daily weather map.

The atmosphere would be at rest on the earth's surface and whirl about with the globe were it not for the sun's heat. All the important meteorological phenomena may be considered as resulting from the interaction of the solar heat, the moisture in the air, the varying temperature, and the centrifugal reaction due to the rapid diurnal rotation of the earth on its axis. The solar radiation maintains the temperature of the equatorial regions. The cold air of the polar region is both by gravity and by centrifugal force driven toward the equator. Thus the general currents are maintained moving from the poles toward the tropics and return. They are most intense in the Northern Hemisphere in January, when the sun is farthest south or over the Tropic of Capricorn, because at that time and subsequently the difference of temperature between the equator and the North Pole is greatest, and the reverse holds good in June, when the sun is north of the equator. The general circulation is greatly modified by the difference in temperature and moisture of the air over the land and the ocean, so that in summer-time the tendency of the air to flow inward toward a continent or mountain is very decided. The general circulation is also greatly modified by the presence of snow, ice, mountains, plateaus, clouds, forest, etc. The winds, when once formed by differences of temperature and moisture, are themselves affected by the rotation of the earth. No matter in what direction they may be moving they are at once deflected from their polar path; in the Northern Hemisphere they turn to the right; in the Southern Hemisphere to the left. Therefore those flowing toward the equator become the northeast and southeast trade winds and those flowing toward the poles, or the upper return trade winds, become the westerly winds of the north and south temperate zones.

The differences in temperature between the continents and the ocean give rise to the so-called monsoon winds. The general centrifugal action of the winds produces a low pressure in the regions about which the winds rotate, namely, a low pressure in the Arctic and Antarctic regions; a low pressure on the left of the winds blowing around a storm centre, and on the right hand side of these same winds considered as blowing around an adjacent region of high pressure; a low pressure at the equator between the northeast and southeast trades. The reaction of the easterly winds near the equator and the westerly winds farther north also produces a similar area of high pressure between these two systems of wind corresponding to the high pressure under the tropics of Cancer and Capricorn.

A full exposition on these and other theorems by Prof. William Ferrel will be found in his *Treatise on the Winds* (New York, 1893). The results of later researches are presented in Prof. F. H. Bigelow's report on international cloud observations (Washington, 1900), and his Report on Barometry (Washington, 1902), but these are written for purely technical and mathematical readers. A general résumé of the laws of atmospheric motion is given in the appendix to Hann, *Lehrbuch der Meteorologie* (Leipzig, 1901). An elementary presentation of the subject, especially adapted to those who are beginning the study of meteorology, will be found in Davis, *Elementary Meteorology* (Boston, 1894); and in Ward, *Practical Exercises in Elementary Meteorology* (Boston, 1899). For the history of practical meteorology in the United States, see Weather Bureau.

Some details as to instruments used in meteorology will be found under the topics: Actinometer; Anemometer; Barometer; Pyrheliometer; Nephoscope; Rain Gauge; Scintillometer; and Thermometer. Some of the results of observation will be found under the topics: Atmosphere; Atmospheric Electricity; Aurora Borealis; Blizzard; Climate; Clouds; Dark Day; Dew; Doldrums; Dust; Equinoctial Storm; Fog; Frost; Hail; Halo; Humidity; Indian Summer; Isobarometric Lines; Isothermal Lines; Lightning; Monsoon; Polarization of Sky Light; Scintillation; Simoom; Snow; Snow Line; Storms; Temperature; Typhoons; Weather; Whirlwinds; Wind.

METEORS (OF. *meteore*, Fr. *météore*, from Gk. *μετέωρον*, *meteōron*, meteor, from *μετέωρος*, *meteōros*, on high, from *μετά*, *meta*, beyond + *αείρειν*, *aeirein*, to lift). A term now applied by astronomers to those shooting stars that flash into view without detonation or explosion. As thus characterized, meteors form a class of bodies distinct from the aërolites (q.v.). Sometimes those meteors of which fragments are not known to reach the earth are called bolides. The phenomena are exactly the same except that the fragments are not actually found.

The brilliant display of November 13, 1866, gave a vigorous impulse to astronomical investigation of shooting stars, leading to the discovery that the November meteors move in an orbit round the sun, and that in all probability this orbit forms a ring or belt of innumerable small fragments of matter, distributed with very variable density of grouping along it, thus corresponding so far to the planetoid (q.v.) group between Mars and Jupiter. It is also known that the motion of this meteor ring round the sun is retrograde; that the earth's orbit at that point where she is situated on November 13-14 intersects this ring; and that, probably in 1799, 1833-34, and 1866-67, it is the same group of meteors which has been observed. The last-mentioned hypothesis has been made the foundation of a calculation of the probable orbit and periodic time of this meteor ring. The fact that a November star-shower may occur for two years in succession, and then recur at an interval of 32 or 33 years, seems to indicate that though the earth may pass through the meteor-orbit every year, the meteors are so grouped at intervals along the ring and their periodic time differs so much from that of the earth that it requires 32-33 years before this accumulating difference amounts to a complete revolution of either the earth or the ring, and a repetition of the star-shower becomes possible.

Professor Newton of Yale, who entered into an elaborate investigation of the subject, concluded that there were five possible periodic times for the meteor ring: 33¼ years, 376 days, 354 days, 188 days, 177 days. The English astronomer Adams then showed that of these the 33¼-year period was the only one actually consistent with known facts, and this is therefore now accepted as the time required by the November meteors to complete a revolution around the sun.

That there is an intimate relation between meteors and comets is an ascertained fact of much interest. There is a great similarity between the orbits of some of the more important showers and certain of the comets, a similarity so close as to establish some kind of mysterious relationship beyond the possibility of mere coincidence.

Popular interest has been very keen in the matter of meteors since the brilliant display of 1866. This star-shower, perhaps the grandest that has ever been observed, was confidently predicted from the occurrence of a similar shower at the corresponding date in 1799, 1833, and 1834. The shower commenced about 11:30 P.M., with the appearance at brief intervals of single meteors; then they came in twos and threes, steadily and rapidly increasing in number till 1:13 A.M. on November 14th, when no fewer than 57 appeared in one minute. From this time the intensity of the shower diminished gradually, wholly ceasing about 4 A.M. The total number of meteors which at that time came within the limits of the earth's atmosphere was estimated at about 240,000, and the number seen at each of the several observatories in Great Britain averaged nearly 6,000. This star-shower, like those of 1833 and 1834, seemed to proceed from the region of the heavens marked by the stars ζ and γ in the constellation Leo; and it has been shown by astronomers that this was the point toward which the earth in her orbit was moving at the time; consequently she had either overtaken the meteoric shower or had met it proceeding in a contrary direction. The meteors on that occasion presented the usual variety of color, size, and duration; the great majority were white, with a bluish or yellowish tinge; a considerable number were red and orange, and a few were blue; many surpassed the fixed stars in lustre, and some were even brighter than Venus at her maximum. Most of the meteors left trains of vivid light 5° to 15° in length, which marked their course through the heavens, and endured for three seconds on an average, then becoming dissipated, though some of the trains were almost 40° in length, and remained in sight for several minutes. On the morning of November 14, 1867, a star-shower nearly equal in magnitude to that of 1866 was observed in this country and in France, but was almost wholly invisible in England on account of the cloudy state of the atmosphere.

METER. See METRIC SYSTEM.

METER, ELECTRIC. See ELECTRIC METER.

METER, GAS. See GAS, ILLUMINATING.

METH'ANE (from *methyl*), MARSH GAS, FIRE-DAMP (Ger. *Sumpfgas*), CH_4. The simplest of the compounds of carbon and hydrogen, usually prepared by heating a mixture of sodium acetate and soda-lime. It is one of the gaseous products of the decay of vegetable matter (especially cellulose) under water, and it is therefore a constituent of the gases bubbling up in the stagnant water of marshes; it is also one of the gases evolved in petroleum wells. It occurs in considerable quantities in some coal mines, where it has often caused disastrous explosions. It is a colorless and odorless gas burning with a non-luminous flame. It is formed in the destructive distillation of organic matter, such as wood, coal, etc., and is, therefore, one of the principal constituents of ordinary illuminating gas, which contains 30-40 per cent. of methane. A very large number of organic compounds can be derived from methane. And since the gradual building up of these compounds from the elements is a matter of great importance in organic chemistry, the synthesis of methane itself, as the first step in innumerable processes employed in producing organic compounds, formed a valuable contribution to chemical science. The synthesis of methane was first effected by Berthelot, who showed that the gas is produced when a mixture of carbon disulphide and water-vapor is passed over red-hot copper. The reaction taking place is represented by the following chemical equation:

$$\underset{\text{Carbon di-sulphide}}{CS_2} + \underset{\text{Water}}{2H_2O} + \underset{\text{Copper}}{6Cu} = \underset{\text{Methane}}{CH_4} + \underset{\text{Cuprous sulphide}}{2Cu_2S} + \underset{\text{Cupric oxide}}{2CuO}.$$

In this manner any quantity of methane can be obtained by using nothing but elementary substances as starting material; for carbon disulphide (q.v.) and water can be prepared by the direct union of their elements.

METHANE SERIES. See HYDROCARBONS.

METHODISM. The name given to the religious movement in England led by John Wesley, appropriated by the numerous churches which have sprung from that movement, and by others which, though not bearing the name, are both historically and spiritually in the Methodist succession. Wesley himself was impatient of all sectarian names, and called the people whom he enrolled in classes for religious culture simply the United Societies, and proudly appealed to the fact that to join the Societies there was no dogmatic or ecclesiastical test, all Christians from Anglicans to Quakers being alike welcome. His definition of a Methodist (abridged) was as follows: "A Methodist is one who has the love of God shed abroad in his heart by the Holy Ghost given unto him; one who loves the Lord his God with all his heart, and soul, and mind, and strength. He rejoices evermore, prays without ceasing, and in everything gives thanks. His heart is full of love to all mankind, and is purified from envy, malice, wrath, and every unkind affection. His one desire, and the one design of his life, is not to do his own will, but the will of Him that sent him. He keeps all God's commandments, from the least to the greatest. He follows not the customs of the world; for vice does not lose its nature through its becoming fashionable. He fares not sumptuously every day. He cannot lay up treasure upon the earth; nor can he adorn himself with gold or costly apparel. He cannot join in any diversion that has the least tendency to vice. He cannot speak evil of his neighbor any more than he can tell a lie. He cannot utter unkind or evil words. No corrupt communication ever comes out of his mouth. He does good unto all men; unto neighbors, strangers, friends, and enemies. These are the principles and practices of our sect. These are the marks of a true Methodist. By these alone do Methodists desire to be distinguished from other men." Wesley's catholicity was so broad that it was indifferent to him whether the books he reprinted for his people were by Roman Catholics or Unitarians. It was his hope that his movement would be the nucleus of a reunited Christendom, and it was with sorrow he saw forces which he could not control carrying his people into permanent separation both from Anglicanism and Dissent. The title Methodist was not a word of his own choosing—it was given by Oxford students because of the strict life of Charles Wesley and his band in the university—and he detested it as soon as it became an ecclesiastical watchword.

POLITY. The polity of early Methodism was suggested by exigencies in the growth of the revival of which it was the outcome. Methodism as an organization dates from 1739, the loosest possible in form. A few Christians met together weekly in 'classes' (the 'class meeting') to pray and to talk concerning the things of God, over whom a leader (a layman) was appointed, whose duty it was to watch over their souls and to give spiritual counsel. The societies were independent of each other, except as they were held together by the itinerating Wesley, who appointed their leaders, and to whom these leaders were responsible. In 1743 Wesley drew up the rules for the United Societies, which have remained the ethical and almost theological standard of teaching and practice from that day to this. As the work extended preachers were appointed. They were of two kinds: clergymen of the Church of England who affiliated with the movement, and who were permanent pastors; and laymen, who were 'itinerants,' moving at first every six months and then every year. In its inception Methodism was preëminently an episcopal movement, oversight, as in the Society of Jesus, being reduced to an exact science. Over the classes were the leaders, over both were the preachers assisted in out-appointments by 'local preachers,' who were laymen with the gift of public address, and from whom the itinerants were recruited. Each preacher had his 'circuit;' and several circuit preachers were under a head (whence arose the 'district,' and, in North America, the 'presiding elder'). There were 'quarterly' and 'district conferences,' and, after 1744, the 'annual conference,' composed of both clergymen and lay preachers. Finally over the whole movement was Wesley himself, giving it vitality, depth of impression, and breadth of view, saving it from fanaticism on the one hand, and laxity on the other, ever guiding and really, though not officially and narrowly, dominating it. A 'general conference,' meeting every four years, arose in the United States after 1792, owing to the great extent of the country.

The relation of the movement to the Church of England is not hard to define. Wesley was a sincere lover of the Church of his fathers, and hoped that the bishops would ordain his preachers and in some way articulate his results into the normal ecclesiastical life of the country. In this he was disappointed, but nothing daunted he went on his way independently, holding that he was justified in this by the unique position he occupied as the providential leader of the movement, and consolidating what became a vast ecclesiasticism. Wesley tried to be a loyal churchman as far as circumstances allowed. But England's call always sounded louder than the Church's, so that he came to feel that he was serving the Church best when disregarding her most.

After Wesley's death in 1791 'the people called Methodists' were governed by the Annual Conference, composed of the Legal Hundred, as the lawmaking body, and all the itinerant preachers as advisory and coöperative. The new denomination—as it was legally ever since 1784, when Wesley entered a deed into the Court of Chancery constituting the Conference, and as it was practically since 1740, when the movement separated from both Moravianism and Calvinism—came to be called the Wesleyan Methodist Connection or Church. The territory was divided into districts for more efficient supervision, whose interests were looked after by the district meeting, and subdivided into circuits whose affairs were governed by a quarterly meeting composed of ministers, local preachers, and stewards, of whom the two last were appointed by the superintending pastor. Various efforts were made to tone down the hierarchical spirit and constitution of the Church by introducing laymen into the Annual Conference and by giving the local church the right to elect its own officers, but these efforts were successful only at the cost of numerous divisions. Finally, in 1878, the Wesleyan Methodist Church introduced the principle of lay representation thus far: that it allowed laymen to sit in the Annual Conference and deliberate with the ministers on all financial and benevolent causes, those of a pastoral nature being reserved to the clergy. In all the Methodist churches of Great Britain and her colonies there is only one order of ministers.

In 1784 Wesley ordained Thomas Coke (q.v.) superintendent for America, and at the Christmas Conference of 1784-85, held in Baltimore, Md., the Methodist Episcopal Church was constituted by the ordination of Francis Asbury as superintendent and the drawing up of an episcopal Church constitution. The new overseers assumed the title of bishop, much to Wesley's disgust, who, out of deference to the Church of England, desired them to be called simply superintendents. But that he considered them to be bishops in the full sense there can be no doubt. In his letter to the Conference stating and defending his position he says: "Lord King's account of the Primitive Church convinced me many years ago that bishops and presbyters are of the same order, and consequently have the same right to ordain. For many years I have been importuned to exercise this right:" but he refused out of deference to the established order. But in America the case was different. There there were no bishops, so that for hundreds of miles there was no one to administer the sacraments. "Here, therefore, my scruples are at an end, and I conceive myself at full liberty, as I violate no order and invade no man's right by appointing and sending laborers into the harvest." Of course it is understood that the American Methodist Episcopacy is in order presbyterial purely, though it is certainly sufficiently catholic in its powers of supervision, especially in its absolute control over pastoral appointments—a control that is, however, limited in practice when dealing with popular preachers and wealthy churches. The other of the two orders is that of deacons, who are strictly differentiated from elders. It is, however, a principle of Methodism that no one type of Church order is of exclusive authority, that the Scripture lays down no model, and that therefore a Church may exercise liberty in matters of polity if she is true to the spirit and general complexion of the Apostolic Church. The non-episcopal Methodist Churches are true to Wesley's idea of oversight through their conferences and districts, but presbyterian in ministry and congregational in some features of their administration. A peculiar feature of all Methodist polity is the itinerancy, or the removal of preachers from one charge to another, which is done by the bishops with the advice of the presiding elders in the Methodist Episcopal churches, and by a stationing committee in the other churches. In the Methodist Episcopal Church the pastoral limit was placed at two years in 1804, at three in 1864, at five in 1888, and in 1900 the limit was removed entirely. Preachers are now reappointed from year to year by the bishop.

THEOLOGY. Few Churches have had less doctrinal disturbances than the Methodist, and this because the main lines of belief have always been accepted with unanimity, and because the stress of evangelism to which she has been called has not given opportunity for speculative discussions. No one has expressed more briefly and admirably the doctrines received by all Methodists than Bishop John H. Vincent: "I. I believe all men are sinners. II. I believe that God the Father loves all men and hates all sin. III. I believe that Jesus Christ died for all men to make possible their salvation from sin, and to make sure the salvation of all who believe in Him. IV. I believe the Holy Spirit is given to all men to enlighten and to incline them to repent of their sins and to believe on the Lord Jesus Christ. V. I believe that all who repent of their sins and believe on the Lord Jesus Christ receive the forgiveness of sin. This is justification. VI. I believe that all who receive the forgiveness of sin are at the same time made new creatures in Christ Jesus. This is regeneration. VII. I believe that all who are made new creatures in Christ Jesus are adopted as the children of God. This is adoption. VIII. I believe that all who are accepted as the children of God may receive the inward assurance of the Holy Spirit to that fact. This is the witness of the Spirit. IX. I believe that all who truly desire and seek it may love God with all their heart and soul, mind and strength, and their neighbors as themselves. This is entire sanctification. X. I believe that all who persevere to the end, and only those, shall be saved in heaven forever." As to the sacraments Methodism holds that the Lord's Supper is a memorial of Christ's death for the spiritual feeding on Him, that He is really present only in the hearts of those who receive Him, and that baptism is a sign of a regeneration already accomplished by faith, and as to adults should be given only to believers. As to infants, baptism is allowed, but not required, and when given is on the ground that the child is already a member of the Kingdom of God. As to atonement, Methodists universally hold to the fact, but are not agreed as to theory. In England the penal substitutionary theory has been held, at least until recently, and that was the common view in America until Professor Miley, of Drew Theological Seminary, published his book on the Atonement in 1879, advocating the governmental theory. But it has been the universal conviction of Methodists that a real atonement was paid to God for the sins of the world, though in 1900 Professor Bowne of Boston advocated the view that it was an act of love to influence men. As to depravity, Methodists hold that it is total in the sense that no man is saved except through God's inciting and enabling grace, but not total in the sense of the Reformation creeds. In eschatology opinions differ. Unlike the older Methodists, many hold now to an intermediate state, and to processes of salvation there for those who never heard of Christ. Dr. Pope presented this view in his *Theology* (1875-76), and his book was placed on the course of study for preachers. The natural immortality of the soul has always been maintained, the first dissentient being Professor Beet in his *The Last Things* (1897; 3d ed., enl., 1899), and more explicitly in his *Immortality of the Soul: A Protest* (1901). Eternal punishment in some sense is a cardinal tenet.

ETHICS. Wesley always retained some of the ascetic fervor of his High Church days, and set forth in his "General Rules for the United Societies" (1743) a standard of conduct of a strict and self-denying type. These rules forbade softness and needless self-indulgence, the using of many words in buying or selling, the use of intoxicants as a beverage, and the reading of books or the taking of diversions that could not be indulged in in the name of Jesus. The early Methodists were accordingly noted for their Quaker-like strictness of life, this even showing itself in regard to dress and jewelry. Amusements like theatre-going, dancing, and card-playing were looked upon, as by the Puritans, with whom Methodists had many points of contact, with abhorrence.

WORSHIP. Wesley was attached to the liturgy of the Church of England, and drew up for the societies at home and in America a service based on the Prayer-Book, which he abridged and changed remorselessly. This was not adapted to American needs and was never used in this country to any extent until recently. It was republished by the Rev. Charles S. Harrower in 1891, and the responsive parts have been widely adopted. But the spirit of Methodism seems opposed to read prayers, and though a modest liturgical service was suggested by the General Conference of the Methodist Episcopal Church in 1896, it goes no further than a responsive reading, the Gloria, and the recitation of the Apostles' Creed, and even this is too ritualistic for some churches. In special rites, however, like baptism, marriage, and burial, all Methodists use a prepared service.

HISTORY AND METHODIST DENOMINATIONALISM. ENGLAND. (For the so-called Calvinistic Methodists, see WHITEFIELD, GEORGE; and for the "Calvinistic Methodist Church" of Wales, see PRESBYTERIANISM.) The paternal absolutism which Wesley exercised he left to his legal successors—the Hundred Ministers—but the control which he had exercised as father of the movement could not be held by his successors. Swung loose from Wesley's hand it was inevitable that the societies would assert their liberties. These liberties had reference to (1) holding service in church hours, which Wesley had opposed out of regard for the Established Church; (2) receiving the sacraments in their own chapels from their own ministers; (3) lay representation in the conferences; and (4) the right of the local church to have a voice in the reception and expulsion of members, in the choice of local officers, and in the calling out of candidates for the ministry. All these principles except the last have been incorporated into all types of Methodism, but the honor of being the first to found a society upon them belongs to Alexander Kilham (1762-98). In 1795 Kilham published a pamphlet, *The Progress of Liberty*, which is a landmark in Methodism, as it is the first systematic presentation of the rights of ministers and laymen. For this book and for statements which were interpreted as reflecting on the Conference he was expelled in 1796. Three ministers joined themselves to him immediately, and soon 5000 members were enrolled, the body taking the name of the *Methodist New Connection* at the date of its organization in 1797. In theology and polity it is similar to Wesleyan Methodism, except in the principle of representation. It was the first effective effort to adjust Methodism to the nonconformist principle, and thus bring it to its logical conclusion.

With the building of chapels there had been a decline in the aggressive zeal of the field-preaching days of original Methodism. In the early part of the nineteenth century news was borne across the Atlantic of the marvelous success of camp meetings as a revival agency, and desire was felt by some to revive open-air meetings in England. Accordingly Hugh Bourne (1772-1852), assisted by William Clowes and other zealous Wesleyan local preachers and exhorters, held a camp meeting at Mow Cap, a hill between Staffordshire and Cheshire, May 13, 1807, and with such favorable results that several similar meetings followed. The parent Conference in 1807 passed a resolution severely condemning such meetings, but Bourne persisted in his use of an evangelism so congenial to early Methodism. For this he and his companions were expelled, and in 1810 they organized an independent Church, which in 1812 took the title of the *Primitive Methodist Connection.* In polity this body is similar to the New Connection Church, except that it has two laymen instead of one to every minister in their Conference, and is especially noted for its large use of laymen both in Church government and in evangelism. It publishes an able review, the *Primitive Methodist Quarterly,* and sustains numerous schools and missions and all the appliances of a strong Church.

A zealous young Wesleyan, William O'Bryan, felt called to carry the Gospel to destitute villages of East Cornwall and West Devon in the early years of the nineteenth century, and had great success in these tours. As this necessarily carried him beyond the bounds of Wesleyan circuits, and he could not limit his work to their harness, he was expelled for his zealous following of Wesley. In 1815 O'Bryan organized his first society, the work developed, other preachers were received, rules were drawn up in 1818, and in 1819 the first conference was held. His societies came to be called *Bible Christians,* although that was not adopted as the official name until 1828. In 1850 they sent Way and Rowe to Australia, where a strong cause has been built up. They also have missions in China. The polity of the Bible Christians is similar to that of the other bodies of reformed Methodists.

The forcing of an organ on the Brunswick Wesleyan Methodist Chapel in Leeds in 1828 against the wishes of the leaders and stewards caused the withdrawal of more than a thousand members and the formation of the *Wesleyan Protestant Methodists.* The dominating influence of Jabez Bunting (minister 1799-1858), who exercised an autocratic power over the Conference, was the indirect cause of the next schism—that over the formation of a theological institution. The opposition to this scheme was led by Dr. Samuel Warren, who was then minister at Manchester, and who was expelled in 1835. Thousands of members sympathized with him and left the Church, forming the *Wesleyan Methodist Association,* which in ten years numbered 21,176 members. Independent speech and action in the Conference being impossible under Bunting, an outlet for criticism was found in anonymous publications and periodicals. To find out the authors of these articles strong measures were adopted, and every member of the Wesleyan Methodist Conference was subject to a system of rigid questioning. For failure to answer these and other questions James Everett and other ministers of standing were expelled in 1849. The revulsion against these proceedings was equal to that against State control in Scotland six years before. One hundred and twenty thousand members left within three years and the contributions fell off £100,000. This separation helped to swell the nonconformist churches, but many kept up a Methodist organization—generally called the *Wesleyan Reformers* —until 1857, when they united with the *Protestant* (Leeds) and *Association* (Warren) Methodists to form the *United Methodist Free Churches.* This body carries on large missionary and educational work. Its polity is thoroughly representative, and is congregational as to the supremacy of the local church in purely local affairs.

Under the charge of English Wesleyan Methodism in 1854 the Connectional Relief and Extension Fund was inaugurated, in the same year that the Wesley Chapel Fund was established on a new basis, and in 1861 the Metropolitan Chapel Building Fund for the building of fifty new churches in and near London was founded by the gift of £50,000 by Sir Francis Lycett. The Children's Home was established in 1873 by the Rev. Thomas Bowman Stephenson, which has developed into a magnificent charity, with branches in several cities and a house in Canada. In 1873 the Sunday School Union was founded for the extension of that cause. But the most important change is the introduction of laymen into the Annual Conference since 1878. There are now two sections of the Conference—a ministerial for the consideration of matters relating to the clergymen, and a mixed section for the financial and other matters in which all are interested. This tardy and partial recognition of laymen has given an impetus to the parent Church, seen especially in the munificent gifts for the Million Guinea Century Fund in 1899-1902.

Ireland. In Ireland, Wesley had been preceded by Thomas Williams, who in 1747 gathered a society in Dublin. Wesley came in that same year and was greatly encouraged, and all through the second half of the eighteenth century both English and native itinerants traveled through the country, establishing societies in some towns, but being frequently mobbed, fined, and imprisoned. In the Irish Rebellion of 1798 the Methodists were the special objects of Irish wrath and suffered numerous tortures. It was they who saved Dublin from being sacked by timely communication of the intentions of the rebels. The first Irish Conference was held in 1752. But Methodism was unable to affect Irish life deeply. The membership has never reached 30,000, and the highest number was, as far back as 1814, 29,388. The Irish were even more insistent on receiving the sacrament at the hands of their own ministers (rather than going to the Episcopal Church) than the English were, and in this they were favored by Dr. Coke, who frequently presided over the conferences. In January, 1818, the *Primitive Wesleyan Methodist Society* was formed under the leadership of the apostolic Adam Averell, whose banner was "The Sacrament from the Established Church." The regular Methodist Church in Ireland declared for independence. In 1878 the two united.

Scotland. Wesley found Scotland stony ground. He received an attentive hearing, but not much response. Whitefield told him plainly that he had "no business in Scotland." But he persevered and established his societies. The Rev. D. Butler has recently shown in two interesting studies the influence of Wesley on Scotland and the debt which Wesley himself owed to Scougal's *Life of God in the Soul of Man* (1671), a book that he had reprinted in 1744. Consult Butler, *Wesley and Whitefield in Scotland* (Edinburgh, 1898); *Henry Scougal and the Oxford Methodists* (Edinburgh, 1899).

France. English soldiers carried Methodism to Jersey, in the Channel Islands, as early as 1779, and Robert Carr Brackenbury, a wealthy layman, who could speak French, was sent there in response to their converts. Wesley himself spent a fortnight in the islands in 1787, preaching and exhorting from house to house. In 1790 the mainland was invaded, and from that day to this Methodism has always had a foothold in France. In 1818 Charles Cook began his ministry there. Cook died in 1858 and left his two sons to carry on his work. In 1852 France was made a separate conference, and the full supervision of the mission was left in her own hands. Some notable men have wrought their lives into French evangelization—Cook and his two sons, Emile F. and Jean Paul, Gallienne, Hocart, and Gibson. One of the best lives of Wesley ever written we owe to this mission, that by J. W. Lelièvre (1868, trans. 1871, new ed. 1900).

Germany. A young Württemberger, C. G. Müller, went to London in 1805 on business, was converted, became a local preacher, in 1830 returned to South Germany, became a missionary of the Wesleyan Conference, and when he died in 1853 left 67 preaching places, 20 local preachers, and 1100 members, chiefly in Württemberg. In 1849 Ludwig S. Jacoby went out from America, and for fifty years English and American Methodism labored in different sections of the German Empire. In 1898 England handed over to the Methodist Episcopal Church her missions in Germany, and a union was effected.

Italy. In 1852 the French Methodists sent M. Rostan to the Piedmont valleys, who established several stations. In 1861 the Wesleyan Methodist Conference in England sent Green and Piggott to Florence, and they soon had flourishing missions in North Italy. In 1872 Leroy M. Vernon began his work in Bologna as representing the Methodist Episcopal Church. Further particulars as to European Methodism will be found below under *Missions.*

America. The first Methodist society in the New World was recruited from the German refugees to Ireland driven out of the Palatinate by Louis XIV. Two of these, Philip Embury and Barbara Heck, had been converted in Ireland, and upon arriving in New York, in 1766, they began preaching. Thomas Webb, an army captain and local preacher, also preached in New York and elsewhere, and about the same time (1766) Robert Strawbridge, another Irishman, started the work in Maryland, where he was assisted by Robert Williams, who was the apostle of Virginia. In 1769 Wesley sent out Richard Broadman and Joseph Pilmoor, and two years later Francis Asbury and Richard Wright. In 1773 their first Conference was held—10 ministers with 1160 members. In spite of the disastrous influence of the Revolutionary War, at its end they had 80 preachers and nearly 15,000 members. Most of the Episcopal clergy had fled, and Wesley tried to get a bishop in England to ordain one of his preachers for America. Failing in this, he concluded that he himself had authority. The societies in America, Wesley said, "are now at full liberty to follow the Scriptures and the primitive Church, and we judge it best that they should stand fast in that liberty wherewith God has so strangely made them free." He accordingly ordained, September 1, 1784, Whatcoat and Vasey as deacons, on the next day elders, and Coke superintendent. He furnished them with a liturgy and collection of psalms and hymns, articles of religion abridged from the Thirty-nine Articles of the Church of England, and told them to organize the American societies into a church. This was done at the celebrated Christmas Conference in Lovely Lane Chapel, Baltimore, December 24, 1784-January 2, 1785, where Asbury was ordained deacon, elder, and superintendent, the societies taking the name of the *Methodist Episcopal Church.*

The catholicity of the new Church was shown by Wesley's method in regard to both doctrine and discipline. Everything of a sectarian nature was stricken out of the Thirty-nine Articles, so that as they left Wesley's hands they could be subscribed to by almost any evangelical Christian. Nor did he insert any of his own teachings. His design was to provide a generous platform on which all who loved the Lord could rally. As to discipline, no mode of baptism was made obligatory, and even rebaptism of such as had scruples of their baptism in infancy was allowed, and although kneeling was recommended on the reception of the Lord's Supper, it was distinctly allowed that it might be received standing or sitting. Nor was it necessary for people to give up membership in their own Church in order to become Methodist; so long as they 'complied with our rules' they were to have full liberty of attending their own churches. On the other hand, no one could be admitted to communion but members of the society, or such as had received tickets from the preacher. Members who neglected their class-meetings were liable to expulsion, and also members who married 'unawakened persons'—rules that have gone by the board long since.

During the national period the growth of Methodism has been phenomenal. Its polity is vigorous yet elastic, and provides for close supervision of all parts of the field. This it does by reviving the apostolate or apostolic episcopate, and adapting it to present day needs. Itineracy has given it the opportunity to meet the immigrant face to face while establishing his family in their new home, and it has thus been able to proclaim the Gospel everywhere on American soil. But this would have been impossible without a band of preachers alert, brave, consecrated, self-sacrificing, ready to go anywhere with the message of salvation. Perhaps history has never seen a truer type of home missionary than the itinerant preachers of Methodism. Ready to obey orders like the Jesuits, strong to preach like the Dominicans, they have gone everywhere, threading forests, fording and swimming rivers, making friends with Indians or with chance settlers, traveling through parishes a hundred miles or more in extent, meeting their appointments with the regularity of a machine, running the gauntlet of all kinds of dangers. These men of the first generations of Methodists revived the earliest traditions of Christianity. The emphasis put on preaching has been another cause of success. Necessarily deficient in learning, the preachers made up for that by study (a course of study was early prescribed), reading, and contact with men. But they learned above all to be preachers—ready, powerful, interesting extemporaneous preachers. Emphasis on religious experience, personal knowledge of Christ, and victory over all sin, gave both preachers and people a buoyant, triumphant life, and this sense of reality and power invested the pulpit with authority and fascination, and its people with a vitalizing influence over others. At a time when the prevailing type of Christianity was Calvinistic, the Methodists came with the Gospel of a free, full and present salvation, which they preached with tremendous earnestness and without philosophical refinements. Methodism has therefore been a revival Church.

The government of the Methodist Episcopal Church was completely in the hands of the preachers, who received their appointments annually from the superintendents, who were thus invested with large legal and indefinite moral power. This excessive clericalism was the occasion of the first two schisms. James O'Kelly, an earnest Irishman of warm piety and strong personality, tried to have the right of appeal to the Conference recognized in the case of a preacher who felt oppressed by an appointment by the bishop, and, failing in this, led a schism in Virginia in 1792. He organized the *Republican Methodist Church*, which was finally absorbed by other movements. Of greater significance was the agitation to admit laymen into the Church councils, which, being refused by the General Conference of 1824, led to a new Church, in 1828, which took the name of the *Methodist Protestant Church* in 1830. This Church repudiated the episcopate, gave laymen their full rights, and thus disentangled Methodism from hierarchical methods.

To many minds at one time slavery seemed the article of a standing or falling Church. At the beginning Methodism had taken strong ground against slavery, but exigencies of the work in the Southern States led to an abandonment of the old ground. The anti-slavery men of the North would not yield, however, and in 1843 organized the *Wesleyan Methodist Connection* at Utica, N. Y. In government they are similar to the Methodist Protestant Church. They hold stricter ground in regard to secret societies and intemperance than the old Church. The great division on slavery was that in 1844-45, in connection with the case of Bishop James O. Andrew, who had married a slave-holding wife. The *Methodist Episcopal Church, South*, was organized, taking most of the societies in the South. This Church has the same laws and customs as the elder body, with some modification of the disciplinary provisions. The latest division of consequence was that in Western New York in 1860, when the *Free Methodist Church* was organized, a reaction toward the strenuous ideals of primitive Methodism in regard to secret societies, plainness of dress, the use of tobacco, and in the interests of positive Christian teaching and practice. Other and smaller separations have taken place prompted by a desire either for a more democratic or for a purer Christianity, or both, the latest being the organization of the *Independent Methodist Church*, at Newark, N. J., in 1900.

Colored Methodism has had free course in the United States. Housed at first in the parent Church, the colored people came out in Philadelphia under Richard Allen in 1816, and organized the *African Methodist Episcopal Church*, with doctrine and polity similar to the old Church. Four years later the *African Methodist Episcopal Zion Church* was organized in New York. The *Colored Methodist Episcopal Church of America* was organized by action of the Methodist Episcopal Church, South, December 16, 1870. The Methodist Episcopal Church has colored conferences in the South, an integral part of her organization, but she has never elected a colored bishop since the death of Francis Burns in 1863.

The struggle for the rights of laymen in America has been similar to that in England. The Methodist Episcopal Church, South, not only (since 1869) admits laymen to the General Conference in equal numbers, but admits four laymen from every district in the Annual Conference. The African Churches do the same. After the organization of the Methodist Protestant Church, 1828-30, the agitation rested in the Methodist Episcopal Church until 1852. But it was not until 1872 that that Church granted place to laymen in her supreme council; and then only to the extent of two laymen from each Annual Conference, which gave the preponderance to the ministers three to one. In 1900 the ratio of representation was made equal.

Canada. The Palatines, who did so much for Irish Methodism and who founded the Church in the New World, were also the organizers of the first class in Canada—at Augusta, Ontario, in 1778. In fact, it was the same Paul and Barbara Heck, their sons and relatives, and the widow and son of Philip Embury, who constituted that class. George Neal, a school teacher in the Niagara district, preached to the people on Sunday and on week evenings after 1786, and gathered his converts into classes. He kept up this work for years, but was not ordained until 1810. William Losee was the first itinerant minister. He preached in and around Kingston in 1790 and following years, and in 1791 and thereafter Canada was regularly supplied with ministers from the United States. In 1800 there were one district, four circuits, seven preachers, and 936 members. Relations with the Episcopalians were not always friendly. Canada was a part of the Genesee Conference of the Methodist Episcopal Church until 1824, when the Canada Conference was organized. In 1828 the Church was made independent and became the Methodist Episcopal Church in Canada. The English Methodists began work in Montreal in 1814, extended it into Ontario in 1818, and took over the Methodist Episcopal Church in 1832, though the latter resumed an independent existence in 1834. Methodism in the eastern provinces was founded by the apostolic William Black, a notable figure, who began his work in Nova Scotia in 1782. Other branches of English Methodism were likewise planted in Canada. In 1874 the Wesleyan Methodist Church of the Dominion united with the New Connection Church, and in 1883 these united with the Methodist Episcopal, Primitive Methodist, and Bible Christian—making one Methodism in Canada. The union has been eminently successful. There are also colored churches.

AUSTRALIA. Two schoolmasters and farmers, who were sent out from England to take charge of the convict schools, established the first class, in Sydney, March 6, 1812. They soon applied for a missionary and in 1815 Samuel Leigh, the Apostle of Australia, landed and took up the work. Others followed, and wonderful success attended their labors, often wrought with heroic self-sacrifice and bravery. In 1820 Methodism went to Tasmania, 1822 to the Friendly Islands, 1823 to New Zealand, 1835 to the Fiji Islands, 1838 to South Australia, and 1839 to Western Australia. In 1854 all the Wesleyan Methodist Churches were united in one conference (including New Zealand), and in 1873 those of Tasmania and the South Sea Islands were united with these, making the Australasian Church. The Primitive Methodist and other English Methodist denominations were also established in Australia, but in 1900-02 these all united with the Wesleyans, making one Methodism in the South Pacific.

MISSIONS. All the Methodist Churches sustain extended missionary operations, but it is impossible here to do justice to their work. A society was gathered in Sierra Leone in 1792, and in 1811 the Wesleyan Conference sent George Warren as the first missionary to Africa. Churches have been established among both natives and Europeans, and in 1884 William Taylor opened up the Congo country. Bishop Hartzell is now coördinating the work over a vast territory with the progress of civilization. In 1814 Thomas Coke, with six missionaries, founded the first Methodist missions in Asia, which have realized great results in converts, literature, and scholarship. The American Church sent Melville B. Cox to Africa in 1833, and William Butler founded missions in India in 1856, which have recently achieved notable results among the peasants of North India—the natives coming into Christianity faster than they can be cared for. In 1873 Butler also began work in Mexico, where hospitals, schools, and churches have been established. Numerous missions exist in South America. Scandinavia has proved a good soil for Methodism; even Finland has been entered, and Switzerland has several societies. In 1900 the Methodist Episcopal Church made John H. Vincent resident Bishop in Europe, where there are already five conferences. Mission work in China has had marvelous success, considering the circumstances, where various Methodist bodies are working in harmony. This is eminently true of Japan, though here efforts have been made to merge the Methodist denominations into a single Japanese Church. The Malay country has been entered, and in 1900 missionaries were sent to the Philippine Islands.

EDUCATION. Though Wesley was obliged to use uneducated men as preachers, he insisted on their diligence in reading and study. He was wont at times to gather them at Kingswood, near Bristol, where he instructed them in Pearson, *On the Creed*, Aldrich's *Logic*, and rules for action and utterance; but it was not till 1834 that it was decided to open institutions for the training of ministers, and even then amid much opposition, partly on account of fear of loss of the old spirituality, freshness, and independence, and partly on account of the preponderating influence of Bunting. In 1834 an institution was opened at Hoxton, London, removed to Richmond, Surrey, in 1843; another was opened in Stoke Newington in 1839, merged in the Richmond school in 1843. The Didsbury institution near Manchester received students in 1842; that at Headingly, near Leeds, in 1868; that at Handsworth, near Birmingham, in 1891. These schools are both academic and theological, and not on the grade of American theological seminaries. These, as well as Wesley College for boys at Sheffield, the Leys school in Cambridge, and Trinity College, Taunton, are in connection with the Wesleyan Methodist Church, which also supports a system of day schools having 159,000 scholars and an annual expenditure of £259,000, with training colleges for teachers in Westminster and Southlands. In Ireland there are Wesley College, Dublin, and the Belfast Methodist College. In Australia and New Zealand there are three theological institutions and ten colleges. The Primitive Methodists have a college for ministers at Manchester, and colleges for youths in York and Birmingham. The New Connection Church has a theological institution at Ranmoor, near Sheffield, opened in 1864. The Bible Christians have Shebbear College at Highampton, Devon, and a girls' school at Edgehill. The other Methodist churches of England have their own schools, of which there are also many—especially among the Wesleyans—in mission fields.

In America foundations for a college were laid as early as 1785, and in 1787 Cokesbury College was opened at Abingdon, Md. After eight years of prosperous life it was burned. It was rebuilt, but was burned again in 1797. After this Asbury turned his attention to founding humbler schools here and there. In 1817 an academy was built at Newmarket, N. H., closed December 30, 1823, but opened again at Wilbraham, Mass., November 5, 1825. The oldest academy having a continuous existence is at Kent's Hill, Maine, founded in 1821. Cazenovia Seminary, at Cazenovia, N. Y., was founded in 1825. The oldest college is Wesleyan University (1831), at Middletown, Conn. A regular course of study for probationers for the ministry, continuing four years, with annual examinations at the Conference, was marked out in 1816. Between 1820 and 1847, however, academies and colleges furnished all the education received in school in theological branches by candidates for the ministry, and that was meagre, as classical and scientific studies necessarily predominated. There was in fact a deep-seated prejudice against theological schools, lest they should become centres of heresy, as well as deprive men of that spirituality, earnestness, and self-sacrifice which characterized early Methodist preachers. It was not till 1840 that the first theological institution was opened, that at Newbury, Vt., removed to Concord, N. H., in 1847, to Boston in 1867, and incorporated in Boston University in 1871. Garrett Biblical Institute at Evanston, Ill., now in connection with Northwestern University (the largest university in Methodism), began in

1856, and Drew Theological Seminary at Madison, N. J., in 1867. Gammon Theological Seminary, for colored preachers, was founded in South Atlanta, Ga., in 1883, and the Grant University School of Theology, for whites, at Chattanooga, Tenn., began work in 1886. In the Methodist Episcopal Church there are 25 theological institutions, 56 colleges and universities, 60 classical seminaries, 8 women's seminaries and colleges, 99 foreign mission schools, and 4 missionary training schools. There is an important school for classical and theological instruction at Frankfort-on-the-Main, another at Bareilly, India, and smaller schools of the same kind in other mission fields. The Methodist Episcopal Church, South, reports 147 schools and colleges, one of the largest being Vanderbilt University at Nashville, Tenn., with a theological school, organized in 1875. The Methodist Protestant Church has colleges at Adrian, Mich. (1859; theological department, 1882); Westminster, Md. (1868; theological department, 1882); and Kansas City, Kan. (1896). The Free Methodists have seminaries at North Chili, N. Y.; Spring Arbor, Mich.; Greenville, Ill.; Ross, Wash.; and Evansville, Wis. Canada established an academy at Cobourg, Ontario, in 1836, which was made a college in 1841, the first degree-conferring body in Ontario; a medical faculty was added in 1854, law in 1860, theology in 1871, and the whole (Victoria University) removed to Toronto in 1892. The Wesleyan Theological College in Montreal was established in 1873, and the Mount Allison College at Sackville, N. B., in 1859. There are several academies and female colleges.

Journalism and Publishing Interests. Every branch of Methodism has its book room and publishing house. Those of the Wesleyan Methodists in London and Methodist Episcopal Churches, North and South, in New York and Nashville (with their branches), are among the largest publishing houses in the world, and the house in Toronto is the largest in Canada. There are many weekly and monthly periodicals. The *Wesleyan Methodist Magazine*, London, was established under the name of the *Arminian Magazine* in 1778, the *London Quarterly Review* in 1853, the *Primitive Methodist Quarterly* in 1858, the *Methodist Review*, New York, in 1818 (quarterly, 1830, bi-monthly, 1885), the *Methodist Review*, Nashville, 1847, and the *Canadian Methodist Quarterly* in 1889 (merged in the *Methodist Magazine*, Toronto, in 1896).

Statistics. According to the latest issue of the *Methodist Year Book* (New York, 1903), and the best figures that can be obtained, the statistics of Methodism at the close of the year 1902 were as follows:

DENOMINATION	Ministers	Churches	Communicants
Wesleyan Methodist Church:			
Great Britain	2,238	8,508	496,710
Ireland	253	468	28,650
French Conference	37	143	1,646
South African Conference	202	826	93,660
West Indian Conferences	93	431	45,726
Foreign Missions	395	2,404	64,614
Methodist New Connection	207	674	42,929
Primitive Methodist Church	1,048	5,413	195,651
Bible Christian Connection	212	793	28,877
Wesleyan Reform Union	18	188	7,849
United Methodist Free Churches	444	1,392	93,684
Independent Methodist Churches	397	156	8,644
The Methodist Church, Australasia	932	5,539	131,774
The Methodist Church, Canada	2,030	....	291,895
Methodist Episcopal Church (Home and Foreign)	17,922	27,875	2,997,772
Methodist Protestant Church	1,647	2,401	184,097
Wesleyan Methodist Connection	700	516	17,000
Methodist Episcopal Church, South	6,247	14,774	1,518,854
Free Methodist Church	1,001	1,009	28,038
Union American Methodist Episcopal	180	205	16,500
Congregational Methodist	400	398	22,000
New Congregational Methodist	192	366	4,000
Primitive Methodist Church, United States	73	112	6,520
Independent Methodist	8	15	2,569
Evangelical Missionary	64	44	2,036
African Methodist Episcopal	6,429	5,715	728,354
African Methodist Episcopal (Zion)	3,310	2,985	542,422
African Union Methodist Protestant	68	68	2,930
Congregational Methodist (Colored)	5	5	319
Colored Methodist Episcopal	2,061	1,433	204,972
Zion Union Apostolic	30	32	2,346
	48,843	84,888	7,813,998

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METHODIST CHURCH, FREE. See METHODISM.

METHODIST EPISCOPAL CHURCH. See METHODISM.

METHODIST EPISCOPAL CHURCH, SOUTH. See METHODISM.

METHODIST NEW CONNECTION. See METHODISM.

METHODIST PROTESTANT CHURCH. See METHODISM.

METHO′DIUS (also called EUBULIUS) (?-c.311). A noted Greek theologian of the third century, a martyr and Church father. He was Bishop of Olympus in Lycia and perhaps of Tyre. He was a contemporary of Porphyry and suffered martyrdom about 311. Epiphanius calls him "a very learned man, and a strenuous asserter of the truth." He vigorously opposed Origen. Of his numerous works, which are mostly dialogues, several exist complete either in Greek or Syriac, the most important being the *Banquet*, a Christian counterpart to Plato's *Symposium*. It is in Migne, *Patrol. Græca*, xviii., and has been edited by Bonwetsch (Leipzig, 1891); there is an English translation in the *Ante-Nicene Fathers* (vol. vi.).

METHODIUS. The apostle to the Slavs. See CYRIL AND METHODIUS.

METHOD OF CHARACTERISTICS. See CHARACTERISTIC.

METHOD OF DIFFERENCE (in logic). See INDUCTION.

METHUEN, mė-thū′*e*n. A town in Essex County, Mass., two miles north of Lawrence, on the Spicket River, and on the Boston and Maine Railroad (Map: Massachusetts, E 2). It has the Nevins Memorial Library; and there are manufactures of cotton and woolen goods, knit goods, worsted goods, yarns, baskets, bells, organs, and hats. The government is administered by town meetings. First settled about 1641, Methuen was part of Haverhill until 1725, when it was incorporated as a separate town. Population, in 1890, 4814; in 1900, 7512.

METHUEN, m*e*-tūn′, PAUL SANFORD METHUEN, Baron (1845—). An English general, born at Corsham Court, Wiltshire, and educated at Eton. He entered the army in 1864 as lieutenant of the Scots Guards; served in the second campaign of the Ashanti War in 1874, and after four years as attaché in Berlin became assistant quartermaster-general for the Home District in 1881. In the Egyptian War (1882) he was staff officer and quartermaster-general, and in Bechuanaland in 1884-85 he won a C.M.G. From 1892 to 1897 he was commander of the Home District, and on the outbreak of the Boer War was put at the head of the first of Buller's three divisions, to relieve Kimberley. He was entirely unsuccessful in this attempt, being severely checked and wounded at Modder River, and, a week after, November 30, 1899, losing in a frontal attack on Magersfontein nearly 1000 men. He retired to Modder River, and did nothing further to hinder Cronje's works. Methuen, together with Hunter, formed the left in Lord Roberts's victorious movement on Pretoria in May and June. In March, 1902, he was captured by De la Rey and Kemp on the way from Vryburg to Lichtenburg. The troops were almost immediately released, and with them Lord Methuen, who had been wounded in the brief engagement.

METHUEN TREATY. A treaty concluded May 16, 1703, between England and Portugal. Soon after the outbreak of the War of the Spanish Succession Portugal agreed to support England against France, and hence a formal treaty was negotiated by Sir Paul Methuen, the English Ambassador at Lisbon. Politically this treaty had the effect of making Portugal the devoted political adherent of England for more than a century. In its commercial aspects the treaty is almost still more interesting. The wines of Portugal were to be admitted into England upon the payment of a duty 33½ per cent. less than the duty paid upon French wines. For this England received proportionate advantages. The result was that for generations the English gentry were addicted to the drinking of port, the Portuguese wine.

METHU′SELAH. According to Gen. v. 21-27, son of Enoch and one of the descendants of Seth, who attained to the age of 969 years and hence has become known as the 'oldest man who ever lived.' The list of ten antediluvian patriarchs in the fifth chapter of Genesis is thought by modern scholars to have some relationship to the legendary list of ten dynasties who ruled Babylonia before the flood and which Berosus embodied in his Babylonian history. The name Methuselah is composed of two elements, *Methu* (= Babylonian *mutu*), 'man,' and *Shelah*, probably the name of a deity; though in regard to all the names in Gen. v., we cannot be certain that the traditional forms have been correctly preserved. Consult Zimmern, *Keilinschriften und das alte Testament*, pp. 535-543 (Berlin, 1902).

METHY. The burbot (q.v.).

METHYL (from Gk. *μέθυ*, *methy*, mead + ὕλη, *hylē*, wood), CH_3. The simplest monovalent radical found in carbon compounds. Like any other radical, it is a group of atoms that cannot exist independently, and that remains undecomposed during many chemical transformations of the substances whose molecules contain it. See Carbon Compound; Chemistry (historical section).

METHYL ALCOHOL, Wood Alcohol, or Pyroxylic Spirit, CH_3OH. A colorless liquid having a peculiar aromatic odor. It boils at a lower temperature than ordinary alcohol, and, like the latter, mixes with water in all proportions. It is largely used in the manufacture of varnishes and for the preparation of 'methylated spirit' (q.v.). Methyl alcohol is one of the products obtained when wood is heated in retorts, out of contact with the air. It is contained in the aqueous portion of the distillate, mixed with pyroligneous (crude acetic) acid, ammonia, acetone, etc. To separate the acid, the mixture is neutralized with slaked lime and distilled, the acid then remaining fixed as calcium acetate. Ammonia may be eliminated in a similar manner, by adding sulphuric acid and distilling. Further, to separate the alcohol from acetone (which is especially objectionable if the alcohol is to be used in the manufacture of aniline dyes), oxalic acid may be added to the mixture and a gentle heat applied. Methyl alcohol acts like a weak base; when brought in contact with oxalic acid it forms the crystalline solid substance called methyl oxalate, while acetone does not react with oxalic acid, and remains in solution. After separating the solid methyl oxalate from the remaining liquid, methyl alcohol may be reobtained from it by dissolving it in potash and distilling. Finally, the alcohol may be freed from water and any remaining impurity by rectifying it over quicklime. An excellent way to obtain pure methyl alcohol from commercial wood spirit is to add to the latter about one-tenth of its weight of iodine and just enough caustic soda to decolorize the solution, to distill off the liquid, and dehydrate the distillate by means of quicklime. All the ordinary impurities of wood spirit, including ethyl alcohol, acetone, aldehyde, etc., are thus converted, by the iodine and caustic soda, into iodoform, which remains behind when the mixture is subjected to distillation. To eliminate the odor of iodoform in the distillate, a little silver nitrate may be added, and the solution redistilled.

METH′YLATED SPIRIT. A mixture of about 90 per cent. of ordinary alcohol and about 10 per cent. of methyl (wood) alcohol. A small amount of paraffin oil is also added, which renders the mixture unfit for drinking, while it scarcely interferes with its properties as a solvent. Methylated spirit is cheaper than ordinary alcohol, and can be used, for most purposes, in place of it.

METH′YLENE BLUE. An aniline dye, occurring in the form of a bluish, finely crystalline powder with a bronze-like lustre. It is slightly soluble in water, and much more freely upon the addition of alcohol. It is largely used as a stain for pathological and normal tissues and for specimens of blood. An attempt has been made to determine the condition of the kidneys by noting the time which elapses between the administration of methylene blue and its appearance in the urine. Aside from the variability of the results obtained with both healthy and diseased kidneys, it cannot be assumed that permeability of those organs for this drug bears a definite relation to that for the normal urinary constituents. It has, however, proved of some value in the treatment of gonorrhœa, and claims are made for it as a substitute for quinine in malaria.

METHYLENE (from *methyl*) **DICHLORIDE,** or Di-Chloro-Methane, CH_2Cl_2. A chemical compound of carbon, hydrogen, and chlorine. It can be obtained by the direct action of chlorine gas on methane (marsh-gas), or by the action of nascent hydrogen on chloroform. It is a colorless heavy liquid, having a chloroform-like odor. It is a powerful anæsthetic, and has been used as a substitute for chloroform. Its effect on the organism is more even than that of similar anæsthetics.

METIS. The daughter of Oceanus and Tethys and wife of Zeus, who devoured her in the fear that the son whom she should bear would be more powerful than himself.

METIUS, mā′tē-ụs, Adriaan (1571-1635). A Dutch geometer, born at Alkmaar. He studied law and medicine, but later devoted his attention to astronomy, and from 1598 until his death was professor of mathematics at the University of Franeker. His mathematical works include: *Doctrinæ Sphericæ Libri* (1598); *Universæ Astronomiæ Institutio* (1605; 2d ed. 1630); *Praxis Nova Geometrica* (1623); *Problemata Astronomica* (1625); *Calendarium Perpetuum* (1627); *Opera Astronomica* (1633); *Arithmeticæ Libri 2, et Geometriæ Libri 6 . . . Trigonometriæ Planorum Methodus* (1626); *De Genvino Utriusque Globi Tractatus* (1624); *Primum Mobile Astronomice, etc.* (1631; 2d ed. 1632-33).

METLAKAHTLA, mĕt′lȧ-kä′tlȧ (properly *Matlakhatla*). A prosperous mission settlement of Chimesyán (q.v.) or Tsimshián Indians, on an island near the extreme southern end of Alaska. The original settlement was some seventy miles farther south, below Port Simpson, on the mainland of British Columbia. Here the Episcopal missionary William Duncan in 1862 established a mission, which within a few months was joined by the whole body of Indians residing near Port Simpson, and prospered so rapidly that in 1886 it had developed into a town of 1500 civilized Indians, with two-story houses, regular streets, a salmon cannery, a sash and door factory, a sawmill, a brickyard, and one of the largest churches in British Columbia. An extensive shawl-weaving industry was also carried on. Unfortunately the British Government undertook to place the Indians of the town under the charge of an agent and reduce them to a reservation status, with the result that almost the entire settlement, led by Duncan, abandoned the place and established themselves at the present location in United States territory, where they continue to maintain their advanced civilization. The original settlement, now called Old Metlakahtla, is almost in ruins, with a population of perhaps 100 souls still remaining.

METONIC CYCLE (so called from its inventor, Meton, who flourished at Athens about B.C. 432). A cycle of nineteen years of 235 lunar months, or 6940 days, at the end of which time the new moon falls on the same day of the year as it did at the beginning of the cycle, and eclipses recur in nearly the same order. This arises from the circumstance that

19 solar years are nearly equal to 235 lunations, their average values being 6939.68835 and 6939.60249 days respectively. As the Greek States reckoned by lunar months, and on this reckoning depended the recurrence of many religious festivals, while on the other hand certain other rites were connected with the recurrence of the seasons, there was a constant effort to bring the solar year (365 days, 5 hours, 48 minutes, 46 seconds) into accord with the period of twelve lunar months (354 days, 8 hours, 48 minutes, 33.6 seconds). Before Meton the favorite cycle was the Octaëteris (or, as it was sometimes called, Enneateris), of eight years with three intercalary months of 30 days. The inaccuracy thus arising was removed by Meton, who in the period of 19 years inserted 7 intercalary months, of which 5 had 30 and 2 had 29 days. They were inserted in the 3d, 6th, 8th, 11th, 14th, 17th, and 19th years. The slight inaccuracy that remained was reduced by Callippus about a century later, by combining four Metonic periods into a 'great year' of 76 calendar years, and omitting one day in the intercalation, obtaining 27,759 days. The details of Meton's cycle are not very clear, and there is considerable difference of opinion among scholars in regard to them. Unger places the beginning of Meton's cycle on July 16th, B.C. 432; Oppert on July 28th, B.C. 433. It is agreed that the Callippic cycle began June 29th, B.C. 330. The Attic calendar, as laid down by Unger, is as follows:

YEAR OF THE CYCLE

MONTHS	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.
Hecatombeon	30	29	30	30	29	29	29	30	29	30
Metageitnion	30	30	29	29	30	30	30	29	30	30
Boedromion	29	29	30	30	29	29	29	30	30	29
Pyanepsion	30	30	29	29	30	30	30	29	29	30
Memacterion	29	30	30	30	29	30	29	30	30	29
Poseideon	30	29	29	29	30	29	30	29	29	30
Poseideon II. (in leap years)	...	...	30	...	...	30	...	30		
Gamelion	29	30	29	30	29	29	30	29	30	29
Anthesterion	30	29	30	29	30	30	29	30	29	30
Elaphebolion	29	30	30	30	29	29	30	29	30	29
Munychion	30	29	29	29	30	30	29	30	29	30
Thargelion	29	30	30	30	29	29	30	29	30	29
Scirophorion	30	29	29	30	30	30	29	30	29	30
Number of days in a year	355	354	384	355	354	384	354	384	354	355

MONTHS	XI.	XII.	XIII.	XIV.	XV.	XVI.	XVII.	XVIII.	XIX.
Hecatombeon	29	29	30	30	30	29	30	30	30
Metageitnion	30	30	29	30	29	30	29	29	29
Boedromion	29	29	30	29	30	29	30	30	30
Pyanepsion	30	30	29	30	30	30	29	29	30
Memacterion	29	29	30	29	29	29	30	30	29
Poseideon	30	30	29	30	30	30	29	29	30
Poseideon II. (in leap years)	30	...	...	29	...	...	30	...	29
Gamelion	29	29	30	30	29	29	29	30	30
Anthesterion	30	30	29	29	30	30	30	30	29
Elaphebolion	29	30	30	30	29	30	29	30	30
Munychion	30	29	29	29	30	29	30	29	29
Thargelion	29	30	30	30	29	30	30	30	30
Scirophorion	30	29	29	29	30	29	29	29	29
Number of days in a year	384	354	354	384	355	354	384	354	384

Consult: Ideler, *Handbuch der Chronologie* (Berlin, 1825-26); Boeckh, *Zur Geschichte der Mondcyclen der Hellenen* (Leipzig, 1855); and *Ueber die vierjährigen Sonnenkreise der Alten* (Berlin, 1863); A. Mommsen, *Chronologie* (Leipzig, 1883); A. Schmidt, *Handbuch der griechischen Chronologie* (ib., 1888); Unger, "Zeitrechnung der Griechen und Römer," in Müller's *Handbuch der klassischen Altertumswissenschaft*, vol. i. (Munich, 1892); Oppert, in *Compte Rendu de l'Académie des Inscriptions et Belles-Lettres* (Paris, 1898).

METON'YMY (Gk. μετονυμία, change of name). A figure of rhetoric by which one thing is put for another to which it bears an important relation, as a part for the whole, the effect for the cause, the abstract for the concrete, etc. For example, "*Lying lips* are an abomination to the Lord."

METOPE, mĕt'ō-pē (Lat. *metopa*, from Gk. μετόπη, *metopē*, space between beam-ends, from μετά, *meta*, between + ὀπή, *opē*, aperture). The space between the triglyphs in the frieze of the Doric order. As this space in the developed Greek architecture is always filled, the name is generally applied to the thin slab thus used. This was often decorated with sculpture in high relief, or with painting. Even where sculpture was used, the background and the relief seem to have been painted in contrasting colors.

METRE. In music, the division of a composition into parts whose rhythm is similar and whose time is equal. The smallest element in metre is the *measure* (q.v.); a *section* comprises two measures, and two sections make a *phrase.* The largest division is the *period,* which consists of two phrases. Theoretically metre differs from rhythm in that the latter deals with accents and with actual and typical patterns which metre arranges in groups in accordance with their time-value. But this definition is not universally accepted, and exactly *opposite* significations are often given to the two terms.

METRE. A designation applied without great precision to measured or rhythmic language called verse; also the rhythmical measure of verse. In those languages whose versification depends not only on the number of feet in a line, but also on the length of the syllable or syllables in each foot, metre designates both the character of the line as a whole and of the feet composing the line. This is true, for example, of Latin and of Greek. In such languages as do not depend on the length of individual syllables for their verse systems, metre applies to the number of stresses or beats in a line, or on the number of counted syllables. This is true, for example, of the Germanic and the Romance languages, although attempts have been made to employ long and short syllables as in the ancient languages. See VERSIFICATION.

METRICAL FOOT. In versification, the designation of the rhythmical unit in a verse. In Greek or Latin poetry this unit may be composed of one or more syllables, all long, or short and long, in various arrangements, as the *spondee*, *dactyl*, *anapest*, etc. (q.v.). In the Germanic and Romance languages the unit may be a single stressed syllable, or a combination of a stressed and one or more unstressed syllables. The metrical foot is marked here not by quantity of individual syllables, but simply by this thesis or accentuation, which corresponds with the regular accentual system of the language, and not necessarily, as in Greek or Roman poetry, with a long syllable. See VERSIFICATION.

METRIC SYSTEM (from Lat. *metrum*, from Gk. *μέτρον*, measure, from *μετρεῖν*, to measure). A system of weights and measures invented by the French in the latter part of the eighteenth century. From earliest times, civilized people have possessed two ideas concerning their standards of weights and measures: that they should be invariable, and that their prototype should be found in nature. All nations have zealously guarded their standards. The Hebrews deposited theirs in their temples, the Romans preserved theirs in the Temple of Jupiter; Justinian standardized the weights and measures of the Empire and deposited them in a church in Constantinople. Dagobert (died in 638) kept the standards of the Franks in the King's palace, and modern nations preserve their units in special archives at their capital cities.

Great diversity in the kinds of units and in the size of the same units has always characterized systems of measures. As early as 1558 Henry II. tried to correct the standard units of France, and a Gabriel Mouton, vicar of Saint Paul at Lyons proposed in 1670 a system remarkably similar to the metric system of today. But not until 1790 did the French Government undertake the making of a new system. For this purpose a committee of the Academy of Sciences was appointed under the authority of the National Assembly and sanctioned by Louis XVI. The committee consisted of Borda, Lagrange, Laplace, Monge, and Condorcet. Of the three linear bases proposed, the length of a seconds pendulum, a quarter of the terrestrial equator, and a quarter of a terrestrial meridian, the committee reported in favor of the last, one ten-millionth of which should be the standard unit of linear measure. Delambre and Méchain were appointed to measure the meridional distance from Dunkirk to Barcelona, the same task which Cassini had undertaken in 1669. This task, difficult in itself, was made the more so by the political revolutions of the times, and required seven years for its completion. The finally computed length of the terrestrial quadrant was in part verified by a comparison with a similar result found by Bouguer and La Condamine in Peru (1736). The length, expressed in English measure, is 32,808,992 feet. Sir John Herschel has since estimated the quadrant to be 32,813,000 feet, which makes the meter 1-208 of an inch shorter than one ten-millionth of a meridional quadrant. In 1793 a temporary commission of twelve was appointed, with Borda as president, to make a comparison of all the units then used in France, and to determine the kinds and composition of the metals to be used in constructing the new standard units, their forms of construction, and finally the place and means of their preservation. In 1798 the European States were invited to send representatives to a conference at Paris, the object being to examine the work executed during the preceding eight years by the various commissions. Nine States responded. Their delegates, together with the ten French commissioners, were divided into committees, which reviewed the work so far accomplished.

On June 22, 1799, the standard units, the meter and kilogram, were presented to the Council of Five Hundred, and deposited in the archives at Paris. In December of the same year the Council adopted these standards. The use of the new system, however, was not made obligatory in all departments until 1837.

The hope of the inventors of the metric system, that it would become the universal system of all civilized nations, seems likely to be realized, for, in one century, its use has been made obligatory in Germany, Austria-Hungary, Belgium, Brazil, Chile, Argentina, Spain, France, Greece, Italy, Mexico, the Netherlands, Peru, Portugal, Rumania, Servia, Norway and Sweden, Switzerland, and Venezuela; its use has been legalized in Egypt, the United States, Great Britain, Japan, Russia, and Turkey. The populations comprised in these two lists of nations are about equal, each being nearly 300 millions. Several attempts have been made to introduce the French system in the United States or to adopt a similar system. On January 15, 1790, Congress ordered the Secretary of State, Thomas Jefferson, to prepare a uniform system of weights and measures. Jefferson, who had been Minister to France, reported, on July 14th, a system founded on the length of a seconds pendulum in the mean latitude of the United States (38°), or in the latitude of 45°. But the English system was not disturbed. Again, in 1821, Congress sought to revise the system of weights and measures, and John Quincy Adams, Secretary of State, recommended in the strongest terms the adoption of the metric system.

In 1866 the law which made the metric system legal in the United States was passed. The same legislation directed that the 5-cent piece should weigh five grams and have a diameter of two centimeters; that the unit for weighing letters in post-offices should be the gram. But these details were imperfectly carried out. The use of units in electrical engineering, based on the metric system, was determined by the law of 1894. Bills have been introduced into the House of Representatives several times, proposing to make the metric system obligatory. The most recent bill of this kind was that of 1902. Although compulsory legislation may not be immediate, the adoption of the metric system is constantly extending, as shown by its use in weighing foreign mail matter, in weighing at the mints, in certain Government publications, in the Pharmacopœia and the Dispensatory, in certain measurements of the Coast and Geodetic Survey, and in much of the work of the arts and sciences.

The basal units of the metric system are: for length the meter, for small surfaces the square meter, for area of land the square hektometer (or are), for volume the cubic meter, for capacity the liter, for weight the gram, and for the monetary system the franc. The scale selected for the multiples and subdivisions of the various units is 10. The prefixes used to designate the multiples of the measuring unit are deka (10), hekto (100), kilo (1000), and myria (10,000), all from the Greek, and those used to designate subdivisions are deci (0.1), centi (0.01), and milli (0.001), from the Latin.

The ratio between the successive denominations in the system of linear measure, of weight, of capacity, and of money is 10, the ratio between the successive denominations of surface measure is 100, and that of cubic measure is 1000. The unit of capacity, the liter, is equal to a cubic decimeter, and approximately so to the volume of a kilogram of water at the maximum density. Its equivalent is 1.05671 liquid quarts (U. S. standard), or .88036 liquid quart (British). The unit of weight, the gram, is the mass weight of one cubic centimeter of water, standard pure, at the maximum density. Its equivalent in the English system is 15.432+ troy grains.

The abbreviations of the following tables are those adopted by the International Commission of Weights and Measures:

TABLE OF LINEAR MEASURE

A myriameter = 10,000 meters
A kilometer (km.) = 1,000 "
A hektometer = 100 "
A dekameter = 10 "
Meter (m.)
A decimeter (dm.) = 0.1 of a meter
A centimeter (cm.) = 0.01 "
A millimeter (mm.) = 0.001 "
A mikron (μ) = 0.000001 "

TABLE OF SQUARE MEASURE

A square myriameter = 100,000,000 square meters
" kilometer (km.^{2}) = 1,000,000 "
" hektometer or hektare = 10,000 "
" dekameter or are = 100 "
Square meter (m.^{2})
A square decimeter (dm.^{2}) = 0.01 of a square meter
" centimeter (cm.^{2}) = 0.0001 "
" millimeter (mm.^{2}) = 0.000001 "

TABLE OF CUBIC MEASURE

A cubic myriameter = 10^{12} cubic meters
" kilometer = 10^9 "
" hektometer = 1,000,000 "
" dekameter = 1,000 "
Cubic meter (m.^{3})
A cubic decimeter (dm.^{3}) = 0.001 of a cubic meter
" centimeter (cm.^{3}) = 0.000001 "
" millimeter (mm.^{3}) = 0.000000001 "

A cubic meter is also called a *stere*, a unit used in measuring wood.

TABLE OF WEIGHTS

A metric ton (t.) = 1,000,000 grams
A quintal (q.) = 100,000 "
A myriagram = 10,000 "
A kilogram (kg.) = 1,000 "
A hektogram = 100 "
A dekagram = 10 "
Gram (g.)
A decigram (dg.) = 0.1 of a gram
A centigram (cg.) = 0.01 "
A milligram (mg.) = 0.001 "
A mikrogram (γ) = 0.000001 "

TABLE OF CAPACITY

A hektoliter (hl.) = 100 liters
A dekaliter (dal.) = 10 "
Liter (l.)
A deciliter (dl.) = 0.1 of a liter
A centiliter (cl.) = 0.01 "
A milliliter (ml.) = 0.001 "
A mikroliter (λ) = 0.000001 "

EQUIVALENTS.

APPROXIMATE EQUIVALENTS

A meter = 39.37 inches = 3¼ feet
A kilometer = ⅗ of a mile
A liter = 1 quart
A kilogram = 2⅕ lbs. avoir.
A gram = 15½ grains
A hectare = 2½ acres
A square meter = 10 square feet

MORE NEARLY ACCURATE EQUIVALENTS

LENGTH

	Inches	Feet	Yards	Fath's	Miles
Millimeter...	0.03937	0.003	0.001	0.000	0.000
Centimeter..	0.39371	0.032	0.010	0.005	0.000
Decimeter...	3.93708	0.328	0.109	0.054	0.000
Meter..........	39.37079	3.280	1.093	0.546	0.000
Kilometer...	39370.79000	3280.899	1093.633	546.816	0.621

CAPACITY

	Cubic in.	Cubic ft.	Dry pints	Gallons	Bshls
Milliliter.....	0.06103	0.000	0.0018	0.000	0.000
Centiliter....	0.61027	0.000	0.0182	0.002	0.000
Deciliter......	6.10271	0.003	0.1816	0.022	0.003
Liter...........	61.02705	0.035	1.8162	0.227	0.028
Hektoliter..	6102.70515	3.531	181.6211	22.703	2.838

WEIGHT

	Grains	Troy oz.	Avoir. lb.
Gram.....................	15.43235	0.032	0.002
Kilogram	15432.34880	32.150	2.204

SQUARE MEASURE

	Square feet	Sq. yards	Acres
Centiare................	10.764299	1.196	0.000
Are........................	1076.429934	119.603	0.025
Hektare..................	107642.993419	11960.332	2.471

TABLE FOR REDUCING FROM ONE SYSTEM TO THE OTHER

(The figures in heavier type represent either of the two columns beside them, as the case may be, viz. with hektares and acres in the first set of columns, **1** acre = 0.405 hektare, and *vice versa* **1** hektare = 2.471 acres, and so on.)

Meter		Yard	Kilogr.		Lb. avoir.	Liter		Gallons
0.914	**1**	1.093	0.454	**1**	2.20	4.40	**1**	0.23
1.829	**2**	2.188	0.907	**2**	4.41	8.81	**2**	0.45
2.743	**3**	3.281	1.361	**3**	6.61	13.21	**3**	0.68
3.658	**4**	4.374	1.814	**4**	8.82	17.62	**4**	0.91
4.572	**5**	5.468	2.268	**5**	11.02	22.02	**5**	1.14
5.486	**6**	6.562	2.722	**6**	13.23	26.43	**6**	1.36
6.401	**7**	7.655	3.175	**7**	15.43	30.83	**7**	1.59
7.315	**8**	8.749	3.629	**8**	17.64	35.24	**8**	1.82
8.229	**9**	9.843	4.082	**9**	19.84	39.64	**9**	2.04
9.144	**10**	10.936	4.536	**10**	22.05	44.05	**10**	2.27
18.288	**20**	21.873	9.072	**20**	44.09	88.10	**20**	4.54
27.432	**30**	32.809	13.608	**30**	66.14	132.14	**30**	6.81
36.576	**40**	43.745	18.144	**40**	88.18	176.19	**40**	9.08
45.719	**50**	54.682	22.679	**50**	110.23	220.24	**50**	11.35
54.863	**60**	65.618	27.215	**60**	132.28	264.29	**60**	13.62
64.007	**70**	76.554	31.752	**70**	154.32	308.33	**70**	15.89
73.151	**80**	87.491	36.288	**80**	176.37	352.38	**80**	18.16
82.295	**90**	98.427	40.823	**90**	198.42	396.43	**90**	20.43
91.438	**100**	109.363	45.359	**100**	220.46	440.48	**100**	22.70

Hektare		Acre	Kilometer		Eng. miles	Square Kilometer		Square Eng. miles
0.405	**1**	2.471	1.609	**1**	0.621	2.592	**1**	0.386
0.809	**2**	4.942	3.219	**2**	1.243	5.184	**2**	0.772
1.214	**3**	7.413	4.828	**3**	1.864	7.776	**3**	1.158
1.619	**4**	9.885	6.438	**4**	2.486	10.368	**4**	1.544
2.023	**5**	12.356	8.047	**5**	3.107	12.960	**5**	1.930
2.428	**6**	14.227	9.656	**6**	3.728	15.552	**6**	2.316
2.833	**7**	17.898	11.265	**7**	4.350	18.144	**7**	2.702
3.237	**8**	19.769	12.879	**8**	4.971	20.736	**8**	3.088
3.642	**9**	22.240	14.484	**9**	5.592	23.328	**9**	3.474
4.047	**10**	24.711	16.093	**10**	6.214	25.920	**10**	3.860
8.093	**20**	49.423	32.186	**20**	12.428	51.840	**20**	7.720
12.140	**30**	74.134	48.279	**30**	18.641	77.760	**30**	11.580
16.187	**40**	98.846	64.373	**40**	24.855	103.680	**40**	15.440
20.234	**50**	123.557	80.466	**50**	31.069	129.600	**50**	19.300
24.286	**60**	148.268	96.559	**60**	37.283	155.520	**60**	23.160
28.327	**70**	172.980	112.652	**70**	43.497	181.440	**70**	27.020
32.373	**80**	197.692	128.746	**80**	49.710	207.360	**80**	30.880
36.420	**90**	222.903	144.839	**90**	55.924	233.280	**90**	34.740
40.467	**100**	247.114	160.932	**100**	62.138	259.200	**100**	38.601

The advantages of the metric system over the English-American system are numerous. Although, in both systems, the standard units of volume, capacity, and weight are directly connected with the standard unit of measure, the relation in the French system is far more simple. Thus, in the English system one quart has a volume of 57¾ cubic inches, while in the French system one liter has the volume of one cubic decimeter; in the English system the pound has the weight of about 0.0156 of a cubic foot of standardized water, while in the French system one gram has the weight of one cubic centimeter. Although the names used in the metric system are generally longer than the names used in the English-American system, the nomenclature of the former has several advantages. Thus, the prefixes deci, centi, milli, deka, hekto, kilo have in point of derivation a numerical significance and have other applications in the language, while the names inch, foot, yard, rod, and mile are devoid of numerical significance and are distinctive in their use. But the greatest advantage of all results from the use of a uniform scale of relation. In the English-American system seldom do more than two units in succession have the same scale. Thus, in the metric system, 10 centimeters = 1 decimeter, 10 decimeters = 1 meter, . . . , the ratio being always 10; while in the English system, 12 inches = 1 foot, 3 feet = 1 yard, 5½ yards = 1 rod, . . ., the ratio changing between every pair of units. The French Commission of 1790 reported in favor of the decimal scale for reasons of expediency, although admitting that the uniform scale of 12 possessed many advantages.

The metric system was once thought to be superior to all other systems of weights and measures in being founded on an invariable magnitude, one ten-millionth of a terrestrial quadrant. But science has dispelled this illusion by showing that this magnitude is not a constant and that the distance originally taken as the basis of the meter was inaccurately measured.

In 1840 the French Government conceived the idea of exchanging sets of the metric units for sets of the units of other nations in order to promote an international interest in the metric system. The international expositions at London (1851) and at Paris (1855) were, on account of the immense variety and confusion of metrical units, the first practical demonstrations of the need of a universal decimal system of weights and measures. At the Paris Exposition of 1867 a committee, representing several different nations, was appointed to consider the question of uniformity, and was called the Committee of Weights, Measures, and Moneys. Mathieu was the president of this commission. The committee recommended instruction in the metric system in the public schools and its use in governmental departments and in scientific publications. The Geodetic Association, which met at Berlin about this time, was also representative of several nations, and likewise favored the general adoption of the metric system. In the year 1869 a committee of the Academy of Sciences at Paris and one of the Saint Petersburg Academy recommended the convocation of an international commission, which should consider the means of providing all nations with sets of standard metric units. Such a commission was invited by the French Government, and assembled at Paris in 1870. Twenty-four countries responded by sending delegates, Joseph Henry and Julius E. Hilgard representing the United States. This body was divided into committees, the most permanent one being the French section, for the purpose of devising means for copying the standards preserved in the archives. Some of the questions which concerned the committee were the composition of the metal to be used in constructing the new unit of length, the most desirable form of cross-section, ways of expressing the length, as the distance between the ends, or between two fine lines made on the bar, means of comparing the new unit with the standard of the Archives, means for determining its variation due to changes in temperature, and other considerations. The French section met in 1872 and proposed that an international bureau of weights and measures be located at Paris, the original conception of the International Bureau being later decided upon at the diplomatic conference of 1875. At the second meeting of the International Commission in 1872 it was decided to make the standard meter and the standard kilogram of the Archives the actual bases for the new standards. In order to give the work of the commission the character of an international act, its members so far being simply citizens of their respective countries, the French Government invited plenipotentiaries and delegates from all of the nations interested. Representatives from twenty States assembled at Paris (1875) to constitute the Diplomatic Conference of the Meter. E. B. Washburne acted as plenipotentiary and H. Vignaud as delegate for the United States. The Observatory of the International Bureau, decided upon by this conference, was completed in 1878. It stands at the entrance of the park of Saint Cloud on a reservation presented by the French Government. The management of the Bureau reposes in the International Committee under the authority of the General Conference. In the Observatory are kept the instruments used in the determination of the international standards, the chief of which are the comparators, balances, and thermometers. The extent of the demands upon this bureau may be inferred from the fact that in 1882 twenty-three countries requested twenty-nine meters and thirty kilograms; in 1889 they requested thirty-six meters and thirty kilograms. The meters are highly polished metal bars made of an alloy of platinum and iridium, and the kilograms are cylinders of the same material.

For a complete history of the metric system, with its present status, its equivalents, the International Bureau of Weights and Measures, and the international abbreviations, consult Bigourdan, *Le système métrique des poids et mésures* (Paris, 1901); Barnard, *Metric System* (3d ed., Boston, 1879); Fouvielle, *Le mètre international définitif* (Paris, 1875); Mendenhall, in *Popular Science Monthly*, vol. xlix. (1896); Potts, *Elementary Arithmetic* (London, 1886); Bassot, *School of Mines Quarterly* (November, 1901). See Weights and Measures.

MET′RONOME (from Gk. *μέτρον*, *metron*, measure + *νόμος*, *nomos*, law). A small machine for indicating the correct time or speed at which a musical composition should be played. It was invented in 1816, and consists of a pendulum, actuated by clockwork, which swings in front of a graduated scale. To the upper part of the pendulum-rod is attached a movable weight which can be set at any figure indicated by the scale. The figure 60 means that when the weight is set there the pendulum swings 60 times a minute. Thus it beats exact seconds. When set at 120 it beats half seconds. The metronome indication appears always at the beginning of a composition. M. M. (Mälzel's metronome, from its reputed inventor, Mälzel) 𝅗𝅥 = 80 means that the tempo must be taken so that 80 half notes fill the space of one minute. The indications differ with the tempo and time of each composition. A work written as allegro in common time might be indicated: M. M. ♩ = 100; allegro in alla breve: M. M. 𝅗𝅥 = 100; adagio in $\frac{6}{8}$; M. M. ♩ = 66; scherzo (Presto ¾): M. M. 𝅗𝅥 =120. By means of the metronome the composer is enabled to give the minutest directions in respect to the tempo, for the old terms allegro, andante, presto, etc., can only serve as *approximate* indications, leaving much to the temperament of the individual performer. The metronome is of the greatest value and is much used to-day in training beginners to play strictly in time.

METROP′OLIS CITY. A city and the county seat of Massac County, Ill., 40 miles east by north of Cairo; on the Ohio River and on the Illinois Central Railroad (Map: Illinois, D 6). It is built on a high bluff which slopes gradually toward the river; has two public parks, the R. W. McCartney Public Library, a sanatorium, and fine Odd Fellows' Temple, public school, court-house, music hall, and city hall buildings. There are potteries, saw and planing mills, flour mills, veneer, box, stave, heading, spoke, and basket factories, and large lumber interests. The government is administered by a mayor, elected every two years, and a unicameral council. The city owns and operates the water-works and electric light plant. Metropolis City is built on the site of old Fort Massac, which was settled about 1700 by French and Indians, but was not permanently inhabited until 1838; five years later it was incorporated. Population, in 1890, 3573; in 1900, 4069.

MET′ROPOL′ITAN (Lat. *metropolitanus*, MGk. *μητροπολίτες*, *mētropolites*, from *μητρόπολις*, *mētropolis*, a capital city, from *μήτηρ*, *mētēr*, mother + *πόλις*, *polis*, city). An ecclesiastical title, in modern times practically equivalent to archbishop (q.v.). It arose from the early custom of giving precedence to the bishop of the chief city or metropolis of a province. In some of the English colonies where the title of archbishop is not used by the Anglican Church, that of metropolitan is applied to the chief bishop of a province. For the prerogatives of metropolitans in canon law, consult Owen, *Institutes of Canon Law* (London, 1884).

METSU, mĕt′sụ, or **METZU**, Gabriel (1630-67). A Dutch genre painter. He was born in Leyden in 1630, and was a pupil of Gerard Dou. In 1648 he entered the Painters' Guild of his native place, and in 1650 settled in Amsterdam. He painted scenes from the life of the burgher classes, although occasionally, in his market scenes and kitchen-maids, he deals with humbler life. In refinement of drawing and grace of expression he ranks among the best of the Dutch School. His pictures are characterized by delicate treatment and picturesque composition; the heads are animated and express cheerfulness and good humor; the color is clear and harmonious. His principal works include: The "Lady at the Piano" and the "Amsterdam Market," in the Louvre; "Music Lovers," at The Hague; the "Duet," in the National Gallery, London; the Music Lesson" (1659), in the Metropolitan Museum, New York; "Feast of the King of Beans," in which there is a touch of Jan Steen's humor, in the Pinakothek at Munich; "Old Poultry Peddler" and the "Young Poultry Maid," both in the Dresden Gallery.

METTERNICH, mĕt′tẽr-nĭk, Clemens Wenzel Nepomuk Lothar, Prince (1773-1859). An Austrian statesman. He was born at Coblenz, May 15, 1773, being the son of Franz Georg Karl, Count von Metternich, an Austrian diplomat and an associate of Kaunitz. Young Metternich was educated at the University of Strassburg, and afterwards studied law at Mainz and traveled in England. In 1795 he married the granddaughter of Kaunitz, by whom he acquired large estates. His diplomatic career commenced at the Congress of Rastadt (1797-99), which he attended as representative of the Westphalian lordly houses. In 1801 he became Austrian Ambassador at Dresden, and two years later was appointed Ambassador to the Prussian Court, where he negotiated the treaty of alliance between Austria, Prussia, and Russia against France in 1805. In 1806 he went as Ambassador to Paris. In 1809 he succeeded Count Stadion as Minister of Foreign Affairs, concluded the Treaty of Schönbrunn with France, and was instrumental in bringing about the marriage of the Archduchess Maria Louisa to Napoleon. He guided the course of Austria amid the difficulties of 1812-13. He maintained at first a temporizing policy and a scheme of armed mediation by Austria; but the arrogance of Napoleon's demands and the personal humiliations to which he was subjected at his famous interview with the French Emperor in Dresden in June, 1813, led him to resolve upon the declaration of war by Austria against France, and he subsequently conducted with great ability the negotiations which ended in the completion of the Quadruple Alliance. He was afterwards employed in almost all the chief diplomatic affairs of that eventful time. With little concern for the cause of German nationality, which animated so largely the Prussians during the War of Liberation, Metternich during the last two years of Napoleon's power pursued a policy aiming at the advancement solely of

Austrian interests. Fearing lest the defeat of France should raise up powerful rivals for Austria in Russia and Prussia, he exerted himself to preserve for France its ancient boundaries, pursuing that end ostensibly in order to preserve the balance of power in Europe. With masterly diplomacy he succeeded in imposing his policy on the allies, represented Austria in the Congress of Châtillon in February and March, 1814, and participated in the deliberations leading to the Treaty of Paris. In June he visited England and formed a new Quadruple Alliance for the preservation of the peace of Europe. As presiding officer of the Congress of Vienna he exercised a preponderating influence on the deliberations of that body, and succeeded in gaining for Austria a dominant position among the Powers of Europe, with her interests supreme in Germany and Italy. After the Congress of Vienna he became the leading statesman of Europe. He was the inspiring genius of the reactionary policy of the Restoration period. Crafty and cynical, having no sympathy with the aspirations of the people, his schemes were all directed to restoring the old order as far as possible. In 1821 he was made Austrian Chancellor. With his customary astuteness, he made use of the Holy Alliance (q.v.), organized by Alexander of Russia to further the cause of 'Christian peace,' as an instrument for the repression of all liberal or national movements. Under his inspiration congresses were held at Karlsbad (1819), Troppau (1820), Laibach (1821), and Verona (1822), at which action was taken against the Burschenschaft and the freedom of the press in Germany, the national movement in Italy, and the struggle for constitutionalism in Spain. He consistently opposed the Greek movement for independence, but there Russia refused to follow him. With time his influence over the French and Russian courts disappeared, but in Germany and Italy the reactionary policy of Metternich remained unabated until 1848. The revolutionary movement of that year, however, breaking forth with sudden violence, ended Metternich's system and caused the aged Minister to flee from Austria (March, 1848) and to seek refuge in England and Belgium; nor did he return to Vienna till the end of 1851, when he received great marks of honor and favor from the Emperor; but although sometimes consulted, he was never again asked to undertake the cares of office. He died at Vienna, June 11, 1859. His writings were published under the title *Aus Metternichs nachgelassenen Papieren*, published by his son, Prince Richard (8 vols., Vienna, 1880-84; published in English translation under the title of *Memoirs*). Consult: Gross-Hoffinger, *Fürst Metternich und das österreichische Staatssystem* (Leipzig, 1846); Mazade, *Un chancelier d'ancien régime. Le règne diplomatique de M. de Metternich* (Paris, 1889); Beer, "Fürst Clemens Metternich," in *Der Neue Plutarch*, vol. v. (Leipzig, 1877); Demelitsch, *Metternich und seine auswärtige Politik* (Stuttgart, 1898); Malleson, *Life of Prince Metternich* (London and New York, 1888). See AUSTRIA-HUNGARY; VIENNA, CONGRESS OF; CARLSBAD DECREES.

METTRAY, mĕ′trȧ′. A great agricultural and industrial colony (reformatory) at Mettray, near Tours, France, which has for years been looked upon as the model of all such institutions. It was founded in 1839 by Mettray Demetz and Bretignières de Courteilles, who had gotten their inspiration from America. The object was to keep young boys out of the regular prisons and to teach them, in addition to common school branches, trades, particularly agriculture. Boys of the better classes who are sent by their parents to the school are kept separately in the 'Maison Paternelle' and spend their time in study. In 1899 the colony contained 450 boys. After the boys leave the institution a supervision is maintained over them. See *Bulletin de la commission pénitentiaire internationale* (Brussels and Berne, 1900).

METZ, mĕts. A town and first-class fortress in Alsace-Lorraine, Germany, capital of the District of Lorraine, situated at the confluence of the Seille with the Moselle, about 11 miles east of the French frontier and 66 miles by rail south-southwest of Treves (Map: Germany, B 4). It is built partly between the two rivers and partly on islands of the Moselle. The streets bear both German and French names. The older section is irregularly constructed and is ancient in appearance. In the southwestern portion of the town is a splendid esplanade with statues of Marshal Ney and Emperor William I., and a fine fountain. The magnificent Gothic cathedral was begun in the thirteenth century. It was consecrated in 1546, and is now being restored. It has numerous fine specimens of stained glass, and is surmounted by a tower 387 feet high. The Church of Saint Vincent, a fine Gothic structure of the thirteenth century, the garrison church, and the Church of Saint Constance, with frescoes, are also of architectural interest. Among the secular buildings may be mentioned the palace of justice, the town hall, the theatre, the barracks, and the railway station.

The educational institutions include a gymnasium, a realschule, a seminary for priests and for teachers, schools of art and music, and a military school. The municipal library of about 60,000 volumes is rich in works relating to the history of Metz, and the municipal museum contains collections of coins and paintings, and of antiquities found in the vicinity. Metz has lost somewhat in industrial importance since its occupation by the Germans, the French having withdrawn a large amount of capital. The chief manufactured products are leather and leather goods, arms, hats, artificial flowers, coarse cloth, preserves, etc. The trade is chiefly in the agricultural products of the surrounding country.

The city is regarded as one of the best fortified places in Europe. Its fortifications, extending along the Moselle and the Seille, consist of works begun by the French and completed by the Germans, and of works built entirely by the conquerors. Some portions of the old fortifications have also been retained. Population, in 1890, including the garrison of over 20,000 men, 60,186; in 1900, 58,424, the decrease being due to the withdrawal of part of the troops. Over two-thirds of the population are Catholics.

Metz was known to the Gauls as *Divodurum*, and in mediæval times as *Metae*. By the Treaty of Mersen (870) the city fell to East Francia (later Germany) and rapidly attained importance, so that in the thirteenth century it became a free Imperial city. It was here that Charles IV. in 1356 proclaimed the Golden Bull. Metz became involved in many conflicts with Lorraine, and in the period of the Reformation the city was a centre of disturbance. In 1552 it was handed over to Henry II. of France, together with Toul and Verdun, by the Protestant lords in order to gain French aid against Charles V. (See MAURICE OF SAXONY.) The latter besieged the city in vain, and the Peace of Westphalia (1648) confirmed France in possession of the city. Metz was henceforth chiefly important as a strong fortress, and played a prominent rôle in the campaigns of 1814 and 1815 against Napoleon and again in the Franco-German War. As a result of the battles of Colombey-Nouilly, Mars-la-Tour, and Gravelotte (see FRANCO-GERMAN WAR), the German army occupied the city on October 29, 1870, and the Peace of Frankfort gave Metz to Germany. Consult: Klipffel, *Metz, cité épiscopale et impériale* (Brussels, 1867); Westphale, *Geschichte der Stadt Metz* (3 vols., Metz, 1875-78).

METZU. See METSU.

MEUDON, mē'dôN'. A town in the Department of Seine-et-Oise, France, in the southwestern outskirts of Paris (Map: France, A 7). Its château, fitted up by Napoleon for Maria Louisa in 1812, was almost destroyed during the bombardment by the Germans in 1871; it has been partly restored. The church contains a statue of Rabelais, who was curé of Meudon. A chapel commemorates a railway accident in 1842, in which over 100 persons, including the celebrated traveler Dumont d'Urville, were burned alive. The forest near by is a favorite holiday resort. Meudon's manufactures comprise glass, chalk, linen, whiting, buttons, and ammunition. Population, in 1901, 9702.

MEULEN, mē'len, ADAM FRANS VAN DER (1632-90). A Flemish painter, born at Brussels and the pupil of Peter Snayers. He afterwards went to France on the invitation of Lebrun, and was made Louis XIV.'s Court painter (1666) and counselor of the Academy (1681). During the war in Flanders he accompanied the King and painted pictures of the battles in which he was engaged. These are remarkable for the care bestowed upon historical detail and the fine grouping of horses. There are several of them in the Louvre and at Versailles. He also designed some cartoons for the Gobelins.

MEUNG, mēN, JEAN DE (c.1250-?). A French poet, also called Jean Clopinel. He was born at Meung-sur-Loire, and died at the beginning of the fourteenth century. Not much is known about his early life, but it is assumed that he studied at the University of Paris. His literary fame rests chiefly on his addition to the *Roman de la rose* (q.v.) of Guillaume de Lorris (q.v.). The poem, as Guillaume de Lorris left it, comprised about 4000 verses. Jean de Meung added about 18,000, of which 12,000 can be found in the authors of whom he was especially fond—notably 2000 from Ovid alone. Ostensibly continuing the allegory of his predecessor, who intended to make it a poem of chivalry, Jean de Meung in reality introduced quite a different spirit, and made the allegory a mere cloak for telling stories and indulging in political and moral satire. At the request of King Philippe, he translated the *Consolatio* of Boëthius into prose and verse. Toward the end of his life he wrote his *Testament*, in which, although praising sincere piety, he pours bitter sarcasm on monks. Consult: Paris, "Jean de Meung," in the *Histoire littéraire de la France*, vol. xxviii. (Paris, 1840); Quicherat, "Jean de Meung et sa maison à Paris," in the *Bibliothèque de l'Ecole des Chartres* (ib., 1880); and Langlois, *Origines et sources du Roman de la rose* (ib., 1890).

MEUNIER, mē'nyā', CONSTANTIN (1831—). A Belgian historical and genre painter and sculptor, born in Brussels. He was for a while professor at the Academy of Louvain, and he spent some time in Madrid, copying the old masters. Afterwards he settled at Louvain and devoted himself principally to painting. Both as a painter and as a sculptor he belongs to the naturalistic school. His subjects usually are chosen from scenes in the colliery district in which he lived—episodes of the foundry and the pit; or else rather brutally painted martyrdoms. But his treatment of any theme is powerful and sincere. His sculptures include "The Lost Son" (in the Berlin National Gallery); and there are also other bronzes by him in the Albertinum at Dresden. Among his paintings are: "The Peasants' Rebellion" (in the Brussels Museum); "The Martyrdom of Saint Stephen" (in the Ghent Museum); and "The Burial of a Trappist" (in the Courtrai Museum). He received a gold medal in Brussels in 1867 and the Order of Leopold in 1873.

MEURICE, mē'rēs', FRANÇOIS PAUL (1820—). A French dramatist, born in Paris and educated at the Collège Charlemagne. In 1842 he prepared a version of *Falstaff* for the Odéon with Vacquerie, presented at the same theatre in 1843. With the same collaborator he produced *Le capitaine Paroles* and an imitation of *Antigone* (1844), and he assisted Dumas in a metrical translation of *Hamlet*, which was given at the Théâtre Historique in 1847. The following year he became chief editor of Victor Hugo's *L'Evénement*, to whose cause Meurice was so devoted that he suffered nine months' imprisonment (1851), but in 1869 he aided in starting a new journal with the same motive, *Le Rappel*, and he was intrusted by Hugo himself with the publication of his complete works (46 vols., 1880-85). Meurice dramatized several of them, as well as a number of George Sand's novels, and his other plays include: *Benvenuto Cellini* (1852); *Schamyl* (1854); *L'avocat des pauvres* (1856); *Fanfan la Tulipe* (1858); *La vie nouvelle* (1867); *Cadio* (1868); and an adaptation of the *Midsummer Night's Dream* (1886). Meurice also wrote romances such as *La famille Aubry* (1854), *Césara* (1869), and *Le songe de l'amour* (1869).

MEURSIUS, mēr'sĭ-ụs (DE MEURS), JOHANNES (1579-1639). A Dutch classicist and historian, born at Loozduinen, near The Hague. At the age of sixteen he finished a commentary on Lycophron. He traveled much, and in 1610 was appointed professor of history at Leyden. Later the political disturbances in his country and the execution of John Barneveldt, to whose sons he had once been tutor, exposed him to considerable persecution and cost him the high favor which he had once enjoyed. He left Holland, and in 1625 accepted a position at the Academy of Sorö in Denmark, where he spent the remainder of his life. His published works include many editions of the Greek authors Lycophron, Apollonius Dyscolos, Philostratus, Procopius, and others. His numerous treatises on Greek literature are mostly reprinted in Gronovius's *Thesaurus Antiquitatum Græcarum.* The *Glossarium Græco-Barbarum* (1614) and *Athenæ Batavæ* (1625) also deserve mention. His complete works were edited in 12 volumes by Lamie (Florence, 1741-63).

MEURTHE-ET-MOSELLE, mērt'ȧ-mō'zĕl'. A frontier department in the northeast of France, part of the old Province of Lorraine, and composed of the remnants of the departments of Meurthe and Moselle which remained to France after the Treaty of Frankfort, 1871 (Map: France, M 2). Area, 2025 square miles. Population, in 1896, 466,979; in 1901, 484,722. It is named from the principal rivers which traverse the department. The surface is diversified and picturesque, the eastern border being marked by the wooded Vosges Mountains, which attain a maximum altitude of 2955 feet. Iron, copper, lead, rock salt, gypsum, and building stone are the chief mineral products; and the fertile soil yields abundant crops of cereals, hops, grapes, and other fruits. There are manufactures of steel, iron, railway materials, textiles, pottery, glass, paper, chemicals, wine, and beer. Capital, Nancy.

MEUSE, mēz. A frontier department in the northeast of France, part of the ancient Province of Lorraine, and bordered on the north by Belgium (Map: France, M 2). Area, 2045 square miles. Population, in 1896, 288,876; in 1901, 283,480. It is traversed from southeast to northwest by the valley of the Meuse, flanked by the wooded Argonne ranges of hills. The department is well forested, and the valleys are fertile and well cultivated, producing wheat, oats, and hemp; grapes are largely grown for wine, and beet-roots for sugar. Minerals and manufactures are unimportant. Capital, Bar-le-Duc.

MEUSE, mēz, or **MAAS,** mäs. One of the principal rivers of Western Europe. It rises on the Plateau of Langres in the Department of Haute-Marne, Northeastern France, and flows at first north through a narrow, winding valley with high and steep sides, sometimes becoming cañon-like with rocky cliffs, and through the wild forest region of Ardennes (Map: France, M 2). It then flows northeast through Belgium into Holland, the land becoming gradually lower, changing through the heath lands of Northern Belgium to the extensive peat-bogs known as De Peel in Southeastern Holland. Finally the river turns westward, joins the Waal, one of the arms of the Rhine, opposite Gorkum, and empties into the North Sea through the great delta common to the two rivers, a large, compound estuary consisting of broad, sandy, and shallow channels inclosing a number of low, flat islands. The united Meuse and Waal first divide into two arms, one of which, the Hollandsch Diep, flows southwest, and, after communicating southward with the delta of the Scheldt (q.v.), enters the sea through the broad Haringvliet. The other arm flows west and again divides into the Old and the New Meuse, which, uniting at several points, flow parallel to the sea. The Old Meuse communicates by side channels with the Haringvliet, and the New Meuse receives the Lek, an arm of the Rhine. The New Meuse, which passes Rotterdam, is the main channel for navigation. The total length of the Meuse is 498 miles, and it is navigable for 355 miles. Its principal tributaries are the Sambre from the left, and the Semoy, Ourthe, and Roer from the right. It connects with extensive canal systems in Belgium and in Holland. Above Neufchâteau, in the Department of Vosges, the river loses itself underground for some miles. The chief cities on its banks are Verdun (the head of navigation), Sedan, and Charleville in France; Namur and Liege in Belgium; and Maastricht, Dordrecht, and Rotterdam in Holland.

MEW, or SEA-MEW. In Great Britain, a gull (q.v.).

MEXBOROUGH, mĕks'bŭr-ō. A town in the West Riding of Yorkshire, England, on the Don, 5½ miles northeast of Rotherham (Map: England, E 3). It has large iron and pottery industries. The markets are municipal property. Population, in 1891, 7700; in 1900, 10,400.

MEXCALA, mĕs-kä'lȧ. A river of Mexico. See MESCALA.

MEXICAN ARCHÆOLOGY. Among the many tribes which occupied Mexico in former times, six may be said to have attained a considerable degree of culture. The Nahuas, whose chief seat at the time of the Spanish Conquest was in the Valley of Mexico, had come from the North, and their influence extended, by reason of conquest and migration, southward as far as Costa Rica. It is impossible to state the exact limits of Nahua remains in Mexico, owing to our meagre knowledge of the antiquities of certain parts of the country, and the confused traditions of the migrations of the people. The Tarascans were settled in what is now Michoacan and probably parts of Jalisco, Tepic, and Colima. In Oaxaca are found the remains of the Mixtecs and Zapotecs, with traces of an earlier settlement of the Nahuas. In Vera Cruz the Huaxtecs, linguistically a branch of the great Maya-Quiché family, are found; and the Totonacs, whose territory lay between that of the Huaxtecs and Nahuas, had a distinct culture, although undoubtedly influenced by both of the former peoples. To the east of the Isthmus of Tehuantepec, and extending eastward over the States of Chiapas, Tabasco, and Yucatan, and northward through Guatemala to Northern Honduras, are the remains of the Maya-Quiché family, whose civilization was, in many respects, the most advanced in ancient America. This region is geographically as well as culturally a part of Central America.

The remains found in Chihuahua show an ancient culture similar to that which existed in the valleys of the Gila and Salt rivers in Arizona, but of a slightly higher grade. The people seem to have reached an intermediate stage, between the Nahuas on the south and the Pueblo peoples on the north, but nearer the latter than the former. In this region the ruins of Casa Grande (q.v.) are the only noteworthy group. The pottery from the vicinity of this ruin is of an advanced type and somewhat resembles the ceramics of Arizona and New Mexico, but it has distinct peculiarities and bears the marks of contact with the people of the south. In the dense forests of the State of Tamaulipas, on the coast of the Gulf of Mexico, ruins have been reported which are related to the culture of the south, and probably belong to the Huaxtec or Totonac peoples. We find the first important remains of the higher Mexican civilization in the very centre of that part of Mexico which lies north of the Isthmus of Tehuantepec, in the immense structure of La Guemada in Zacatecas, which have been but little studied; but they are probably the ruins of an ancient Nahua settlement. In Michoacan the ruins of Tzintzuntzan bear some resemblance to those of La Quemada. This region of the Tarascos has been little explored. The great ruins of the Nahuas include Tula, Teotihuacan, Xochicalco, Tepoztlan, Cholula, and Tenochtitlan, now the City of Mexico, the ancient capital of the Aztecs, the predominant branch of the Nahuas, at the time of the Conquest; beneath the soil of the City of Mexico lies buried a vast number of objects, and also the bases of temples, although the imposing structures and the greater number of the sculptures, idols, books, etc., of Montezuma's seat were destroyed by the Spaniards. In the Huaxtecan and Totonacan districts are the ruins of Papantla, Misantla, Ceutla, Tusapan, and Cempoalla; while in the State of Oaxaca, Monte Alban, the ancient capital of the Zapotecs, is one of the most stupendous ruins in Mexico. Mitla, in the same district, has nothing in common with Zapotec remains and must be ascribed to the Nahuas. In the Maya region are the remains of hundreds of cities, the most important of which are Palenque, Piedras Negras, Menché, Seibal, Tikal, Labna, Kabah, Uxmal, Chichen Itza, Quirigua, and Copan.

In the arts the ancient Mexicans show a surprising progress. For the architecture of ancient Mexico, see ARCHITECTURE, ANCIENT AMERICAN; MITLA; PALENQUE; UXMAL.

Sculptures in stone are found, ranging in size from the small amulets, representing deities, and designed as personal ornaments, to monuments of colossal size, such as the so-called Mexican calendar stone, and the great stelæ of the ruins of Quirigua. In wood-carving the Mexicans displayed even greater skill than in the working of stone. The great altar tablets of Tikal, the wooden drums, and the atlatls or throwing-sticks splendidly carved, and in some instances covered with gold leaf, attest their proficiency in this branch of art. Carving, whether in stone, wood, bone, or shell, was done with stone or copper tools. Jadeite, emerald, rock crystal, turquoise, and serpentine were carved into numberless varieties of personal ornaments, chiefly in the territory of the Mixtecs and Zapotecs of Oaxaca, and by the Mayas in the mountainous parts of Chiapas. The Nahuas and Zapotecs fashioned mosaics on wood, shell, and clay, using bits of shell, jadeite, turquoise, obsidian, mother-of-pearl, and hematite to form the designs.

In the ceramic art the products of the several civilized nations are quite distinct, and we may determine their provenance with a certain amount of exactness. The terracotta figures of the Jalisco district, the ware from the vicinity of Cholula, the funeral urns from the Oaxaca Valley, and the pottery from the Maya region are characteristics of each centre. In metallurgy we find the ancient Tarascos, the Aztecs, Totonacs, Mixtecs, and Zapotecs were very skillful in the manipulation of copper into axes, tweezers, rings, rattles, and bells. Beautiful objects of gold have been found in the Matlantzinca region near Toluca and in the Mixtecan and Zapotecan areas, which are the very highest achievement of the ancient American goldsmiths. Ear, nose, and lip ornaments; beautiful bells, some representing symbolic faces and animals' heads; beads; circular breastplates; the copilli or crown of rulers, and even remains of armor made of the precious metal, have been found in ancient graves during recent years. Unfortunately the greater part of these 'finds' go to the melting pot.

The ancient Mexicans believed in a future life which was graded according to the manner of death, and among the Zapotecs they had elaborate funeral ceremonies and sacrificed slaves to assist the shades of important persons on their journey to paradise. They had greater and lesser deities. The principal god of the Aztecs was Teotl, who was worshiped as a supreme being. Next to Teotl, Tezcatlipoca was venerated as the soul of the world, who rewarded the righteous and punished the unrighteous. The great beneficent god was Quetzalcoatl among the Nahuas, called Kukulcan by the Mayas, the great feathered serpent deity, undoubtedly a deified culture hero. He invented the arts and taught the people wisdom by his laws. According to his various attributes he appears under different names, as do many other gods of the Mexican pantheon. Tlaloc was the god of rain, and among the Aztecs, Huitzilopochtli, the terrible war god, was patron and protector. There were gods of the hunt and chase, of play, flowers, wine, merchants, trickery, lust, and so forth, while each trade and occupation had its own patron deity. The religious rites were elaborate and prescribed with minuteness. The multiplicity of gods required a great number of priests and priestesses, who were almost as highly venerated as the deities they served. There were degrees of priesthood and religious orders; fixed and movable festivals. The great teocallis or godhouses were commanding edifices of stone, built on high truncated pyramids with annexed buildings. Their idols were many and hideous, smeared with the blood of human and animal sacrifices.

Among certain of these civilized tribes we find artificial flattening of the head; also trepanation, and decoration of the teeth by filing and interlaying with certain stones, such as jadeite, turquoise, obsidian, and hematite, rock crystal and obsidian. Labrets, or lip ornaments, made of obsidian and gold, were inserted in holes in the lower lip; Y-shaped ornaments of obsidian and shell were hung from the nose, and large ornaments were inserted in incisions in the ears. Many of the musical instruments are still extant, and we find in various museums examples of the teponoztli, the horizontal drum, made from a log of wood hollowed out on the under surface and having two tongues cut on the upper one, which were beaten with rubber-tipped sticks. Among the instruments were the upright drum, of a hollowed log of wood, with skin-covered top, beaten with the hands; flageolets, whistles, and rattles of clay; trumpets; and rattles of shell and notched human bones from the arm or leg, rasped with a bone or shell. Painting was another art in which the ancient Mexicans had made remarkable progress. This is shown by the mural paintings of Teotihuacan, Mitla, and Chichén Itzá, and those recently discovered in British Honduras. One of the most important sources of information for the study of ancient Mexico is found in the existing pictorial and hieroglyphic codices, or books. As is well known, several of the tribes of Mexico had attained a degree of culture at the time of the Spanish Conquest that led to the recording of events, not only on stone bas-reliefs and sculptures, but on material of a more perishable nature. These codices were on strips of deerskin, the surface of which was covered with a thin coating of stucco. They were folded screen-fashion, and the paintings were on both sides. The Mexicans had furthermore invented a kind of paper. In Mexico proper, in addition to bark-paper, a paper was made from the leaves of the maguey plant, Agave Americana; this paper they also sized with a coating of lime.

One of the things which impressed Cortés, when he first came in contact with the messengers sent out by Montezuma, was that some of them were busily employed in making paintings of the Spaniards; their costumes, arms, and different objects of interest, giving to each its appropriate color. These were to convey to Montezuma an idea of the conquerors in picture writing, and is the first notice we have of its existence in ancient America. In symbolic and picture writing the Mayas approached very closely to phoneticism, and recent progress has been made in an interpretation of the codices of the Nahua and Mixtec group, as well as signal success in the decipherment of the hieroglyphics of the Mayas, preserved in codices, tablets, and stelæ. Of the latter class of inscriptions certain dates and methods of counting have been worked out, and in some instances about 40 per cent. of the inscriptions have been successfully deciphered. Besides the two known systems of pictographic and hieroglyphic writing, explorations in Oaxaca have recently revealed a third and distinct form of inscription among the Zapotecs.

The complex calendar system of the Tarascos, Nahuas, Mixtecs, Zapotecs, Totonacs, and Mayas is the same, and is a remarkable evidence of the high culture which they had attained, but the Mayas had more extended measures for the computation of time than the Nahuas. Recent investigation of the Maya calendar revealed various periods and elaborate computations and a knowledge of the movements of certain planets. The general scheme of the calendar proper was the division of the year into two unequal parts, three hundred and sixty days being the year, divided into eighteen months of twenty days each; at the end of the last month five days were added to round out the true solar year; and each of the twenty-day periods had its own name and symbol, but the days were not numbered from one to twenty, but from one to thirteen. By this method of numeration the day bearing the same name and number did not recur until the thirteen months had elapsed; this made a period of two hundred and sixty days, which, among the Aztecs, was called Tonalamatl; it was a year within a year, and was used for divinatory or religious purposes. There were, also, many other intricacies in the Mexican calendar, some of which have not yet been explained.

In studying Mexican artifacts, we are somewhat handicapped by the immense number of clever frauds which have been made during recent years, and which have found their way into all collections and museums. We are just beginning to study in a systematic way the archæology of this region, and further research will unquestionably prove that the early accounts of the Mexican civilization, handed down to us in the writings of the eye-witnesses of the Spanish Conquest, and the histories of the early missionaries, as Sahagún, Durán, De Landa, and others, were not very greatly exaggerated.

MEXICAN HAIRLESS DOG. See HAIRLESS DOG.

MEXICAN JUMPING BEAN. See JUMPING BEAN.

MEXICAN LITERATURE. Modern Mexico, despite the surprising advance of the past quarter-century, has been so far outstripped in the material elements of civilization that the people of more progressive nations are apt to forget the time when its capital was the intellectual and artistic centre of the New World. The intellectual life of Mexico, therefore, is not of modern creation, but dates back to the third decade of the fifteenth century, which the early *conquistadores* marked by the introduction of the first printing press, to be followed shortly by the establishment of the first university upon the American continent. That neither of these establishments was a matter of mere formal enactment is shown by the creditable list of the writers of that century, who were connected as teachers or pupils with the early educational institutions, and whose works bear the imprint of the native Mexican press, whose list of extant works, printed before 1600, embraces some 116 titles.

Any study of Mexican literature naturally begins with the few survivals of primitive picture writing. These hieroglyphs so far approached writing as to give clearly names, places, and the date of events—some of which are accurate—as far as the twelfth century, while more vague traditions extend several centuries further back. Most of these records belong to that aboriginal branch of Nahua stock known as the Toltecs, but the famous *Popul-Vuh*, of Quiché origin, also mentions names and places of Mexican legendary history. The meagre details of these records were supplemented, within a century after the Spanish Conquest, by so-called 'histories,' written by educated natives from the above sources, aided by oral tradition. These works consist of songs, ordinances, memoirs of the native kings, and accounts of the Spanish conquerors. Without them it would now be impossible to read the few extant sources; and if some of the early Church fathers are to be blamed for their fanaticism in destroying hieroglyphs, others deserve equal credit for their care in preserving the remaining few, and in training natives who could still unravel their meaning.

Most writers of the early colonial period were natives of the Old World, whom matters of Church or State called to the New. Among those works of the sixteenth century which relate to early native history we may mention Motolinía's *Historia de los Yndios de la Nueva España* (1541); Sahagún's *Historia de las cosas antiguas de los indios* (1566); and Molina's *Vocabulario* (1555), a Castilian-Mexican work of 249 pages, one of the products of Juan Pablo's first printing press. The work of these men was largely utilized by Torquemada in his *Monarquia Indiana* (1615), a work for which Alamán bestows upon him the title 'the Livy of New Spain.' Above the names of the adopted European chroniclers stand those of Tezozomoc, son of the last Mexican Emperor, Cuitlahuac, whose *Crónica*

Mexicana (c. 1600) is an admirable companion volume to Friar Diego Durán's *Historia de los Indios de Nueva España y islas de Tierra firme* (1581), up to that time the most complete chronicle of the ancient Mexicans; and Fernando de Alva-Ixtlilxochitl (1568-1648), the original chronicler of the Texcuco royal line, whose work, though not rigorously correct in chronology, in volume and importance surpasses all his predecessors. It is to these two native writers that we owe the interpretation of the early Mexican hieroglyphs then in existence.

The chroniclers who treated merely of the Conquest did so from a European standpoint, and for this reason do not greatly concern us here. Among the Creole population of the sixteenth century, however, there were some poets of note. Prominent among these were Francisco de Terrazas, who was eulogized by Cervantes, but whose works have been lost; and Saavedra Guzmán, whose most famous poem, *El Peregrino Indiano* (1599), adds rather to his reputation as chronicler than as poet.

Though the modest literary product of the seventeenth century may to some extent exemplify the intellectual decadence of New Spain during that period, yet it illustrates in one phase the aptitude of the *mestizo* caste for music and for poetry—an aptitude which displayed itself in both Castilian and Latin verse. Easily the leader of this period stands the poetess Juana Inés de la Cruz (1651-1695), a leading personage at the vice-regal court, and later a nun, who dazzled her contemporaries by her learning, and whose subtle and suggestive verse gained for her the title 'the Tenth Muse.' Another easy and correct versifier of the period was the Pueblan Matias Bocanegra, whose popularity lasted well into the succeeding century. The making of verse at that time was simply a pastime, so a comparatively small output has survived until our own day. The man of letters *par excellence* of the century was the diligent and versatile Carlos de Sigüenza y Góngora (1645-1700), whose writings, poetical and prose, embraced a wide variety of literary and scientific subjects. He held the post of Cosmographer of New Spain, and for many years filled the chair of mathematics in the University of Mexico. The most noted colonial dramatist of the century was Eusebio Vela, who, if not equal to the leaders of the Spanish stage, surpassed many of those of the second rank. Juan Ruiz de Alarcón, the dramatist, was of Mexican birth and education, though his mature work was produced in Spain. The theological works of the time bore the names of many native Church fathers; likewise the best work on the early compiling of the Laws of the Indies was that of Rodrigo Aguiar y Acuña (died 1629). In the realm of scientific literature the work of Enrico Martínez, *Reportorio de los tiempos y historia natural desta Nueva España* (1606), and that of Friar Agustin de Vetancourt, *Teatro Mexicano* (1698), fittingly open and close the century.

The eighteenth century in New Spain was marked by a more extensive if less notable literary culture. This was especially true of the reign of Carlos IV., when public functions were the scenes of notable contests of poets and orators, many of whose productions were favorably mentioned in Europe. The book trade with Madrid and other Spanish cities was very flourishing, and some especially fine editions of classical authors were printed in the Creole capital. Large and well-selected private libraries were common, both here and in the provincial towns. It was the period for the collection of archives and the writing of local history—a work in which the names of Veytia (1718-1779) and Morfí (died 1793) hold a prominent position. Spanish-American journalism is represented by the monthly gazette (1728-39) of Francisco Sahagún de Arevalo; by the *Gacetas de Literatura* (begun 1768) of José Antonio de Alzate (1729-90), whose periodical did much to stimulate intellectual effort and develop a correct literary sentiment; by the *Mercurio Volante* (begun 1772) of José Ignacio Bartolache, largely a medical journal; by the *Gaceta de México*, a fortnightly publication from 1784 to 1806, devoted to general news and literary and scientific discussions, and after that date a bi-weekly; and the *Diario de Méjico* (1805) and the *Diario de Vera Cruz* (1805), the former devoted to literary and statistical matters, and the latter a commercial sheet. Despite the strict censorship of all these periodicals, they exercised a most beneficial effect upon public opinion at the close of the century.

In the literary production of the nineteenth century the work of the Mexican historians easily leads at home, and occupies a prominent place in the world at large. An important work as collector of historical documents was done by José Fernandez Ramirez. Among historians of lesser note may be mentioned Mora and Zamacois. Of unusual excellence is the work of Bustamante (died 1848), whose volumes treat of the revolutionary period and of the beginnings of the American War. The leader of his age, and still easily the foremost Mexican historian, was Lucas Alaman (died 1853), whose work as statesman during a trying period has been eclipsed by his greater work as the historian of that period. His *Disertaciones sobre la Historia de Méjico* (3 vols., 1844-49) cover the vice-regal period, and these are supplemented by his *Historia de Méjico* (5 vols., 1849-52), continuing the narrative to the middle of the century. Among the more recent historians the greatest figure is that of Manuel Orozco y Berra (1816-81), who crowned a life of public service and valuable archæological research by devoting his last twenty years to his *Historia Antigua de Mexico*. Closely allied with these is the work of Antonio García Cubas, whose *Diccionario geográfico, histórico, y biográfico de los Estados Unidos Mexicanos* (1889) is a model of its kind.

In the realm of pure literature the physician-poet Manuel Carpio (1791-1860) was well known for his vigorous descriptive verse, of which the most important example is *La Cena de Baltasar*. His firmness and moderation in political life, and the erudition and charm of his poems, easily render him the most popular Mexican poet of the century. Ignacio Manuel Altamirano (born 1834), a noted liberal orator, is famous both as a poet and as a novelist. His poems are less vigorous in description than those of Carpio; the best known of his novels, *Clemencia*, is of considerable merit. To Rodriguez Galván is given the credit of the first national drama, but his work has been surpassed by Fernando Calderón (1819-45), whose *Reinaldo y Elena*, *Zadig*, and others gave promise of much better work had he lived to complete it. In comedy the name of

Manuel E. Gorostiza (1789-1851) stands supreme. His comedies, of which the most famous are *Indulgencia para todos* and *Contigo pan y Cebollas,* still hold popular favor. In addition to an active military and diplomatic career he organized the present *Biblioteca Nacional,* and greatly advanced the cause of popular education throughout the Republic. Consult: Alaman, *Disertaciones sobre la Historia de Méjico* (Mexico, 1844-49); Piementel, *Historia critica de la literatura y de las ciencias en Mexico* (Mexico, 1885); Cortez, *América Poética* (Paris, 1875); id., *Diccionario biográfico Americano* (Paris, 1875); and *México a través de los siglos* (Mexico, 1887-89).

MEXICAN POPPY. See ARGEMONE.

MEXICAN SUBREGION. In zoögeography, a subdivision of the Neotropical Region which embraces Central America and the low, hot coast regions of Mexico to the mouth of the Rio Grande on the east and about to the border of the plains of Durango on the west. Between these, the northern fauna and flora are continued along the summit of the Cordillera as an entering wedge reaching south to Nicaragua. It has many species peculiar to itself, but no large groups. Many northern as well as southern forms extend their range into this middle region, as might be expected; and views differ as to where its boundaries should be drawn. (See SONORAN REGION.) On the whole, its affinities are South American. See DISTRIBUTION OF ANIMALS; NEOGÆA; NOTOGÆA.

MEXICAN WAR. The war between the United States and Mexico in 1846-48. It was the result of a series of outrages upon American citizens, the recognition of the independence of Texas by the United States (1837), the annexation (1845) of Texas to the United States, in the face of bitter opposition on the part of Mexico, herself torn with revolution and contending factions, and finally of a dispute regarding the boundary of Texas, the United States claiming the Rio Grande as the boundary, while Mexico held that Texas did not extend farther south than the Nueces. During the fall of 1845 a large part of the small regular army of the United States was assembled under Gen. Zachary Taylor at Corpus Christi, near the mouth of the Nueces in Texas, and on March 12, 1846, under orders from the United States Government, Taylor advanced into the territory the possession of which was then in dispute. After a march of sixteen days he reached the Rio Grande at a point opposite to the Mexican city of Matamoros. A week earlier, on the 21st, the United States Minister to Mexico, Slidell, unable to negotiate a treaty in accordance with President Polk's directions, or even to secure official recognition, received his passports and started on his return to the United States. The Mexican army at this time numbered at least 30,000 of all arms, and comprised, besides troops of the line, the active battalions of the States and the local national guards of the cities. The cavalry (lancers) were excellent horsemen, fairly disciplined, but indifferently mounted and poorly armed; the artillery, officered partly by foreigners, were good gunners, but the arm lacked mobility; the infantry were well drilled, but were armed with muskets of ancient pattern. An undue number of general officers (politicians rather than soldiers) and an inefficient general staff completed the Mexican resources for war. The effective power of the Mexicans, however, was enhanced by the fact that they represented the 'defense;' that they served among friends, and that they often fought behind strong fortifications. The American army was inferior in numerical strength to the enemy. At the close of 1845 the maximum strength was 7883. What it lacked in numbers, however, was made up in fighting quality. It consisted of two regiments of dragoons, four of artillery, and eight of infantry, with the usual staff corps. The dragoons were well disciplined, drilled as light cavalry, and armed with carbines and sabres; the artillery garrisoned the fortifications, but had little instruction in gunnery, excepting one company in each regiment organized as light artillery, which had reached a high standard of efficiency; the infantry, well disciplined and familiar with the use of arms, were distributed among a number of small frontier posts and never in large bodies; the officers, a majority graduates of West Point, were generally of superior ability, with the experience and self-reliance gained in Indian service and independent command. The navy of the United States, although small, was exceedingly efficient. The Mexican Republic had only a few small steamers and sailing vessels, and these principally on paper. Taylor's command hardly comprised 3000 effectives upon its arrival opposite Matamoros, on the 28th of March, 1846. Taylor immediately fortified his position and established a base of supply at Point Isabel. The mouth of the Rio Grande was blockaded by the small naval force accompanying the American army, and two vessels with supplies for the Mexican army were warned off and returned to sea. General Ampudia, who was in command at Matamoros from April 11th to April 24th, protested vigorously against the occupation of disputed territory by General Taylor, and insisted that, pending a settlement of the boundary dispute, the American army should be withdrawn to the Nueces. On April 24th General Arista superseded Ampudia, and at once decided to take the offensive and cross the Rio Grande, notifying Taylor that he considered hostilities already to have begun on the part of the United States. On the 25th General Taylor learned that a large force of cavalry had crossed the Rio Grande some miles above his position, and sent a small squadron of the Second Dragoons under Captain Thornton to obtain definite information. While endeavoring to execute the order, Thornton, whose guide had deserted, found his command surrounded by a Mexican cavalry force of more than 500, and in an attempt to cut his way out lost one officer and eight men killed, and two men wounded; and, with the remainder (46), was captured. Taylor notified his Government that the first blow had been struck, and called upon the Governors of Louisiana and Texas for 5000 volunteers. On the 30th, General Taylor, leaving a regiment of infantry and two companies of artillery to garrison an earthwork, known as Fort Brown (see BROWNSVILLE, TEX.), in front of Matamoros, proceeded with the remainder of his command to Point Isabel in order to complete his communications. During his absence the Mexicans attacked the fort vigorously, but to no avail. As he was returning (May 8th), he encountered Arista, who with 6000 men and ten guns barred the road at a place nine miles from Matamoros, known as Palo Alto. Taylor's force numbered 2300 officers and men and ten guns. After a fight of four hours (see PALO ALTO), Arista fell back to Resaca de la Palma, with a loss of 252. The American casualties comprised 7 killed and 47 wounded. On the following day Taylor continued his march. Arriving in front of the Mexican position, a low ridge commanding the road to Matamoros, the Americans paused to reconnoitre. On account of the dense 'chaparral,' movements en masse were impacticable, and the infantry were deployed as skirmishers, with the artillery, supported by the dragoons, remaining on the road. Arista had been reënforced during the night by 2000 infantry. As on the day before, an artillery duel ensued, and the Mexican batteries held the Americans at bay for some time, until Taylor sent a squadron of dragoons under Captain May, who gallantly charged, taking the guns, together with the Mexican general, La Vega, at the cost, however, of 1 officer, and 7 men killed, and 10 men wounded. Upon this the enemy gave way and fled from the field, pursued by the Americans, who made many captures, including 14 officers, 8 pieces of artillery, and several standards. The Mexicans, in confusion, retired to Matamoros, many being drowned in crossing the river. Arista's losses were estimated at 1000 men, of whom 200 were left dead upon the battle-field. On May 17th Arista evacuated Matamoros, and on the following day Taylor crossed the Rio Grande and took possession. Previously, on May 11th, President Polk had sent to Congress his famous war message, in which he enumerated the wrongs committed by Mexico against the United States, and, ignoring Mexico's reasonable claim to the country between the Nueces and the Rio Grande, asserted that "Mexico has passed the boundary of the United States, has invaded our territory, and shed American blood upon American soil." Two days later Congress issued a formal declaration of war, and threw the onus of striking the first blow upon Mexico. The ensuing three months were utilized by both sides in raising additional troops. Congress authorized a call for 50,000 volunteers, and the regular army was increased to 30,000. On August 19th Taylor marched with 6700 men (including volunteers) upon Monterey, which was held by Ampudia with 10,000 men. Previous to his arrival before Monterey, however, Santa Anna (q.v.) had subverted the Government of Paredes, and had established himself in power. The American army arrived in front of the town September 19th, attacked on the 21st, and after three days of severe fighting the defenses were taken by assault, and the Mexican general capitulated, being permitted to march out 'with the honors of war,' and an armistice of eight weeks being agreed upon. (See MONTEREY.) The Mexican losses were estimated at nearly 1000; those of the Americans at 488. General Scott withdrew from Taylor the greater part of his army and instructed Taylor to establish his headquarters at Monterey and refrain from further offensive operations. Through captured dispatches Santa Anna learned of Taylor's depleted force, and quietly advanced upon the American position near Saltillo with 20,000 effectives. Taylor's scouts informed him of this in time for him to complete his dispositions for battle. With 4691 men, including several regiments of newly enlisted volunteers, he awaited Santa Anna at Angostura, near Saltillo and on the road to San Luís de Potosi. The engagement which followed, known as the battle of Buena Vista (q.v.), lasted two days (February 22 and 23, 1847), and more than once the result seemed doubtful, the panic which seized certain regiments of Taylor's volunteers being counterbalanced by the steadiness of the regulars, the effective work of the light batteries, and the gallantry of the Mississippi regiment under Col. Jefferson Davis, afterwards President of the Southern Confederacy. Notwithstanding the numerical superiority of the Mexican army, the obstinacy of the defense eventually won, and Santa Anna was forced to withdraw with 2500 killed and wounded and nearly 4000 missing, of whom the greater number had deserted during the battle. The American casualties comprised 264 killed and 450 wounded. Soon afterwards General Taylor returned home on leave of absence.

While the campaign in Northern Mexico was thus progressing, the United States sent expeditions into New Mexico and California. Within three months the American flag had been hoisted at Santa Fé, the navy had planted the flag at San Francisco, and seaports on the west coast of Mexico were blockaded.

On March 9, 1847, Scott began to land his force (12,000 men) at Vera Cruz, with materials for a siege. By the 22d the investment of the city was complete, and a formal demand for surrender was made, which met with prompt refusal. For four days the besiegers bombarded the city and the Castle of San Juan de Ulua, their fire being replied to with spirit, but on the 25th the foreign consuls used their influence in the interests of non-combatants and to secure the burial of the dead, and a suspension of hostilities ensued. On the 29th the city surrendered. (See VERA CRUZ.) After a brief interval the Americans pushed on toward their goal. At the same time Santa Anna, having reorganized his army, marched with more than 12,000 men from the City of Mexico. At Cerro Gordo (q.v.), a pass in the mountains, 60 miles from Vera Cruz, he awaited the invaders, about 8500 strong. On the 14th of April Scott arrived and on the 18th attacked. Although stoutly resisted, by noon the Americans had swept over Cerro Gordo and driven the Mexicans down the road for ten miles. The spoils comprised 3000 prisoners, including 5 generals, and 40 bronze cannon. The casualties on the Mexican side were fully 1000; on the American side, 431. The advance to Puebla was only slightly opposed, and on May 15th Worth's division of 4000 men encamped in the Grand Plaza of this 'City of the Angels,' in the midst of 60,000 hostile citizens, 75 miles from the Mexican capital. On the 17th Scott made a final appeal to the Mexicans in the interest of peace, but in the imbittered state of popular feeling it failed. On the contrary, Santa Anna strained every means for the defense of his capital; he appealed to the patriotism of the people, money was freely contributed, and almost every able-bodied man was enrolled for the common defense, until 36,000 men and 100 pieces of artillery were in readiness. Sickness and the discharge of seven regiments of volunteers had reduced Scott's army, but the arrival of 2400 men under General Pierce (afterwards President of the United States) brought the total strength of the American forces to 10,738, nearly one-half of whom were recruits. Leaving a detachment of 500 men at Puebla, where 2300 wounded were in hospitals, Scott advanced upon the 'Halls of the Montezumas.' The city was entered by three roads, each guarded by rocky hills strongly fortified, the most prominent being that of El Peñon, mounting 51 guns, behind which were long and narrow causeways, flanked on one side by fields covered with broken lava, and on the other by ponds and marshes. On the east and southeast large lakes added to the military protection of the city; an inner line of fortifications, made doubly impregnable by nature and art, completed the obstacles to a further advance on the part of the Americans. Undismayed by these, however, General Scott summoned his engineers, among whom were Captains George B. McClellan and Robert E. Lee, and a new road was cut, skirting Lake Chalco and by a circuitous route of 27 miles leading to the most vulnerable side of the town. After careful reconnoissance the first impediment, the hill of Contreras (q.v.), was taken (August 20th) by an unexpected and desperate assault, with 813 prisoners (including four generals), 22 cannon, and thousands of small arms. The attacking force numbered 4500, the defense 7000 men, of whom 700 were killed, while the Americans lost about 60 in killed and wounded. On the same day the strong positions of San Antonio and Churubusco (q.v.) were carried by the divisions of Worth and Twiggs, with further captures of 1800 prisoners, including 4 general officers; the Mexicans losing more than 3000 and the Americans about 1100 killed and wounded. After the 'outer walls' had thus been gained, the American advance was again halted, and on August 23d an armistice was agreed upon pending the possibility that the demands of the United States might be acceded to without further bloodshed. This expectation proved futile, and on September 7th the final movement began. After severe hand to hand fighting, the defenses of Molino del Rey were carried by the Americans on September 8th, and on the 13th the castle of Chapultepec was stormed. On the 14th the Mexican army evacuated the capital, and General Scott made his entry into the city. The total American losses during the operations in the Valley of Mexico were 2703, including 383 officers; that of the Mexicans 7000 killed and wounded and 3730 prisoners of war. The spoils of war comprised 20 standards, 132 cannon, and 20,000 small arms. General Scott established his headquarters in the City of Mexico, was reënforced to an aggregate of 20,000 men, and levied a tax of $150,000 upon the municipal government, to be largely expended for the comfort of the sick and wounded. On February 2, 1848, a treaty of peace between the United States and Mexico was signed at Guadalupe Hidalgo. (See GUADALUPE HIDALGO, TREATY OF.) The total number of American regulars who served in Mexico and its borders during the war was 21,509; of volunteers, 22,027.

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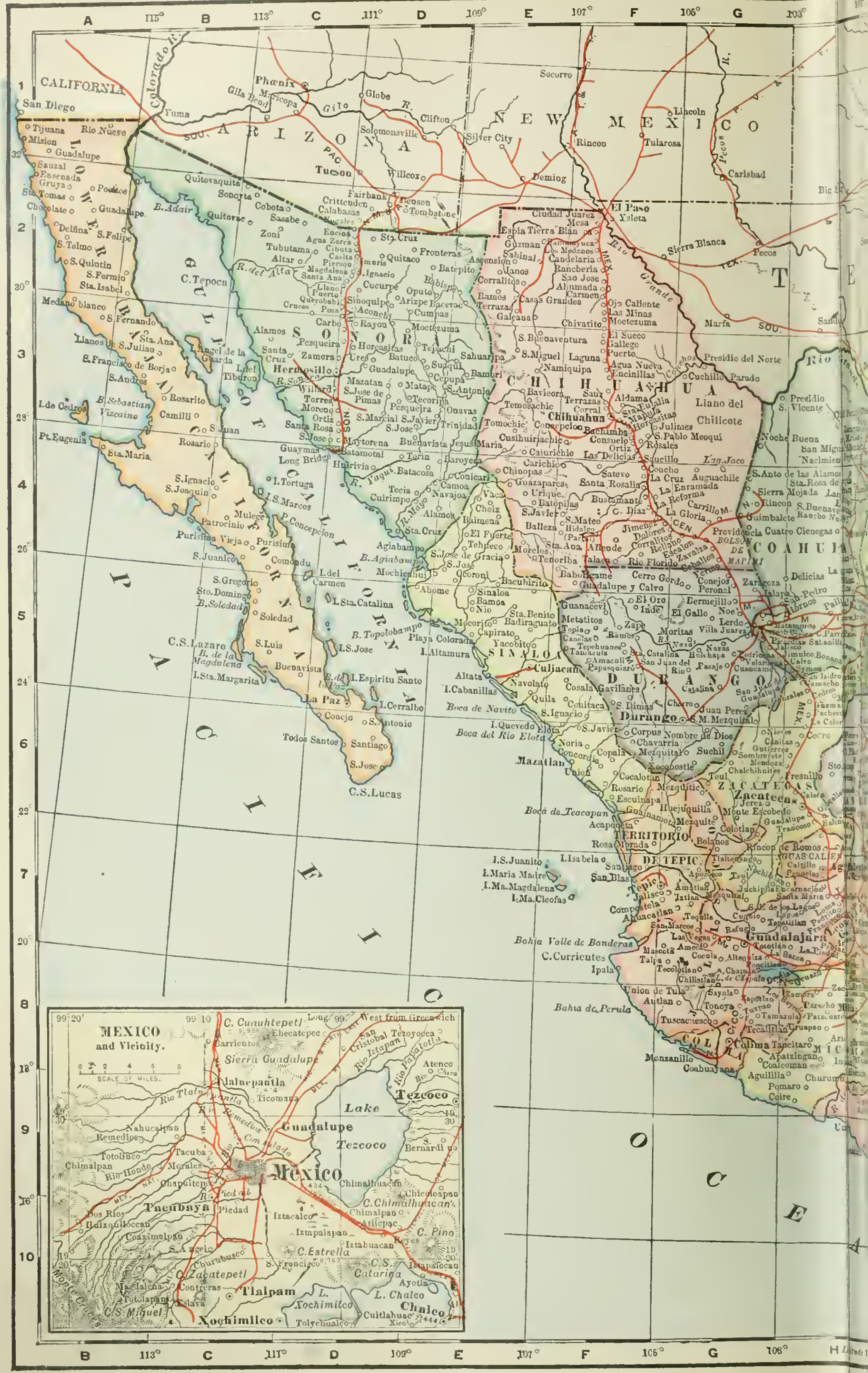
MEXICO (Sp. *Méjico*, mā′hĭ-kō). A country of North America bounded on the north by the United States and the Gulf of Mexico, east by the Gulf of Mexico, the Caribbean Sea, and British Honduras, south and west by the Pacific Ocean and Guatemala. It extends through 18 degrees of latitude, between the parallels of 15° and 33° N., and through 30 degrees of longitude, between the meridians of 87° and 117° W., and has an area of 767,000 square miles, including the islands. The Tropic of Cancer passes through it nearly midway between its northern and southern boundaries, the southern half of the country being therefore within the tropics. The boundary between Mexico and the United States is 1833 miles in length, the northern extremity of the country being its widest portion. The Isthmus of Tehuantepec, a little more than 100 miles across, is the narrowest part. The country has 1727 miles of coast line on the Gulf of Mexico and the Caribbean Sea, and 4574 miles on the Pacific Ocean. In form Mexico is not unlike a cornucopia with its narrow end tapering toward the southeast; and the country is concave on its eastern and convex on its western coast lines. It is prolonged toward the east by the low, wide peninsula of Yucatan; and the long, narrow peninsula of Lower California projects through 9 degrees of latitude, the great Gulf of California separating it from the mainland.

TOPOGRAPHY. The surface of the main portion of Mexico rises steeply from the narrow coast lands, and more gently from the great depression of the lower Rio Grande to the broad tableland of the interior. This central plateau is dominated by mountains whose great height is masked by the elevated lands above which they rise. The peninsula of Yucatan, on the other hand, has nothing in common with the main mass of Mexico in its conformation or geological structure, being a very low, level region.

The eastern coast is of monotonous aspect, low, flat, and sandy; but in the State of Vera Cruz, where the lofty mountain edge of the plateau most nearly approaches the coast, the inconspicuous shore line is forgotten by all who approach it from the gulf, for the majestic summits of the interior are visible far out to sea and dominate the view. Long reaches of sand banks stretch in front of the shore nearly as far south as Vera Cruz, shielding the shallow waters between the mainland and the banks from the sea waves. The Pacific shore is also generally low, though here and there relieved by spurs from the Cordillera that extend to the ocean. Most of the many small islands near the coasts are uninhabited, though some of them are very fertile. The most important islands are El Cármen, the largest Mexican island in the Gulf of Mexico; San Juan de Ulua and Sacrificios, at Vera Cruz; Mujeres and Cozumel, in the Caribbean Sea; Guadalupe, in the Pacific off the coast of Lower California; the Tres Marias group, near the entrance to the Gulf of California; the Revilla Gigedo group, far off the coast of the State of Colima, to which it


CALIFORNIA
ARIZONA
NEW MEXICO
TEXAS
LOWER CALIFORNIA
GULF OF CALIFORNIA
SONORA
CHIHUAHUA
COAHUILA
SINALOA
DURANGO
ZACATECAS
TERRITORIO DE TEPIC
JALISCO
COLIMA
PACIFIC OCEAN
MEXICO and Vicinity.
SCALE OF MILES.
Long. West from Greenwich
Lake Tezcoco
Mexico
Tacubaya
Guadalupe
Tlalpam
Xochimilco
Chalco
San Diego
Yuma
Phœnix
Tucson
El Paso
Chihuahua
Hermosillo
Guaymas
La Paz
Mazatlan
Durango
Zacatecas
Tepic
Guadalajara
Colima
Manzanillo
C.S.Lucas
A
B
C
D
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115°
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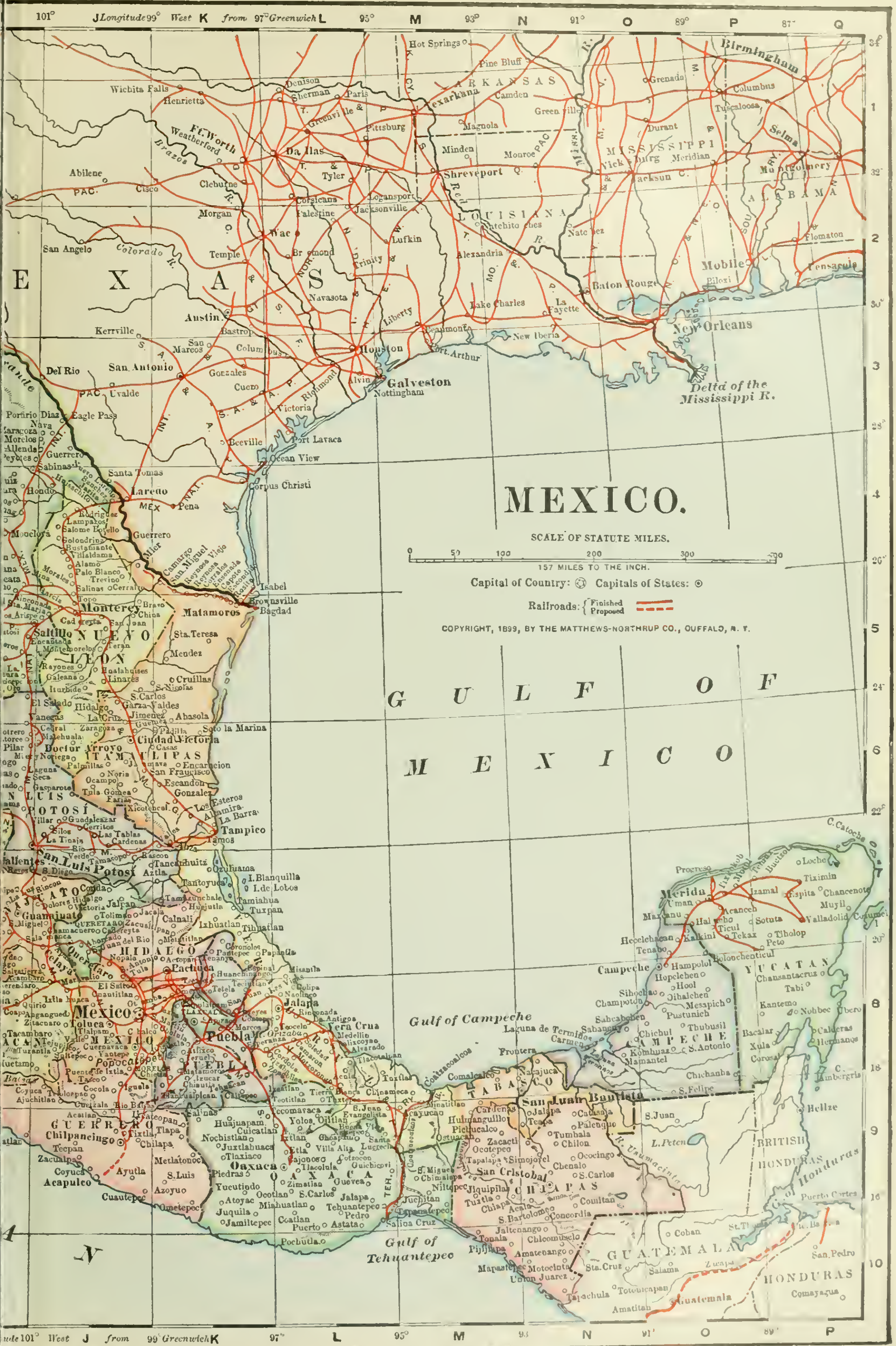

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is assigned; and Alcatras Island, near the coast of Michoacan.

There are no good natural harbors on the Gulf of Mexico coast, but this impediment to commerce has been partly relieved by the expenditure of large sums. Jetties at the entrance to the port of Tampico have increased the depth from 9 to 24 feet; and breakwaters at Vera Cruz have turned that dangerous roadstead into a safe and commodious harbor. The best natural harbors are on the Pacific coast, those of Acapulco, Manzanilla, Guaymas, and La Paz, the chief town of Lower California, being most conspicuous. That of Acapulco is one of the finest natural harbors in the world. These excellent Pacific coast ports have, however, the disadvantage that they are shut off by mountains from the busiest parts of the republic, and therefore do not have a large share of the country's trade.

The eastern and western edges of the great central tableland are bordered by two cordilleras or high mountain ranges. The eastern range (Sierra Madre Oriental) extends from 10 to 100 miles back of the Gulf of Mexico, the land gently sloping from the foot of the mountains to the sea. The cordillera on the Pacific side (Sierra Madre Occidental) is on the whole nearer to the coast; and in the south, in the States of Michoacan and Guerrero, extends a coastal range, a broad and fertile valley stretching between it and the main cordillera which trends toward the east. The most continuous range is the Sierra Madre Occidental of the Pacific which extends from Arizona to Oaxaca with a mean elevation of over 10,000 feet. The inland faces of the two border ranges descend somewhat gently to the central tableland, while their seaward sides are more precipitous, presenting many scarps and cliffs and furrowed with deep chasms or gorges. The border ranges gradually approach one another toward the south and the narrowing plain between them terminates, south of the City of Mexico, in a labyrinth of mountains culminating in giant peaks, such as Popocatepetl and Orizaba. They include an irregular line of mountains, known to the Mexicans as the Cordillera de Anahuac, extending east and west across the country without forming a continuous chain, but embracing most of the active volcanoes.

The numerous volcanoes of Mexico, active and extinct, which are confined to the southern half of the country between the 22d parallel and the Isthmus of Tehuantepec, are the most elevated features of the topography. Ten of them are more or less active, though a number may be called dormant, as their exhalations consist only of aqueous or sulphurous vapors. The loftiest among them is Orizaba (Citlaltepetl), Star Mountain, 18,250 feet in height, situated to the north of the line of the railroad between Vera Cruz and the City of Mexico. It has not been in violent eruption since the middle of the sixteenth century, and has been nearly quiescent since the middle of the nineteenth century, though vapors and sulphurous jets are still ejected from its crater, which, however, is usually filled with snow. Popocatepetl (Smoking Mountain), 17,520 feet, the most widely known of the Mexican volcanoes, is comparatively easy of ascent. Its yawning crater is over a half a mile in circumference and 250 feet deep, and through the melted snow around the orifice frequent jets of gas emerge. Orizaba and Popocatepetl are among the most perfectly formed of volcanic mountains. Ixtaccihuatl (White Woman), 16,960 feet, rises to the north of Popocatepetl, and is now extinct, though many legends relating to its ancient activity are still repeated. The extinct Nevado de Toluca (14,950 feet) rises to the south of the town whose name it bears, a lake from melting snows partly filling its crater with pure cold water in which fish of a peculiar species are found. Malinche (13,460 feet) rises in isolated majesty from the middle of the Tlaxcala plateau. On the verge of the central plateau bordering the Sierra Madre Oriental is Cofre de Perote (13,400 feet), another great eruptive summit now extinct, which owes its name 'coffer' to the quadrilateral form of its summit, and is famous for the China-camote cavern on its western side, said to be over 30 miles in length, but difficult of access because its floor is strewn with large rocks. Colima (12,970 feet), not far from the Pacific and the most active volcano in Mexico, is in an almost incessant state of ebullition. The view from its summit, during its periods of quietude, is unrivaled, embracing the ocean, widespread plains, and the glittering snow crown of Popocatepetl far to the east. The forested Tancitaro volcano (12,650 feet) is in the same latitude as Colima, but nearer to the Sierra Madre. As the limit of perpetual snow is a little under 15,000 feet above the sea, only three of these lofty summits, Orizaba, Popocatepetl, and Ixtaccihuatl, have an enduring crown of snow; and considerable glaciers develop only on Ixtaccihuatl. The small volcano of Jorullo (4330 feet) is said by the natives to have suddenly risen above the cultivated plain in a single night near the end of 1759, though its period of construction did not end till 1763. Humboldt made it famous by the description he received from the natives of its terrific energy. Columns of superheated air still rise from its crater.

The wide tableland or plateau of Anahuac (q.v.), fringed by these mountains, slopes from south to north, being from 5000 to 9000 feet high in the States of Mexico and Puebla and falling to 3600 feet at El Paso, on the United States border. Its surface is covered with long-continued outpourings from the volcanoes and the detritus worn away from the mountain slopes, which, according to Heilprin, filled the original depressions, the valleys of to-day having been imposed upon this new surface. The mountains of the plateau, nearly buried by the accumulations of past ages, still rear their heads above the general level, and here and there are continuous ridges or ranges which divide the surface into well-defined basins such as the Valley of Mexico, nearly 8000 feet above the sea and completely inclosed by mountains. The rivers of the plateau have cut deep valleys and cañons, some of which are 1000 feet below the general level, extending the warmer influence of the coast lands into the plain. These barrancas, as they are called, are watered by small streams and contrast, by the luxuriance of their vegetation, with the dry and often barren plateau above them. The most famous of the barrancas extend from the neighborhood of Guadalajara through the western mountains to Colima and Tepic. On the whole, the surface of the plateau is so level that there was little difficulty, even before there were wagon roads, in traveling by carriage between the City of Mexico and Santa Fé.

The dry and sandy peninsula of Lower California, the most remote region of the Republic, is also traversed by a range of mountains, broken in two places, and culminating in Mount Santa Catalina, rising 10,000 feet above the sea not far south of the neck of the peninsula. Owing to its excessively dry climate and scanty population, this peninsula is still little known. The huge quadrilateral peninsula of Yucatan is projected beyond the continental coast line toward Cuba, has no mountain ranges, and its mean altitude is scarcely above 100 feet.

HYDROGRAPHY. The form of the central plateau, hemmed in by border ranges parallel with the sea and preventing wet winds from reaching the interior, is not favorable to the development of large fluvial systems. No Mexican river is important for its volume or is valuable for commerce excepting to a very limited extent. All rivers tributary both to the Gulf of Mexico and the Pacific are obstructed by sand bars at their mouth. The longest river is the Rio Grande, which rises in Colorado and for 750 miles forms the boundary line between the United States and Mexico. The waters of its upper course are so far diverted for irrigation purposes that the lower river is almost entirely dry during the dry season. While the Mexican part of its basin comprises 94,000 square miles, the river receives scarcely any perennial stream. Its largest affluent in Mexico is the Rio Conchos, which is fed for 200 miles north and south by the eastern slope of the Sierra Madre Occidental. The Salado tributary comes from the Sierra Madre Oriental, and its name, Salt River, indicates that its waters are rendered saline by their very slow passage through shallow basins. Other tributaries have the same peculiarity, so that they give a brackish taste to the waters of the Rio Grande itself. The Pánuco, the most considerable river of the south tributary to the Gulf of Mexico, rises north of the Mexican Valley and empties at the port of Tampico. The Coatzacoalcos, or Snake River, drains the alluvial plain and low mountain district, forming the northern slope of the Isthmus of Tehuantepec; small boats ascend it for over sixty miles from its mouth. The most important rivers on the Pacific coast are the Rio de las Balsas (river of the rafts), which, as its name indicates, is navigable to a limited extent in its lower reaches, and the Lerma or Santiago, which rises a little west of the City of Mexico, and about fifteen miles from Guadalajara is precipitated over the great falls of Juanacatlan, one of the finest waterfalls in the Western world.

The Lake of Chapala, which receives and discharges the Lerma River, is the largest lake in Mexico; many fine country houses have been built on its shores. Mexico has no really large lakes, though some of the sheets of water, as Cuitzeo and Patzcuaro, in the State of Michoacan, are famous for their beauty. A considerable part of the Valley of Mexico is occupied by six very shallow lacustrine basins, four of the lakes salt. They are the relics of much larger lakes which existed when the Spaniards invaded the country.

CLIMATE. As a whole, Mexico is a hot country, but its climate, if not one of the most salubrious, is among the most delightful in the world; the normal warm temperature is modified by great contrasts in elevations and by the position and trend of the mountain ranges, which influence the force and direction of the winds and the distribution and amount of the rainfall. The climatic differences depending upon the differing altitudes are so great that the vegetable products include almost all that grow between the equator and the arctic regions. In some large areas, however, uniformity of climate prevails; thus the great plains of the northern States, hemmed in by mountains from sea influences, have the extremes of temperature characteristic of the continental climate in the United States. On the other hand, the Isthmus of Tehuantepec is entirely included in the wet tropical zone.

Three zones of climate are distinctly marked. The tierra caliente, or hot land, lies along the low maritime zone of the Gulf and the Pacific, and includes swampy and sandy coast lands and well-watered plains and slopes leading up to the mountains. The growth of luxuriant tropical vegetation is promoted by a mean annual temperature of 77° to 82° F., the mercury seldom falling below 60°, but often rising to 100°, and in the sultry districts of Vera Cruz and Acapulco to 104°. Some places, as the port of La Paz, are among the hottest in the world. The seacoasts are unhealthful, fevers prevail, and in some localities yellow fever and black vomit are endemic. The health conditions may be greatly improved by draining the swamps, as has already been shown at Vera Cruz.

Above the Gulf and Pacific hot zones are the tierras templadas, or temperate lands, from 3000 to 6000 feet above the sea, embracing the higher terraces and parts of the central plateau. The temperate lands rise to a higher elevation in the southern than in the northern States. The mean temperature is from 62° to 70° F., and does not vary more than 4° to 5° during the year. Thus extremes of heat and cold are unknown; semitropical products, like those of Southwestern Europe, are abundant and to some extent, also, products both of the tropical and cold regions. Around the city of Oaxaca wheat and sugar cane may be seen growing on the same piece of ground.

Above the temperate lands are the tierras frias, or cold lands, 7000 feet or more above sea level, with a mean temperature of from 59° to 63° F. Most of the central plateau, with its girdle of mountains, is included in this region, but in great depressions of the surface a warmer temperature and tropical products are found. The less elevated parts of this region produce cereals and apples, while the higher grounds, some of which extend above the snow line, have a sparse vegetation. The lower cold lands are the most thickly inhabited regions in Mexico.

Owing to the differences of temperature and the effect of the mountain ranges upon the direction of the winds, the rainfall is very unequally distributed. During the rainy season, from the middle of May to October, many torrential storms occur in the southern half of the Republic. Little or no rain falls in the winter or dry season. The cold lands receive only about one-fifth as much rain as the temperate lands except in some of the mountain districts, where the precipitation is heavy. The City of Mexico has a mean rainfall of 30 inches a year, which is somewhat in excess of the general supply of the plateau to the north of it, though the precipitation on the mountain coast lands is two to four times as great. The extreme northern part of the plateau is semiarid, reproducing the conditions that prevail in

Arizona and New Mexico. The country lies in the zone of trade winds blowing from northeast to southwest, but, as mentioned above, the trend of the ranges modifies their normal direction. Both the Gulf and Pacific coasts are exposed to violent gales, which often do great damage to shipping.

Geology and Mineral Resources. The mountain ranges are formed chiefly of plutonic and volcanic rocks such as granites, gneiss, syenites, mineral-bearing trachytes, basalts, porphyries, obsidian, sulphur, pumice, lavas, and tufa. Sedimentary formations are also represented especially by a carboniferous limestone interspersed with deposits of anthracite. The land consists mainly of metamorphic formations largely penetrated and overlaid by volcanic outpourings and the débris resulting from mountain denudation. The most valuable rocks thus far known are the argentiferous porphyries and schists of Sinaloa and the central plateau. It has not yet been revealed whether the auriferous deposits of Sonora are destined to equal them in economic value. The sandstones of the northern States have produced the sandy plains of North Mexico, but none of the horizontal layers is rich in ores, which are found chiefly in metamorphic rocks of Durango, Chihuahua, and the south.

Mexico is one of the richest mining countries in the world. Excepting Sinaloa and Sonora, which contain vast stores of the precious metals, nearly all the historic mines lie on the south-central plateau at elevations of from 5500 to 9500 feet. A line drawn from the City of Mexico to Guanajuato, thence north to Chihuahua and south to Oaxaca, incloses a silver-yielding zone that is unsurpassed in richness. The central group of mines in the districts of Guanajuato, Zacatecas, and Catorce in the States of Guanajuato, Zacatecas, and San Luis Potosí have thus far yielded over half of the silver mined in Mexico. The Veta Madre lode of Guanajuato alone produced $252,000,000 between 1556 and 1803. Gold is found chiefly, not on the plateau, but on the slopes facing the Pacific. It is believed to be in greatest abundance in Sonora, but the gold-mining industry may be said as yet to be almost in its infancy, and the production is comparatively small. The inferior development of gold-mining is due to the fact that it is far more difficult and expensive to mine and reduce gold than silver; and most of the gold Mexico produces is that obtained in association with silver-mining. Copper in a pure state is found near the City of Guanajuato and associated with gold in several States. Iron is in vast abundance in Michoacan, Jalisco, and Durango, but until the coal fields found at various points are developed there is little prospect that iron-mining will become very important. The famous Cerro del Mercado in Durango, discovered in 1562, is a hill of magnetic iron ore, 4800 feet long, 1100 feet in width, and 640 feet high, averaging about 70 per cent. of metal and estimated to contain over 300,000,000 tons of ore above the plain, beneath which it may extend to a great depth. Fuel is one of the most pressing needs of Mexico. Firewood costs in the City of Mexico $14 a cord. Coal ranges from $16 to $22 a ton, and is brought from England and the United States. The difficulty is that most of the coal is remote from lines of transportation, and the fields cannot be developed till means of cheap carriage are provided. Sonora has a carboniferous area with veins from 5 to 16 feet in thickness of hard clean anthracite carrying as high a percentage of fixed carbon as the best coal of Wales. When it can be transported the anthracite of this field will supply the Pacific Coast of North America with anthracite of the first quality for years to come. The coal measures of Michoacan and Oaxaca are also undeveloped. Many of the inhabitants of the northern State of Coahuila burn mesquite bush, straw, and cotton bushes because they cannot procure the coal mined at Salinas in their State, which now supplies fuel for the International Railroad Company, a part of the Southern Pacific Railroad, and the factories in Monterey.

Much lead is associated with silver, and tin, sulphur, salt, marble, and the building stones are in abundance. All other mining enterprises, however, are dwarfed by the colossal development of silver production. The value of the precious metals presented at the Mexican mints and assay offices in the year 1898-99 was: Silver, $57,985,400; gold, $4,043,374. In 1899 there were in Mexico 1142 mines including: Silver, 256; silver and lead, 171; silver and other metals, 114; gold, 84; gold and silver, 278; gold and other metals, 117; copper, 31. The total output of ore was valued at $89,000,000, and the number of persons employed was 106,536.

Three mints and eight Government assay offices are maintained, and producers of gold and silver may have their bullion coined at small cost. The total coinage of Mexican silver from the time of its discovery by the Spaniards to 1895 amounted to $3,398,664,400, which is more than one-third of the world's production of silver from 1493 to 1895. As a large amount of silver is not coined, but is used in the arts, it is estimated that Mexico has produced nearly one-half of the world's silver mined in the past four centuries. The larger part of the gold and silver is exported. In the twenty-two years ending in 1896 the silver exports amounted to $429,057,100 in coin, $143,418,595 in bullion, $85,898,933 in ores, and $30,102,151 in other forms. Europe is the principal market for the export silver and the United States for the export gold.

Flora and Agricultural Resources. The sharp differences in climate produce rapid transitions in forms of vegetation; in a few hours' travel not only great differences in the kinds of plants, but also in the stages of growth of the same plant, are observed. The Mexican Southern Railroad from Puebla to Oaxaca descends by fertile terraces from 7000 feet to 1750 feet above the sea. In March the green wheat is just peering above the ground in Puebla, while lower down along this railroad fields of wheat are ripe for harvest and still lower the grain is being threshed. The varied conditions of temperature and moisture result in the greatest contrasts, desert areas lying contiguous to grassy steppes, which are succeeded by cultivated fields, and in the lowlands by forests with an inextricable tangle of tropical undergrowths. Gray, thorny plants characterize the northern region, where rain seldom falls, though even this region is brightened in the spring by many flowers. Owing to the undeveloped state of coal-mining and the great need of fuel and timber for the mines, the forests that once covered the mountains have been largely destroyed, and thus the conditions of rainfall have been considerably modified. But many varieties of oak and also pines and firs are found on the mountain slopes; and the hot lands have about 100 varieties of building and cabinet woods, including mahogany and rosewood, besides dyewoods, gum trees, the fig and oil-bearing trees and plants, such as the olive, cocoa palm, sesame, and almond. Fifty-nine species of medicinal plants have been classified.

Few countries equal Mexico in the variety of its economic vegetable products. Many localities are well suited for the raising of coffee, an export crop of which about 60,000,000 pounds are produced every year, most of it in the temperate lands of Vera Cruz, Oaxaca, Tabasco, Chiapas, and Michoacan. Cotton is grown chiefly in the Pacific States and also in Vera Cruz and Coahuila. It is not so cheaply produced as in the United States, is wholly consumed by the local mills, and the Government endeavors to promote its cultivation, and to improve the facilities for transportation to the spinneries so that the dependence upon foreign supplies of cotton cloth may be decreased. Sugar cane is cultivated in the lowlands of the southern States, though they as yet produce scarcely enough sugar for home consumption. Tobacco grown on the warm lands south of Tampico and San Blas is almost equal to Cuban leaf in aroma. Its improved cultivation was introduced by Cuban planters about forty years ago. Maize, the chief crop throughout the temperate region, thrives best south of Durango. Another great food staple is the frijole or brown bean, cultivated with peas and lentils and daily eaten by most Mexicans. The wheat crop in the cold zone is worth only about one-fourth as much as the maize crop.

A great variety of tropical fruits are raised in the hot zones, including oranges (up to 2500 feet), lemons, bananas (up to 5000 feet), easy to cultivate and affording a large profit, pineapples (from sea-level to 3000 feet), and cocoanuts along the hot coasts. Many species of the agave grow on the central plateau, some of them yielding, particularly in the eastern part of the plateau, large quantities of a white juice which, when fermented, is intoxicating, and is the national beverage, pulque holding the same place in the dietary of Mexico that wine occupies in France. Other species of the agave yield henequen or sisal hemp, whose cultivation and preparation for market is by far the most important of the fibre industries and has made the prosperity of the State of Yucatan, in the northern part of which it is produced. Enormous quantities are exported to the United States for sacking, cordage, and binder's twine. The *Castilloa elastica* is the predominant species of rubber tree, and though rubber-collecting is as yet little developed, it is destined to be very profitable. The cacao tree thrives chiefly in Chiapas and Tabasco, but not enough cocoa is produced for home consumption. The vanilla bean grows luxuriantly on the Gulf Coast and brings a high price on account of its excellent quality. Rice on the coasts is usually grown without irrigation, depending entirely upon the rainfall. The soils of Mexico excepting in the sandy north and some areas of sand along the coasts are excellent. The agricultural resources are capable of far larger development as soon as irrigation is applied to the naturally productive lands. Much of the plateau is semi-arid, but the neighboring mountains have inexhaustible supplies of water, which by the construction of reservoirs and other modern appliances may be conserved for agricultural uses. Farming methods are crude and modern machinery has been introduced only on the large plantations. The chief agricultural products of 1899 were, in kilograms (a kilogram = 2.2 pounds):

Rice	23,100,000	Cotton	22,400,000
Wheat	252,700,000	Logwood	45,400,000
Sugar	68,600,000	Cacao	1,000,000
Panocha	59,100,000	Coffee	37,600,000
Molasses	62,000,000	Tobacco	7,800,000
Henequen	118,800,000		

There were produced also 93,370,000 bushels of maize, 29,059,000 gallons of spirits, and 171,710,000 gallons of fermented liquors.

FAUNA. In the plateau regions the fauna is that of the North American continent, while it is more closely associated with that of the West Indies in the coast lands of the Gulf; that of the Pacific seaboard partakes of the character of the Californian and South American fauna. Wolves and coyotes are common in the northern States, and bears, peccary, the puma, jaguar, and ocelot are found among the mountain forests. In the tropical forests are five varieties of monkeys and a species of sloth. Among the other animals are the hare, rabbit, squirrel, beaver, mole, marten, otter, and several species of deer. A few boas in the south and several other species of snakes, some of them very venomous, as the rattle and coral snakes, represent the ophidians. Noxious insects infest the hot regions in myriads. The coast waters and estuaries of the rivers teem with fish, and turtle-shell is an article of some trade importance. Bees are numerous and their wax is exported. Vultures are the scavengers of every town, and parrots, humming-birds, and other tropical birds vie in brilliancy of plumage with those of Brazil. The Mexican mocking-bird and other songsters are unsurpassed by those of any other country. Only the turkey and a species of duck have been domesticated. all the other farm animals having been introduced by the Spaniards into Mexico, where they have multiplied prodigiously.

ANIMAL INDUSTRIES. Stock-raising is one of the leading industries. In the low-lying coast regions. particularly in Vera Cruz and Tabasco, are moist savannahs, covered with nutritious grasses, where cattle may be reared and fattened at small expense; and on the comparatively arid plateau of the north there is sufficient herbage to support enormous numbers of cattle. On some of the haciendas 10,000 to 30,000 head are in charge of vaqueros, who are very skillful in throwing the lasso and in all the other arts of the cowboy. Mexican cattle are of inferior quality (long-horned type) and small size, weighing only 900 to 1000 pounds. In recent years many of the stock-raisers have begun to improve their herds by the importation of better breeds from the United States. Hides are an important export to the United States, and hundreds of thousands of undeveloped steers are sold in Texas. The horses are small but hardy animals; sheep produce only 1 to 2½ pounds of coarse and inferior wool to the fleece, all of which is consumed in the home mills, which import much wool of finer grades, while well-to-do Mexicans wear imported clothes. The tendency toward the improvement of all the native domestic animals and of the methods of stock-raising gives promise of large expansion in these industries.

Manufactures. The manufacturing industries have progressed slowly, though in recent years, with the advent of much foreign capital and the cessation of political revolutions that were long the curse of the country, there has been a large development of many industries. There are now over 3000 small establishments for the manufacture of sugar. The first cotton mill was erected in 1834. In 1899 there were 107 cotton spinning and weaving mills with 468,547 spindles, 13,944 looms, consuming 57,201,573 pounds of raw cotton and producing 3,795,446 pounds of yarn and 9,875,764 pieces of cloth. Puebla, Jalisco, Vera Cruz, Coahuila, Tlaxcala, the City of Mexico, Rio Blanco, near Orizaba, and the falls of Juanacatlan, near Guadalajara, are the centres of largest development in the cotton industries; 2211 distilleries produced 864,858 gallons of spirits; 721 tobacco factories, with Vera Cruz as the chief centre, used 5,546,567 kilograms of tobacco, making 328,605,915 packages of cigarettes, 45,438,759 cigars, 64,302,282 cheroots, besides pipe tobacco and snuff. Woolen and linen spinning and weaving (over 20 mills producing underwear, carpets, etc.), the manufacture of glass, drugs, chocolate, paper, porcelain, flour, and soap, and beer brewing are also important industries. The artisans of the plateau are skilled in making the broad-brimmed Mexican hats, silver ornaments, jewelry, saddlery, leather work, and embroidery, and in other arts that contribute to the distinctive finery of Mexican attire and equipment. The feather work and other products of the Indians are still highly prized. The Government encourages the development of home industries by imposing a tariff amounting on an average to about 38 per cent. on the declared value of nearly all imported goods.

Commerce. The value of the foreign trade of Mexico has for years been rapidly increasing. The exports are usually larger in value than the imports. A peculiarity of Mexican statistics of foreign commerce should be borne in mind in order to reach correct conclusions as to the actual value of exports and imports. Duties are collected in gold upon gold valuations of the commodities imported. The value of import articles is thus given in gold. But the value of export commodities is given in Mexican silver, the value of the peso or silver dollar fluctuating in 1901 between 46.4 cents and 50.9 cents.

The value of the exports (in Mexican silver dollars) in 1899-1900 was: merchandise, $79,031,336; precious metals, $71,025,024; total, $150,056,360. The value (in Mexican silver dollars) of the chief exports in 1900-01 was: Minerals, $97,900,000; vegetable substances, $36,100,000; animals, $11,400,000; manufactured products, $2,300,000; various, $600,000.

The value of the imports (in gold) was: in 1899-1900, $61,318,175; in 1900-01, $65,083,451. The trade with the leading countries (in millions of dollars) was:

	Imports from (gold dollars)		Exports to (silver dollars)	
	1899	1900–01	1899	1900–01
United States	31.0	35.1	116.1	117.2
Great Britain	10.4	9.9	12.4	12.0
France	6.7	6.5	6.6	2.8
Germany	6.6	7.0	5.0	5.0
Spain	2.2	2.8	0.9	1.2

The leading commodities exported, in the usual order of importance, are silver, gold, henequen, coffee, cabinet and dye woods, copper, live animals, lead, hides and skins, chewing gum, tobacco, and vanilla. The commerce of the two ports through which most of the internal trade is conducted was valued in 1900-01 at: Vera Cruz, imports, $22,328,154 (gold); exports, $21,892,184 (silver). At Tampico, imports, $9,712,956 (gold); exports, $43,880,140 (silver). About one-half of the imports are purchased from the United States, England, France, and Germany supplying most of the remainder. The United States buys by far the larger part of the exports. Mexico is thus chiefly dependent upon the United States as a market for its commodities and the source from which its foreign supplies are drawn.

Shipping and Communications. Most of the foreign trade of Mexico is carried either by railroad or in foreign bottoms. Hundreds of vessels, most of them very small and owned by Mexicans, are engaged in the coasting trade. The mercantile marine of the country comprised, in 1900, 24 steamers of 4200 tons and 50 sailing vessels of 8445 tons. About 10,000 vessels in the foreign and coastal trade enter and clear at the Mexican ports every year, the tonnage being, on an average, over 3,000,000.

The first railroad, only three miles in length, connecting the City of Mexico with Guadalupe, was completed in 1854. Since 1870 railroad construction has been carried on rapidly. The railroad between Vera Cruz and the City of Mexico was completed in 1873. Two trunk lines connect the capital with the United States—the Mexican Central to El Paso, Texas, with a branch from San Luis Potosí to the port of Tampico; and the Mexican National to Laredo, Texas. Another trunk line from Torreon on the Mexican Central to Eagle Pass, Texas, makes a third route between Mexico and the United States. There are now two lines between the City of Mexico and Vera Cruz. The Tehuantepec Railroad from the port of Coatzacoalcos on the Gulf of Mexico to Salina Cruz on the Pacific, 130 miles long, is the only road yet extended from the Atlantic to the Pacific, though several others are building. Great improvements have been completed at the ports of Coatzacoalcos and Salina Cruz, so that large vessels may enter them, and it is expected that much trade between the Atlantic and Pacific will pass over this road. The railroad system now reaches the principal cities and commercial and mining centres, and extends southward as far as Oaxaca, 500 miles from the Guatemalan frontier. Many of the railroads are heavily subsidized, it being the Government's policy to promote railroad building. In 1901 there were 9600 miles of railroad in operation, most of which had been built by foreign capital. In 1898 9,061,646 passengers and 5,964,000 tons of freight were conveyed, the gross proceeds being $39,800,000. In 1900 there were 42,843 miles of telegraph lines, of which 28,560 miles belong to the Federal Government and the remainder to the States, companies, and railroads. In 1901 there were 2082 post-offices. In the cities there were in 1898 1440 miles of street car lines, most of them using animal traction.

Banking. Banking is very profitable in Mexico, though the system is not yet well developed throughout the country. The great bank of the country is the National Bank of Mexico, established in the City of Mexico in 1882 and having branches in all the principal cities. It has a monopoly for the issuing of bank notes, excepting that the same privilege is exercised by the Bank of London and Mexico, founded during the French intervention in Mexico, and by the International and Hypothecary Bank of Mexico, or. as it is commonly called, the Mortgage Bank of Mexico. Both of these banks antedate the National Bank, though both have since been reorganized. A general banking law was adopted by the Mexican Congress in 1896, establishing the conditions under which banking institutions may be organized; but this law does not affect the National Bank or the other banks in the capital that were chartered before the law was passed. In 1895 there were twelve banks in Mexico, three in the capital, four in Chihuahua City, two in Mérida, Yucatan, and one each in Durango, Zacatecas, and Monterey, besides the numerous branches of the National Bank. The capital of the National Bank is $20,000,000, of the Bank of London and Mexico $15,000,000, and of the Mortgage Bank $5,000,000. The capital of the other banks ranges from $7,000,000 to $600,000, and the deposits from about $22,000,000 in the National Bank and $9,000,000 in the Bank of London and Mexico to less than $100,000. The Central Bank, in the City of Mexico, acts as a clearing house for the provincial banks. The existing banks are in a flourishing condition. The demand for increased banking facilities is very large; new banks are being established and the old banks are extending their facilities in various directions. The National Bank, which began with a capital of $3,000,000 and now has a reserve fund of $5,500,000, has in the past decade declared annual dividends ranging from 23 to 29 per cent. The declared dividends of the Bank of London and Mexico for seven years ranged from 10 to 20 per cent. When the stock of this bank was increased from $5,000,000 to $10,000,000, the $5,000,000 of new stock was subscribed more than four times over. The National Bank is the fiscal agent of the Government and is owned almost exclusively by Mexicans.

Owing to the expense and dangers of transportation, it was formerly difficult and hazardous to carry money from one city to another, and exchange between the various cities was sometimes as high as 10 per cent. The building of railroads has reduced the rate, but it is still high. It costs 1 per cent. to draw money from the City of Mexico to the city of Oaxaca and vice versa. The exchange is much higher when money is sent to towns without banking facilities.

FINANCE. Mexico still needs capital to develop her resources and give employment to labor. A great deal of foreign capital is invested in the country, but much more will be required before the natural resources are adequately developed. It was not surprising that the finances of the country were in a very unsatisfactory condition so long as there were no railroads, little development, and the country almost incessantly suffered from disturbed political conditions. Mexico's credit fell very low in the money markets during this period of her history, and it was not till peace and order became firmly established, after 1877, that her credit began to revive and that the revenues finally reached an amount sufficient to pay the public expenses. It was ostensibly for the purpose of protecting the interests of European holders of Mexican bonds that a combined force of French, English, and Spanish soldiers was sent to invade the country in 1861. The English and Spanish soon withdrew; but Emperor Napoleon III. proceeded to carry out his plan, now known to have been formed before the invasion, of founding a Mexican empire under French protection, and Maximilian ascended the throne in 1864 with assurances from France that it would help him to establish his rule upon a firm basis. The financial difficulties of Mexico were therefore the pretext for the intervention out of which arose the ill-starred empire of Maximilian.

Long after his downfall, however, the finances of the country were still in a chaotic state. At the close of the fiscal year, June 30, 1896, Mexico was able for the first time since achieving independence to show a surplus of $6,000,000. The obnoxious tax called *alcabalas,* or interstate duties on domestic and foreign commerce, was a great drawback to internal trade, and was finally abolished on July 1, 1896. The country was then in a condition when radical financial and other reforms might be introduced without danger of serious disturbances.

The per capita expenses are necessarily large, as the population is small in proportion to the vast extent of coast line and the large area requiring army, revenue, lighthouse, and police services; and only a small part of the inhabitants are wealth-producers, the burden of taxation falling chiefly upon a fourth or a third of the people. It is only since 1888 that the reorganization of the Federal Treasury has enabled that office to keep correct and complete accounts of the public expenses. The following is a statement of the national receipts and expenditures for a number of fiscal years:

FISCAL YEARS	Revenues	Expenditures
1888–89	$139,362,070	$141,959,065
1891–92	64,653,630	64,624,084
1893–94	69,116,510	69,441,269
1899–1900	64,261,078	58,309,934
1900–01	63,284,196	59,423,006

The apparent great excess of the revenues and expenditures in 1888-89 was partly due to the operations of the Liquidating Bureau which was closing the old accounts and opening the new ones under the new system.

The revenues of the Mexican States from 1884 to 1895, derived chiefly from taxes on real estate, averaged $15,815,585 a year; expenditures, $13,810,850. In the same period the revenues of the Federal Government averaged $41,442,877; expenditures, $50,225,750.

The federal revenue is derived chiefly from three sources: import and export duties, internal revenue, and direct taxes in the Federal District. The duties levied on foreign trade are highly protective and yield about 4 per cent. of the revenue. Export duties are levied upon some of the largest exports, such as henequen, cabinet and dye woods, and vanilla. The internal revenue collected through the use of stamps supplies about 45 per cent. of the receipts; and the direct taxes levied upon the real estate, scientific professions, and industrial establishments of the Federal District, together with some minor sources of income, make up the remainder. Taxes on the professions vary from 50 cents to $20 a month. The national debt in 1901 was divided into the gold debt, $112,398,300; and internal debt, $135,509,271 (silver).

Population. It is difficult to take a correct census in Mexico, particularly in the many districts inhabited by Indians, who fear that they will be taxed if they are enrolled in the census return. This table gives the area, population, and density of population according to the census of 1900; and, for comparison, the population according to the census of 1895 is added:

STATES AND TERRITORIES	Area in square miles	Population 1895	Population 1900
ATLANTIC STATES			
Tamaulipas	32,128	203,342	218,948
Vera Cruz	29,201	853,892	960,570
Tabasco	10,072	133,926	158,107
Campeche	18,087	87,264	84,281
Yucatan	35,203	297,088	312,264
Total	124,691	1,575,412	1,734,170
INLAND STATES			
Chihuahua	87,802	260,008	327,004
Coahuila	63,569	237,815	280,899
Nuevo Leon	23,592	307,856	326,940
Durango	38,009	292,549	371,274
Zacatecas	24,757	447,265	462,886
San Luis Potosí	25,316	562,195	582,486
Aguas Calientes	2,950	102,378	101,910
Guanajuato	11,370	1,047,817	1,065,317
Querétaro	3,556	224,848	228,489
Hidalgo	8,917	551,817	603,074
Mexico	9,247	837,981	924,457
Federal District	463	468,705	540,478
Morelos	2,773	156,786	161,697
Tlaxcala	1,595	163,244	172,217
Puebla	12,204	973,876	1,024,446
Total	316,120	6,635,140	7,173,574
PACIFIC STATES			
Lower California (Ter.)	58,328	41,838	47,082
Sonora	76,900	189,158	220,553
Sinaloa	33,671	256,858	296,109
Tepic (Ter.)	11,275	146,805	149,677
Jalisco	31,846	1,094,569	1,137,311
Colima	2,272	55,264	65,026
Michoacan	22,874	887,008	935,849
Guerrero	24,996	417,886	474,594
Oaxaca	35,382	872,902	947,910
Chiapas	27,222	318,730	363,607
Total	324,766	4,281,018	4,637,718
Islands	1,420		
Grand total	767,005	12,491,573	13,545,462

The population in 1900 included 6,716,007 males and 6,829,455 females. Nineteen per cent. of the population were pure white, 43 per cent. mixed bloods, and 38 per cent. Indians. The cold lands, being the most healthful, have the densest population, about 75 per cent. of the total population; a relatively small part of the people, from 15 to 18 per cent., live in the temperate zone, and only 7 to 10 per cent. in the torrid zone. The first census in 1795 showed a population of 5,200,000. The population therefore much more than doubled in the past century. The increase of the Indian population is comparatively slow, because, though the Indians have large families, they are subject to many epidemics. Of the foreign elements of the population the English, Germans, and French monopolize many branches of business. Very few foreigners, excepting those engaged in leading branches of trade, are well educated. The country is to some extent being Americanized as far as means of transportation, electric lighting, improved hotels, and other modern conveniences are concerned. The tendency of the people, however, is to cling to the old habits which grew out of their Spanish ancestry and climatic environment. They still desire their midday siesta, their religious feast days and holidays, but they are unwilling to live abstemiously, spending their money freely and dressing poorly. This is especially true of the Indians.

Immigration and Public Lands. The public lands are surveyed by surveying companies, who receive title to one-third of the lands which they demarcate. In the six years 1893-98 settlers acquired title to 756,592 hectares. The Government in every way encourages immigration and the occupancy of the areas not yet appropriated for farms, plantations, and grazing lands. The laws permit the free importation of personal effects and the supplies needed for the subsistence of colonists for a term of years, exempt colonists from taxes, and to some extent supply seed or plants. Thirty-two agricultural colonies have been established by the Government or by authorized companies or persons. The low rate of wages is an obstacle to large immigration. Other difficulties are that a large portion of the public lands have already been disposed of, comparatively little of the land, either public or private, has yet been adequately surveyed, and therefore cannot easily be obtained in small lots, and the large land-holders are unwilling to divide their estates.

Education. In nearly all the States education is free and compulsory, but the law is not strictly enforced; illiteracy is very prevalent, and little has been done to educate the Indians. In 1899 the common schools, supported by the Federal and State governments, numbered 6376; by the municipalities, 2989; the teachers in both, 15,505; enrolled pupils, 684,563; average attendance, 474,622; cost of schools, $6,805,074 (Mexican silver). The private and clerical schools numbered 2560; enrolled pupils, 134,987, with an average attendance of 103,955. The Federal Government supports special schools for engineering, law, medicine, agriculture, etc., and most of the States support one technical college. The public and private libraries are notable, the largest of them, the National Library, containing 205,000 volumes; there are 138 other public libraries, 33 museums for scientific and educational purposes, 11 meteorological observatories, and 702 newspapers, including 11 in English and 11 in Spanish and English. Mexico occupies the first place in Latin America in artistic, literary, and scientific advancement. A considerable number of historians, poets, dramatists, scientific men, painters, and sculptors have conferred honor upon their country.

Religion. The Catholic faith is the prevailing religion, but there is no connection between Church and State, and the Constitution guarantees the free exercise of all religions. Protestant missionaries from the United States entered the country in 1867 after the withdrawal of the French army from Mexico. The number of Catholic churches in 1899 was 10,112, and of Protestant places of worship, 119.

Government. The present Constitution of Mexico was adopted by a constituent assembly on February 5, 1857, and has undergone various amendments extending down to the year 1896. It is a written instrument of great length, and is closely modeled after the Constitution of the

United States. There are twenty-nine articles on the 'rights of man.' These rights include mainly personal freedom, freedom of speech and of the press, right of assembly and petition, right of bearing arms, certain rights of accused persons on trial for the commission of crime, and immunity from the operation of retroactive laws, laws which impose excessive fines or inflict unusual punishments and which take private property without compensation. In case, however, of great public danger from insurrection or invasion the President of the Republic, in concurrence with the Council of Ministers and with the approval of Congress, may suspend these guaranties for a limited period.

The Government of Mexico may be described as a Presidential federal republic, composed of 27 States, 2 Territories, and a Federal District. The Constitution provides for a distribution of the powers of government among legislative, executive, and judicial branches. The legislative power is vested in a Congress consisting of a House of Representatives and a Senate. The House of Representatives is composed of members elected by indirect secret ballot for a term of two years on the basis of one Representative for every 40,000 of the population and by an electorate which consists practically of all male adults. The qualifications for membership in the House of Representatives are citizenship and the full enjoyment of all the rights incident thereto, the attainment of the twenty-fifth year, and residence in the State from which the Representative is chosen. Ecclesiastics are disqualified. The Senate is composed of two Senators from each State and two from the Federal District, chosen in the same manner as the Representatives and possessing the same qualifications, except that the Senators must have attained the thirtieth year of age. The terms of one-half the Senators expire every second year. Both Senators and Representatives receive annual salaries of $3000 (which cannot be renounced) and are privileged from arrest for opinions expressed in the discharge of their duties. Each House is the judge of the election and qualifications of its own members. Two ordinary sessions of Congress are held annually, beginning respectively in April and September. The two Houses enjoy substantial equality of powers in legislation, except that financial and revenue measures and bills for the recruiting of troops must be first discussed in the House of Representatives. Legislative measures may be initiated by the President of the Republic, the State legislatures, and by individual Senators and Representatives. Bills vetoed by the President, but subsequently passed by an absolute majority of each House, become law in spite of the executive veto.

The powers of Congress are enumerated with great specification in the Constitution. They include the admission of new States to the Union, the erection of new States within the limits of old States, the levying of taxes, the issuing of commercial codes, the maintenance of the army and navy, the declaration of war, the coinage of money, the regulation of weights and measures, the granting of pardons, and the enactment of all laws necessary and proper to the execution of the enumerated powers. The exclusive powers of the House of Representatives include the election in certain rare contingencies of the President of the Republic, the judges of the Supreme Court, and the Senators from the Federal District, supervision of the chief auditorship, the approval of the annual estimates of expenses, and the impeachment of the President, Senators, Representatives, supreme judges, and Governors of States for the commission of crimes during their terms of office. The exclusive powers of the Senate include the approval of treaties with foreign powers, the ratification of nominations made by the President to important offices, the decision as to whether the status of a State government is such as to require the appointment of a provisional Governor, the decision of political conflicts within a State, and the trial of impeachments preferred by the House of Representatives. During the recess of Congress some of its important functions are discharged by a Permanent Deputation, composed of 15 Representatives and 14 Senators.

The executive power is vested in a President chosen indirectly by electors who are themselves popularly elected. His term is four years, and by a constitutional amendment of 1887 he is eligible for reëlection for any number of consecutive terms. His qualifications are citizenship by birth, the full enjoyment of the civil right, and the attainment of the thirty-fifth year. Ecclesiastics are disqualified. No provision is made for a Vice-President except that, in case of the disability or absence of the President, Congress has power to choose an acting President to discharge the executive duties temporarily. The office of President cannot be resigned except for grave cause, and then only with the approval of Congress. His chief powers are: to promulgate and execute the laws; to appoint and remove most of the military and civil officers of the Republic, the approval of Congress being necessary in some cases; to declare war with the consent of Congress; to dispose of the army and naval forces; to grant letters of marque and reprisal; to negotiate treaties with foreign countries; to receive ambassadors and ministers; to call special sessions of Congress with the consent of the Permanent Deputation; to grant pardons; and to grant exclusive privileges to discoverers and inventors. In carrying out the work of administration the President acts through a Cabinet composed of seven secretaries, who serve as heads of the Departments of Foreign Affairs, Interior, Justice and Public Instruction, Colonization and Industry, Communication and Public Works, Finance and Public Credit, and War and Marine. Every order, decree, or regulation of the President must be signed by one of the Cabinet secretaries in order to be valid. The members of the Cabinet do not occupy seats in Congress and their responsibility to that body extends only to criminal acts.

The judicial power of the Republic is vested in a Supreme Court and in District and Circuit courts. At present the Supreme Court consists of 15 judges chosen by electors for a term of six years. They must be native born citizens thirty-five years of age, and learned in jurisprudence. They are required to take oaths similar to that prescribed for the President of the Republic, and may resign only with the approval of Congress. The organization of the district and circuit courts is determined by statute. The jurisdiction of the Federal courts extends to cases involving the application of Federal law; to maritime cases; to cases in which the Republic is a party; to cases in which a State is a party; to cases arising under treaties with foreign Powers; and to cases concerning diplomatic agents. In those cases in which the Republic or a State is a party, and in those cases in which the question of jurisdiction arising between the State and Federal courts is involved, the Supreme Court has original jurisdiction. In all other cases it has appellate jurisdiction.

The individual States of the Mexican Republic have a large degree of local autonomy, although the Federal Constitution requires that they shall adopt the popular, representative, republican form of government. They have their own constitutions and codes of laws; their own Governors and legislatures, and local officials. They are allowed to regulate with one another their own boundaries subject to the approval of Congress, but may not form alliances or treaties with one another, grant letters of marque and reprisal, coin money or issue paper currency, lay duties on interstate commerce, or without the consent of Congress levy tonnage duties, keep troops or ships of war, or wage war except in case of invasion or peril so imminent as to admit of no delay. Each State is under an obligation to deliver without delay criminal refugees from other States and to give full faith and credit to the public acts, records, and judicial proceedings of every other State. It is made the duty of the State executives to publish the Federal laws and cause them to be obeyed. On the other hand, it is made the constitutional duty of the Federal Government to protect the States against invasion or domestic insurrection upon request of the Legislature of the State concerned or of the executive if the Legislature be not in session. As in the United States, all powers not expressly conferred upon the Federal authorities are reserved to the individual States. Similarly the Federal Constitution, the laws of Congress, and all treaties made in pursuance thereof are declared to be the supreme law of the whole Union, and the judges are bound thereby, anything in the constitutions or laws of the States to the contrary notwithstanding.

Amendments to the Federal Constitution may be proposed by Congress, two-thirds of all members present concurring. If approved by a majority of the State legislatures, they shall be a valid part of the Constitution.

Money, Weights, and Measures. The standard of value is silver, the only paper currency being ordinary bank notes. The silver peso or dollar is the unit of coinage. The metric system of weights and measures was introduced in 1856, but the old Spanish denominations, the libra (1.01 pounds avoirdupois), the quintal (101.6 pounds), and the vara (33 inches), are very commonly used.

Peoples of Mexico. The population of Mexico at the present day is largely Indian, and in many parts of the country ancient customs, superstitions, and languages hold sway. It is impossible to estimate the exact proportion of pure Indian blood, mestizo, or mixed blood, and white; probably there are about five million pure-blooded Indians, and a somewhat larger number of mestizos. Dr. Leon, the most recent student of the linguistic families of Mexico, has divided them into 17 families and 180 dialects, and is of the opinion that future studies and investigations will resolve this number of families to three mother tongues, which will be the Otomí, Maya-Quiché, and the Nahua. In many parts of the Republic where certain languages are spoken over extended areas, we find dialectal differences in every village. In some parts of Mexico the tribes occur in masses, while in other parts people speaking different languages are strangely intermingled. In the same town, separated by a single street, we may find two different languages spoken, while in one town Starr reports Aztecs, Otomí, Tepehuas, and Totonacs, each group preserving its independence in language, dress, customs, and superstitions, and occupying its own distinct quarter of the town.

Most of the Mexican Indians have been converted to Christianity; some are still idolaters, but have lost much of their knowledge of ancient traditions and religion. These are superstitious to a degree, and believe in omens, witchcraft, and divination. Among the Huicholes, whose habits, customs, religion, and symbolism have been exhaustively studied by Lumboltz, and the Mixes, who have been briefly investigated by Starr and Belmar, we find greater adherence to primitive ideas than among any other Mexican people.

All over Mexico the commerce of the people is carried on in very much the same manner as before the Spanish Conquest, and their periodic markets, the 'tianguis,' are held weekly, as in former times; they also carry merchandise for long distances, to attend annual festivals of certain saints, whose modern shrines are built on the sites of ancient temples. The Indians are principally agriculturists, though certain aboriginal trades still prevail, such as weaving, basket and mat making, and the manufacture of pottery; and the products of these industries, for which certain villages are noted, are scattered throughout extended areas. Their mode of living, habitations, and clothing have changed but little under white influence. Their food consists mainly of corn, beans, and chili peppers; the corn is made into cakes, or 'tortillas,' or a thin mush called possole; their food is prepared as before the Conquest, although to a certain extent cooking vessels of tin and iron are used as well as those of clay. Their great vice lies in the use of alcoholic stimulants; they make many native drinks as in former times, and on every possible occasion they indulge in their use.

HISTORY.

The Aztec or Nahuatl tribes whom the Spanish conquerors found in the central valley of Mexico had been preceded by at least two other races in that region. From the hopelessly confused legendary accounts of events in prehistoric Mexico, it is possible to make out only a rough outline of what probably happened. The Toltecs were said to trace their history back to the year 720 of the Christian Era, when they began a long course of wanderings which finally led them, about the year 970, into the Valley of Mexico. There they erected vast cities, whose ruins, at Tullantzinco and at Tula or Tollan, some fifty miles north and northeast of the present City of Mexico, justify the name of 'the Builders' given them by their successors. In the year 1103 the Toltec power was overthrown and they were eventually driven from the country, going off toward the south, where they are supposed to have erected some at least of the immense buildings now in ruins in Yucatan, Honduras, and

Guatemala. Their conquerors, the Chichimecas, first appeared in the vicinity of the two great volcanoes, Popocatepetl and Ixtaccihuatl, where the ruins of Amecameca show the centre of their power. The Chichimecan legends carry their history back for 1796 years before the Christian Era. After they succeeded the Toltecs as the dominant power, the Chichimecas settled at Texcoco, on the east side of the lake of that name, where they were living in a flourishing condition when, early in the twelfth century A.D., seven allied Nahuatlaca families or tribes entered the valley from the north, having started on their wanderings, quite possibly, in the cliff-dweller region of the modern New Mexico and Arizona. One of these tribes, unable to win a home elsewhere from the powerful Chichimecas, settled upon some marshy islets in the lake of Texcoco. The year 1325 is given, with some signs of probability, as that in which these Nahuatl Aztecs fixed upon this location, which is said to have been pointed out to them by a sign from their gods, an eagle perched upon a prickly-pear cactus, the *nopal*, strangling a serpent. This sign is now the national seal of Mexico. Gradually the settlement in the marshes at Tenochtitlan grew stronger. The islands were enlarged, causeways built to connect them with the mainland and the allied settlements at Tlaltelolco and Chapultepec, and by 1375 the Aztec war chiefs had won for their people a position of influence in the valley. Huitzilihuitl, who was chosen chieftain—or 'king' or 'emperor' as the Spanish writers styled these rulers—in 1404, and his brother Chimalpopoca, who succeeded after his death in 1414 and directed the tribe until 1427, greatly increased their power by intermarrying with the rival tribes and establishing trade relations, as well as by their successful battles. Izcohuatl or Izcoatzin was the next tlaca-tecuhtli or war chief, and during his time the dominant position of the tribe was rendered more secure by the formation of a sort of military confederation, with the other tribes subordinate to the Aztecs, by which the peoples about Lake Texcoco were united for the purpose of overpowering their outlying neighbors and forcing them to pay tribute. Izcohuatl was followed in 1436 or 1437 by the first Motecuhzoma or Montezuma ('Wrathy Chief'), who was perhaps the first chief to combine the war and priestly functions, and who prepared for the downfall of the tribal power by allowing the latter to interfere with the former. His successors, Axayacatl, Tizoc, and Ahuizotl, considerably extended the influence of the tribe by conquering the tribes beyond the mountains, to the two seas on the east and west, and far toward the south, and forcing them to render tribute of slaves for the sacrifices which were becoming the established and popular religious practice of the Aztecs.

In 1502 the second Montezuma was elected to the chief position in the tribe. (For an account of Montezuma's career and the invasion of Mexico by Cortés, see MONTEZUMA; CORTÉS.) In November, 1519, Cortés entered Tenochtitlan—Mexico—and before the end of the month he had secured the person of the Mexican 'Emperor,' whose subjects soon fully realized that the white men would have to be expelled by force, and quickly commenced hostilities under the leadership of Montezuma's younger brother, Cuitlahuatzin (q.v.), and the Emperor's nephew, Guatemotzin (q.v.), or Cuahtemoc. On the *Noche Triste*, or 'dreadful night,' June 30, 1520, Cortés withdrew from the City of Mexico, and for a time his position was desperate, but the indomitable valor of the Spaniards enabled them to return to the attack. Cuitlahuatzin, Montezuma's successor, died in November, 1520, and was succeeded by Guatemotzin, whose heroic defense of the City of Mexico during the following year remains one of the noblest episodes in American history. Cortés began his siege of Mexico in May, 1521, and after the capture of Guatemotzin in August, he set promptly to work at rebuilding the city. The dead bodies were burned and the city roughly cleansed, the canals filled up, streets, market places, and the sites for a church, fort, official residence, and other necessary buildings located. As an administrator Cortés was less successful than as a military leader, and the repeated complaints and threats against his rule led him to go to Spain to present his case at Court. There were rapid changes in the form and personnel of the Government of Mexico, or of New Spain, as it was officially called, military Governors succeeding one another every few months until 1528, when the first Audiencia, under Nuño de Guzman, arrived, to be replaced by the second a year later. This managed affairs successfully until 1535, when the first Viceroy, Antonio de Mendoza, came from Spain. To him was principally due the growth of the country along lines which assured its permanent strength and welfare. In 1550 'the Good Viceroy' Mendoza was transferred to Peru, and was succeeded by Luis de Velasco, under whom the University of Mexico was founded in 1553, and the mineral and other sources of wealth developed. Few acts or episodes of general interest mark the reigns of the succeeding vice-regal rulers of Mexico. The capital grew, was periodically flooded, and plans as regularly were made for its draining, by the Viceroy Velasco and others, whose vast designs were only consummated in the last years of the nineteenth century by President Diaz. The Inquisition was introduced in 1571, and the *Autos da Fe* claimed their heretical victims from time to time. In 1789 the second Count of Revillagigedo began the rebuilding of the capital. One result of these works was the finding of the ancient Mexican Calendar stone and the sacrificial block, which had been buried at the time of the Conquest. The gradual increase of education among all classes, the spread of revolutionary and independent ideas all over the world, a succession of Viceroys who responded to the pressure from Spain by draining the American colonies of every possible ingot and coin, and finally the addition of Spain to the appanages of Napoleon, were all factors in causing the growth of ideas of independence for Mexico.

Various groups had been formed for the discussion of revolutionary plans, and some of the advocates of independence had been imprisoned and killed, before the fateful 16th of September, 1810, when the parish priest at Dolores, near Guanajuato, Miguel Hidalgo (q.v.), upon suddenly learning that some of his fellow conspirators had been arrested, rang his church bell and called upon his people to follow him and free Mexico from foreign tyranny. His *Grito de Dolores*, the cry of "Long live religion! Long live our Holy Mother of Guadalupe! Long live

America, and death to bad government," marked the beginning of the struggle for Mexican independence. Hidalgo, after a series of successful fights with scattered Royalist forces, was defeated, driven north, and finally caught and shot at Chihuahua, on July 30, 1811. His pupil, Morelos (q.v.), took up the leadership, became known as the 'hero of a hundred battles,' and was in turn defeated by the Royalist army under Iturbide (q.v.), betrayed by one of his followers, and shot in December, 1815. In 1817 Javier Mina invaded Mexico from Tamaulipas and maintained the fight for independence with the usual temporary success, until defeated, captured, and shot, November 11th. Meanwhile, Vicente Guerrero (q.v.) had gradually been establishing his claim to be the natural and most able leader of the Independents in the field, while among all classes in Mexico the feeling was growing more and more strong that the Spanish power must be done away with. Iturbide determined to unite the two parties, and by the *Plan of Iguala*, February 24, 1821, in which Guerrero and the Spanish Viceroy, O'Donaju, joined, proposed an independent monarchy with a ruler from the Spanish royal family. The plan failed; no ruler could be secured from Europe, but independence had been practically and peacefully assured. Iturbide arranged a popular demonstration, and the Congress ratified his choice of himself as Emperor, May 19, 1822. The older Independents soon refused to acknowledge his empire, and on March 20, 1823, the opposition forced his resignation. An executive council of four revolutionary leaders, Nicolas Bravo, Guadalupe Victoria, Negrete, and Vicente Guerrero, managed affairs during the next year, calling for the election of a congress, which, on October 4, 1824, proclaimed the first Constitution of the Republic of Mexico. Guadalupe Victoria became the first President and succeeded in retaining office for the full term. In 1828 the election was bitterly contested by rival factions of Freemasons, and the successful party was almost immediately overpowered by its opponents, under Santa Anna, who forced Congress to depose the duly elected President, Gomez Pedraza, and install Guerrero. His Vice-President, Bustamente, forced him to take refuge in the South, before the end of 1829, and had himself inaugurated as President.

The course of local politics during the next twenty years is sufficiently detailed under Santa Anna, who had a hand in whatever occurred. In 1836 the Texans made good their separation from Mexico, and ten years later the United States forces invaded Mexico, the task of its generals being rendered relatively easy by the repeated internal dissensions which absorbed most of the attention of the Mexican commanders. There were twelve changes in the chief executive during the two years of the war, a fact which sufficiently explains the inability of the Mexicans, in spite of their admirable fighting qualities, to prevent the advance of the United States troops. In the Treaty of Guadalupe-Hidalgo (q.v.) Mexico suffered heavy loss of territory. Santa Anna was the leading factor in affairs until August, 1855. General Comonfort (q.v.) was installed as President in December, and in June, 1856, issued the decree ordering the sale of all unimproved Church lands, which precipitated the struggle between Church and State. On February 5, 1857, a new constitution, which is still in force, was adopted by Congress. In January, 1858, Comonfort, who had tried to set aside the Constitution, departed suddenly for the United States, and General Zuloaga and after him Juarez (q.v.) took the lead in affairs. 'La Reforma,' the war for reform of the Church, broke out with all the fury of religious warfare. Juarez, on July 12, 1859, issued his decree nationalizing all Church property. The battle of Calpulalpam, in December, 1860, with the defeat of Miramon (q.v.) by the Juarez forces under General Ortega, marked the end of the old order of things. In addition to the difficulties of internal administration, Juarez brought foreign war on the country by decreeing the suspension for two years of the payments on the foreign loan. The act, wise and perhaps necessary in itself, was not managed with diplomacy, and on October 31, 1861, the Convention of London was entered into by England, France, and Spain, in which these Powers agreed upon common action for the protection of their interests in Mexico. Fleets were at once dispatched across the ocean, and in December a Spanish force occupied Vera Cruz. In February, 1862, England and Spain withdrew their forces, upon becoming aware that Napoleon III. was scheming to establish an empire, supported by France, in America. On the departure of the English and Spanish troops the French came out openly against the Mexican Government and were joined by the Reactionists and Monarchists, who were naturally hostile to Juarez. On May 5, 1862, a French army of 6000 men under General Lorencz was defeated before Puebla (the famous Cinco de Mayo), and was compelled to retreat to Orizaba. In September the arrival of reënforcements raised the French strength to 12,000 men. In May, 1863, a combined force of French and Mexicans captured Puebla, and marched upon the capital, which fell into their hands on June 10th after Juarez and his Cabinet had fled. A council of thirty members was appointed by the French commander, Forey, and this council in turn elected a committee of three men to whom was intrusted the supreme executive authority. The most prominent of those who made up this Supreme Council of the Regency was General Juan Nepomuceno Almonte (q.v.). On July 10th an Assembly of Notables at Mexico proclaimed Mexico an empire and tendered the crown to Maximilian, Archduke of Austria, brother of the Emperor Francis Joseph. (See Maximilian.) Maximilian accepted the crown on condition that the action of the Assembly of Notables be ratified by a vote of the Mexican people. In view of the powerful French army of 35,000 present in the country, there was little difficulty in obtaining this. On May 29, 1864, Maximilian and his wife landed at Vera Cruz and on June 12th the sovereigns entered the capital, taking up their residence at Chapultepec, where they established a court with all the regalia and forms of a European dynasty. In the field the French troops under Bazaine, who had assumed command in October, 1863, gained a number of successes over the patriot forces, and drove Juarez from place to place until he finally established his capital at El Paso del Norte on the United States border. In the desperate guerrilla warfare which the Nationalist forces waged against the invaders a large part of the country was devastated. For a year and a half everything went satisfactorily with Maximilian to outward seeming, but at the end of 1865 he found himself, despite his efforts to win the good-will of his subjects, with no real support except that of the French soldiers. Meanwhile the United States had convinced Napoleon III. that French troops would not be suffered to interfere in American affairs. On May 31, 1866, Maximilian received word that the French army was to be withdrawn. He at once decided to abdicate, then changed his mind, at the instigation of the Empress Carlotta, who hastened back to Europe, where her failure to secure any help was probably responsible for the attack of brain fever which left her hopelessly insane. Maximilian again decided to withdraw, but the French commissioners refused to agree to the terms in which he insisted upon phrasing his abdication, and eventually the Emperor determined to stay by his empire and the supporters who remained true to him. Meanwhile Juarez returned southward, gathered an army, and awaited the departure of the French. Maximilian made his way to Querétaro, where he was joined by the troops raised by Marquez, Miramon, Mejia, and others, and where, in turn, the republican armies quickly surrounded him, by March 1, 1867. Marquez broke through the enemy to bring assistance from Mexico, but instead undertook to establish a power for himself at Puebla, where he was defeated by Diaz, who drove him back to Mexico and then captured that city. Maximilian had meanwhile been betrayed by one of his most favored officers, Colonel Miguel Lopez, who arranged the admittance of the enemy into the Imperial camp. The Emperor was forced to surrender, was given a military trial and shot, with Generals Mejia and Miramon, on June 19, 1867. After four years Juarez entered the City of Mexico on July 15, 1867, and began the reorganization of the Republic. An election was held which confirmed him in the Presidency, and he held the position until his death in 1872. Lerdo de Tejada succeeded to the office and held it until 1876, when he was ousted by Porfirio Diaz, who became President in 1877. In 1880 Diaz was succeeded by his friend, General Manuel González, whose four years of inefficiency convinced Diaz of the necessity of governing in person. Since then he has continued to fill the Presidential office. Under Diaz have occurred the remarkable extension of railroads that have knit together the most distant portions of the Republic, the great advance in textile industries, the enormous development of mines, the practical reconstruction of the capital, and the rebuilding of portions of the other cities. This work is largely due to governmental initiative, at the expense of the national or State treasury, but accompanied by an increase in national credit commensurate with the results obtained.

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MEXICO. An inland State of Mexico, bounded by the State of Hidalgo on the north, Tlaxcala and Puebla on the east, Morelos and Guerrero on the south, and Michoacan and Querétaro on the west (Map: Mexico, J 8). A part of this territory, adjacent to the State of Morelos and bounded on three sides by the State of Mexico, is occupied by the Federal District, which is outside the jurisdiction of the State. The area of the State is 9247 square miles. The surface is very diversified. In the north it is generally flat, with a few low hills and a number of lakes. The eastern part is taken up by the Popocatepetl range with its two great volcanoes rising to an altitude of 17,000 feet. In the south rises the Ajusgo range with its highest peak of over 13,500 feet, while the centre is occupied by the Sierra de las Cruces, exceeding 14,000 feet in its highest peak. The rivers are few in number, the chief among them being the Serma, which rises in this State. There are a number of lakes in the eastern portion, the largest of which is Lake Texcoco. The climate is generally cold, owing to the mountainous character of the surface. In the valleys, however, it is temperate and healthful and even favorable to the cultivation of tropical fruits. The chief products are cereals, sugar, coffee, tobacco, and spices. Stock-raising is also an important industry. The mineral wealth of the State is very considerable, but only slightly exploited. The manufactured products include cotton and woolen goods, glassware, pottery, wines, and flour. The State is traversed by several railway lines, all centring in Mexico City. Population, in 1895, 841,618. The capital is Toluca (q.v.).

MEXICO. The largest and finest city in Latin North America. It is situated in the Federal District (area, 463 square miles) on the west side of the Valley of Mexico on the Anahuac plateau, 7350 feet above the sea, in latitude 19° 26′ N. and longitude 99° 8′ W. (Map: Mexico, J 8). Its area is about 20 square miles. The city is 263 miles by rail from Vera Cruz on the Gulf of Mexico, 290 miles from Acapulco on the Pacific, 839 miles from Nuevo Laredo, the nearest railroad town on the United States frontier, and 1224 miles from El Paso, Tex. Its population by the census of 1900 was 368,898, of which number 12,064 were of foreign birth. It is one of the most ancient cities of the continent, and has been successively the capital of the Aztecs, of the Spanish colony of New Spain, and of the Republic of Mexico.

The valley in which it stands is an immense basin, approximately circular in shape, embracing some 2220 square miles, and completely encircled by high mountains, through which only two or three quite elevated passes afford an entrance. The view of the valley and of its girdling mountains and snow-capped volcanoes from elevations such as the towers of the Cathedral or Chapultepec Hill, three miles west of the city, is superlatively beautiful. There is no natural exit for the waters which pour down the inner sides of the mountains and they collect in six lakes scattered over the surface of the plain—Chalco and Xochimilco (fresh water), and Texcoco, Xaltocan, San Cristóbal, and Zumpango (salt water). In an early age nearly the entire surface of the valley was a lake bed, but for many centuries desiccation has been very gradually progressing until the waters are collected entirely in the six shallow basins whose extent has been still further reduced by the drainage work recently completed. The waters of Xochimilco, however, were practically absorbed by the network of canals that irrigate the surrounding region.

Owing to the inadequate drainage and sewage systems and a soil permeated with the refuse of centuries, the city long had an annual death-rate of 40 to every 1000 inhabitants, a larger proportion of mortality than in any other civilized city of the world. The conditions which promoted this high death-rate have now largely been remedied, and the city compares favorably with others in salubrity, and is decreasing its death-rate, though the unhygienic manner of life of the poorer classes swells the mortality. The city is naturally healthful, and in its climatic conditions is a delightful place of residence. The temperature is extremely equable, with an annual range of only 12° to 15°. The mean temperature of the summer months is 60° to 65°, and the mean temperature in mid-winter is about 53°. The prevailing winds, coming from the northwest, are damp, while the south winds, which blow only a sixth of the time, are very dry. The total rainfall is about 20 inches, or about half of that at New York.

From its three centuries of Spanish domination Mexico still preserves many characteristics of the great cities of Spain, and from a certain Oriental suggestion in its appearance, far surpasses them in novelty and interest. Along with the wonderful commercial development that has characterized the last quarter of a century are to be found evidences of an artistic plan to preserve more beautiful forms of architecture than are usually associated with a modern industrial city, with the result that here may be found an artistic centre for local color not equaled elsewhere on the American continent. Seen from a distance the city, prevailingly white in color, is an imposing spectacle. Spreading widely over the plain, overtopped by domes and pinnacles, and hemmed around by majestic mountains, few cities of the world are more charming and impressive.

Most of the houses have terraced roofs and inner courts, are solidly built of sandstone or lava, and are only one to two stories in height, a precaution against the frequent though usually slight earthquakes; but many of the business and public buildings, supported on solid foundations of piling, are three and even more stories in elevation, and some of them reach an altitude of five stories. The walls of many of the poorer buildings are not quite perpendicular, owing to the shocks they have sustained, thus giving to some of the street fronts a rather rickety appearance. The later buildings along the business streets are making greater use of steel in their construction, a practice better adapted to the rather insecure foundation soil of the city.

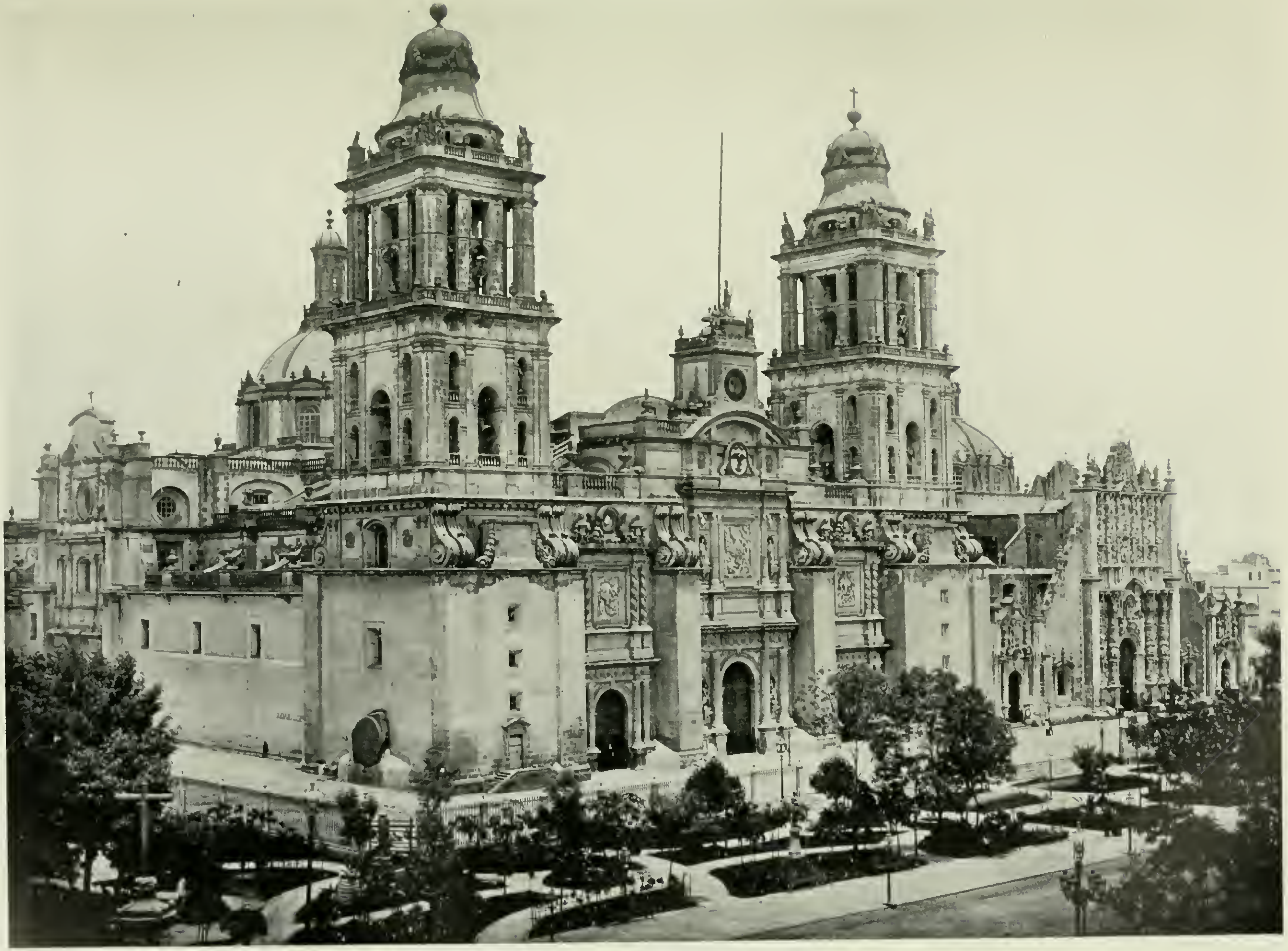
Buildings. On the north side of the Plaza de Armas, the Cathedral, one of the largest and most sumptuous churches in America, rises on the site of the great temple of Huitzilopochtli, the titular god of the Aztecs. The Cathedral, begun in 1573, and dedicated in 1667 at a cost of $2,000,000 for the walls alone, forms a Latin cross, 426 feet long and 203 feet wide, with two great naves, three aisles, twenty side chapels, and a magnificent high altar supported by marble columns and surrounded by a balustrade with sixty-two statues of gold, silver, and copper alloy. The elaborately carved choir inclosed by tombac (copper and zinc alloy) railings is valued at $1,500,000. The Doric style of architecture prevails in the interior, and the mixed Doric and Ionic of the Spanish Renaissance in the exterior, with its five domes and two open towers 218 feet high. The latter were not completed until 1791. In addition to the Cathedral, Mexico contains some sixty churches, among which the finest are La Profesa, Loreto, Santa Teresa, Santo Domingo, and San Hipólito. The leading Protestant denominations are represented by houses of worship, which are attended almost wholly by the foreign element of the population.

The east side of the Plaza is occupied by the National Palace, of poor and monotonous architecture, which has 675 feet frontage and contains most of the Government offices, the general archives, and some remarkable paintings by Miranda and native artists. With its associated buildings this structure occupies an area of 14,000 square meters. The *Palacio* has long been inadequate to the needs of the various departments installed within it, and at the present time there are in process of building a new post-office building and a new War and Navy building, both steel and stone structures. North of the National Palace and forming parts of it are the post-office and the National Museum of Natural History and Antiquities, with a priceless collection of Aztec relics, and 'the bones of giants' as they were formerly supposed to be, though now recognized as the remains of large animals of the Quaternary epoch. The National Observatory and the Meteorological Bureau are also located here. The Monte de Piedad, the famous national pawnshop of Mexico, with nearly $10,000,000 of accumulated funds, stands close to the Cathedral, and with its liberal management is really a beneficent charity.

Facing the Cathedral is the Palacio Municipal or City Hall, containing the city and Federal District offices. Among other notable buildings is the School of Medicine on the Plaza San Domingo, occupying the quarters in which the Inquisition made its infamous history; the Church of the Jesuits; the School of Arts, where many branches of industry are taught; the National Picture Gallery of San Carlos, in which the Florentine and Flemish schools are especially well represented; the National Library, formerly the Church of San Augustin, with over 200,000 volumes, numerous manuscripts, and rare old Spanish books; the Mint, in which silver and gold have been coined, since 1690, to the value of nearly $3,000,000,000; the Iturbide Hotel, and the School of Mines, designed by the artist Tolsa, one of the finest structures in Mexico, with rich mineralogical and geological collections, and containing also the School of Engineering with its observatory. The city abounds with hospitals, for no place takes better care of its sick and infirm than the City of Mexico. One of the curiosities is the little old building in which the first printing in America was done. At the present time 33 daily papers and 109 magazines and reviews, in Spanish, English, French, and German, administer to the intellectual and artistic life of the capital. The chief of the twenty scientific institutions is the Geographical and Statistical Society, which issues many maps and charts. There are numerous public schools, and many of the sciences and arts are represented by special schools.

Streets and Parks. Mexico is said to be the finest built city on the American continent. Some of its thoroughfares, paved with asphalt and lined with houses whose height bears a strict architectural relation to the width of the streets, certainly bear out this assertion. While many of its 600 streets and lanes are very narrow, especially within the nine square miles that the old walls inclose, still they are laid out with great regularity. The monotony of arrangement of this part is fairly well broken by an occasional public square or garden, while beyond the circle of the walls, and especially to the northwest, the streets have spread with greater irregularity. The main streets running from north to south and from east to west intersect at the *Plaza Mayor*, familiarly known as the 'Zocalo.' These streets are of fair width, but the sidewalks here, as elsewhere, are too narrow to accommodate easily the passers-by. For the customary mule tramway an up-to-date electric service has been substituted, with the result that the urban population is largely increasing. The principal streets are electrically lighted, and are clean and well kept.

The leading business thoroughfare, San Francisco Street, with its continuation, *Calle de Plateros* (for the city still retains the bewildering custom of changing the name of the street every few blocks), connects the Plaza Mayor with the Alameda and reminds the visitor strongly of the fashionable shopping districts of European centres. Here shops with their costly displays of



CITY OF MEXICO

THE CATHEDRAL

all sorts of merchandise, the best hotels, cafés, and restaurants, the business offices and clubs, pour forth during the later afternoon hours their elegantly attired throngs that overflow the narrow sidewalks and fill the costly equipages and hackney coaches moving in a double line along the crowded street. San Francisco Street is interesting any day, but it is doubly so when processions of flower-bedecked carriages, columns of troops in showy uniform, and the gaily decorated fronts of the buildings, proclaim the celebration of the *fiestas* of September or of the Cinco de Mayo (Fifth of May). This name, by the way, is now applied to the principal rival of San Francisco street, and is borne by a thoroughfare extending from the Cathedral to the New National Theatre. As San Francisco street represents the business life of the city, so the *Paseo de la Reforma* is the highway of Mexican social life. This beautiful drive, two miles in length, extends from the Alameda to the hill of Chapultepec. With its double avenue of fine trees, shading well-constructed stone sidewalks; its seven large circles, each 300 feet in diameter, some already surmounted with statuary of historic interest, and others exhibiting a wealth of flowers and shrubbery; with its terminal parks of rare beauty in the midst of an architectural setting that each year becomes more imposing, it is no wonder that daily from five to seven o'clock the *Paseo* is the favorite parade ground for every Mexican who owns or can afford to hire an equipage. Along the line of handsome vehicles one occasionally detects a touch of domestic color in the person of some *caballero* in native costume, but such appear with less frequency as the years pass on, and the Mexican 'Vanity Fair' approximates more closely to the ordinary park processions of the great world centres.

A spot hardly second to the *Paseo* in interest is the beautiful park and promenade known as the *Alameda*. With its 40 acres well shaded with poplar and beech trees and variegated with a most profuse collection of semi-tropical plants and shrubs, it has long been the favorite stamping ground of Mexican aristocracy, whose weekly parade on Sunday from eleven to one exhibits the fashionable life of the capital at its best. Here a fountain now stands on the site of the *Quemadero* or 'burning place' of the Inquisition, where many a heretic expiated his heresy at the behest of the then all-powerful Church, and had his ashes thrown into the ditch flowing behind the neighboring sanctuary of San Diego. The central *Plaza de Armas* or *Plaza Mayor*, surrounded by the magnificent Cathedral, the *Palacio*, the municipal buildings, and some of the finest retail stores, seems more truly than any other spot the real centre of the city. It covers 14 acres and is beautified by trees, flower plots, statuary, and marble fountains, while in the centre is the charming band-stand which gives to it its popular name of 'Zocalo.' At all times the centre of the commercial and political life of the metropolis, it is preëminently so for the patriotic celebrations so dear to the heart of its populace. It is here, during the *fiestas* of September, that one can view the floral parade of the 14th; can listen to the charming military concerts of the 15th, and behold the gorgeous electric and pyrotechnic display that follows the commemorative ring of the *grito* of Hidalgo; and on the 16th can perceive in column after column of well-drilled troops on parade the *mano fuerte* (strong hand) of the modern ruler whose sway has been characterized by peace and order.

Monuments. The city, which contained the first academy of fine arts erected upon the American continent, still affords many examples of the artistic instinct of its people in its well-built public and private residences and in important groups of statuary. Among the most important of these is the equestrian statue of Carlos IV., begun in 1794 and finished in 1803, the work of a native artist, Manuel Tolsa. Originally placed on the *Plaza Mayor*, it is now situated at the city terminus of the *Paseo*. Farther along the same thoroughfare appear statues of Columbus and Cuauhtemoc, the last of the Aztec rulers, as well as others of less artistic prominence. The monument over the tomb of Juarez, in the San Fernando Cemetery, is also worthy of notice.

Clubs and Theatres. As may be imagined, the social life of Mexico City, from a Latin-American point of view, is exceedingly attractive. In addition to many native organizations, all of the principal foreign colonies have a social centre, the British and the Americans being especially well housed. The Jockey Club, a native organization, has as its headquarters one of the finest buildings in the city, formerly the palace of the Count del Valle. Among the play-houses the old *Teatro Nacional*, or 'opera house,' had a seating capacity of 3000. It has been replaced by a more commodious structure at the terminus of the Cinco de Mayo street. The *Teatro Principal* is smaller, and there are several others of less note. Although the theatres of Mexico City are not the finest of the Republic, it is one of the important stations of the Spanish-American circuit. In no other country, except Spain, is bull-fighting so popular, and although the administration of Diaz has made quiet efforts to bring the sport into disrepute, the two bull-rings are well thronged on festal days and at the Sunday performances.

Suburbs, etc. The tramway expansion of the past few years has resulted in the building of new suburbs, formed of houses constructed in American style with all modern conveniences. Although possibly more desirable as places of residence, they do not yet equal in interest the older suburbs. Prominent among the latter, at the far end of the *Paseo*, is Chapultepec, a mass of rock rising some 200 feet from the midst of magnificent cypress groves, and topped by the splendid structure containing the National Military Academy and the President's summer palace, from which may be obtained the finest view of the valley. Farther on, reached by the same tramway, is Tacubaya, the most fashionable resort of Mexico, situated in the most fertile portion of the Federal District. Here is located one of the National Observatories, occupying a former palace of the Archbishop of Mexico. To the north of the city lies Guadalupe, whose beautiful and rich church is the Lourdes of Mexico, and whose traditional Virgin has become the tutelar divinity of the modern Republic. To the south is the Viga Canal, lined with the so-called 'floating gardens,' the region which furnishes the flowers, fruits, and vegetables for the city markets, and whose inhabitants present some of the most interesting pictures of contemporary native life. Upon this canal are the towns of Santa Anita and

Iztacalco, interesting pleasure resorts frequented by the lower classes. Also to the south is Tlalpam, a resort second only to Tacubaya in importance. To the west, Popolta contains the 'Noche Triste' tree, under which tradition says that Cortés wept on the night of his expulsion from Mexico. By rail it is possible to extend one's excursions beyond the mountain valley to the most interesting points of ancient and modern Mexican history, all of which are within easy distance of the capital.

Industries and Commerce. The industries of the city are constantly increasing. Around the outskirts, completely encircling the city, is a belt of factories and other industrial establishments, manufacturing cotton, paper, linen, silk, gold and silver wares, pottery, feather articles, leather, carriages, bricks, corks, and soap; there are also several packing houses; in spite of the high price of fuel, all these establishments do a thriving business and will welcome the day when coal can be brought in cheaply to give them a new element of prosperity. A large part of the trade interests is in the hands of French, German, and English merchants. (For communications with the United States and other countries, see Mexico.) The city is the wholesale centre for the nation, and its banks, of which the most important are the Banco Nacional de Mexico, capitalized at $20,000,000, and Bank of Mexico, London, and South America, capitalized at $10,000,000. control its financial conditions. Its fifteen markets are large and well ordered and a perpetual source of convenience to its inhabitants as well as of interest to the increasing number of visitors.

Drainage and Water Supply. The city derives its water supply from the western mountains, the greater portion coming from the vicinity of Tacubaya. For the transportation of the water there have been constructed a series of aqueducts, the first of which was completed in 1576 and the last in 1900. When the city obtains full advantage of these it will receive from them 55,000 liters per minute, an average of 198 liters per day for each inhabitant. This is a larger average than London, Berlin, or New Orleans enjoys, and with the supply from the 690 artesian wells added this will be raised to 250 liters. At present, however, the water is very unevenly distributed, the poorer sections especially suffering in this particular; but when the new plans of the department are put in operation, some 12,000 of the 15,000 houses can be supplied with water at a cost of $30 to $48 a year, which rate will yield the city an annual revenue of $500,000. In this way one of the present wretched conditions of the worst slums will be greatly ameliorated.

The drainage works, which have vastly improved the sanitary conditions, were completed in 1898 after three centuries of more or less spasmodic effort, and at the cost of the lives of many thousands of men and many millions of dollars. The great evils from which the City of Mexico suffered for many generations were inundations from Lake Texcoco, and disease promoted by the fact that the city stood in the bottom of an undrained natural sink. The lake, suddenly filled by downpours from the mountains, sometimes buried the streets in water for weeks. Thirty thousand persons were drowned by the sudden submergence of the city in 1629, and similar catastrophes were caused by other floods. It was to rescue the city from inundations that the drainage works were begun three centuries ago; but it was not till 1789 that the city ceased to be menaced by deluges. Up to 1830 the total expenditure on the drainage works had been $8,000,000, but the menace of malaria and epidemics had not yet been removed. The canal was not deep enough, the lake was still very little below the mean level of the city, and the fall was not sufficient to carry off the sewage. The gigantic works now completed were not seriously undertaken till 1885. They rank among the great engineering achievements of modern times, and with the completion of the sewage system in the city the total cost will be about $20,000,000. The works consist of sewers carrying the waste of the city to a canal starting from the San Lázaro gates and extending for 43 miles, its course being deflected so as to cut Lakes San Cristóbal, Xaltocan, and Zumpango. Near the town of Zumpango the canal empties into the tunnel, completely lined with brick, which has been dug through the mountains a distance of 32,869 feet to a river which carries the sewage to the Gulf of Mexico. These works thus carry all the surplus waters and sewage of the City of Mexico outside of the valley, and also control the entire waters of the valley, affording an outlet to those that might otherwise overflow fields and towns.

Government. With the exception of the temporary organization of a municipal government at Vera Cruz to further the ambitious plans of Cortés, the municipal corporation of Mexico City was the first to be established upon the American continent. The probable date of its establishment by the Great Conqueror is 1522, but the earliest preserved record of its meetings is that of March 8, 1524. In that year the officers consisted of two *alcaldes* (municipal judges), six *regidores* (members of council), a secretary, and a major domo. Later the number of these officers was increased and other official places created. At first there was a nominal form of election for these men, though the influence of Cortés practically dominated the choice of the corporate members; but later the governing body of the city became more of a close corporation, filling a portion of its own vacancies. The remaining positions were at the disposal of the King or Viceroy; both classes were often bestowed by sale or bequest.

Although created at first as the creature of Cortés, the *cabildo* (municipal corporation) of Mexico soon became a powerful body, strong enough in some cases to make or mar the reputation of succeeding viceroys. It greatly interfered with the salutary reforms of the Count of Revilla-Gigedo (1789-93), and on the abdication of Ferdinand VII. in 1808, it took a prominent part in the assembling of a general *junta* of New Spain to resist the pretensions of Joseph Bonaparte.

Following the declaration of Mexican independence and the division of New Spain into the States of the Republic of Mexico, there arose a conflict between the State authorities of Mexico and the National Government which resulted in the creation, November 18, 1824, of a Federal District, comprising the territory within a radius of two leagues of the main plaza. The Federal District was subsequently enlarged, until it comprises four prefectures besides the municipality of Mexico, which of itself covers some twenty square miles.

The present governing body of the municipality is the *Ayuntamiento Constitucional* (Constitutional City Council), under the direction of a president. Among those who within recent years have filled this station with credit are General Gonzalez Cosio, the present Minister of War, who has the reputation of having completely changed the appearance of the Mexican metropolis. Following him Señor Gallardo began the great Drainage Canal. When the latter was transferred to the headship of the whole Federal District, he was succeeded by Don Sebastian Camacho, who is laboriously continuing the good work of his predecessors—which work is but a portion of the beneficial policy of President Diaz. As an indication of recent municipal progress it may be noted that the revenues of the cities of the Federal District (and those of Mexico City are by far the largest) have increased from $1,332,403 in 1884 to $3,395,638 in 1895; while the expenses have shown a corresponding increase. The same figures for the past seven years would show a still greater contrast.

HISTORY. The city dates from about A.D. 1325, when the Aztecs, looking for a favorable site, saw perched on a cactus an eagle devouring a snake. The omen was interpreted to mean that this was to be the site of their city; hence its original name, Tenochtitlan, 'cactus on a stone,' changed later to Mexico in honor of the war god Mexitli. With the progress of Aztec culture the city expanded and improved, and about 1450 tradition reports that the mud and rush houses were replaced by solid stone edifices built partly on piles amid the little islands of Lake Texcoco. The Aztec city was an imposing spectacle at the time of the arrival of the Spaniards in 1519, when it is reported to have contained at least 50,000 buildings and several hundred thousand inhabitants. It was about twelve miles in circumference, everywhere intersected by canals and connected with the mainland by six long and solidly constructed causeways. It was thus essentially a lacustrine city, but the subsidence of Lake Texcoco has left the modern city high and dry, with the lake two and a half miles away. The Aztec city was almost wholly destroyed by Cortés, who, in 1521, employed the friendly natives to rebuild the city on the same site. Under Spanish domination the city in 1600 contained about 15,000 inhabitants, which number gradually increased to 120,000 two centuries later.

The city was captured by the United States forces after the battle of Chapultepec, on September 13, 1847, and by the French forces under Marshal Forey in 1863. With a history extending from the uncertain past of Aztec tradition through three centuries of Spanish dominion and six decades of spasmodic revolution, the centre, subsequently, of a political system unique on the American continent and of an intellectual and industrial development unparalleled in Latin America, Mexico is to-day at once one of the most interesting and most promising cities of the Western continent.

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MEXICO. A town of Luzon, Philippines, in the Province of Pampanga (Map: Philippine Islands, E 4). It is situated on an arm of the Pampanga Delta, about 5 miles northeast of Bacolor. Population, 17,099.

MEXICO. A city and the county-seat of Audrain County, Mo., 110 miles northwest of Saint Louis, on Salt River, and on the Chicago and Alton and the Wabash railroads (Map: Missouri, E 2). It is the seat of Hardin College for Women (Baptist), founded in 1873, and of the Missouri Military Academy. There is a considerable trade in horses and cattle, and the manufacturing industries include flour mills, a foundry, and fire-brick, marble, stove lining, cigar, plough, and wagon works. Settled in 1833, Mexico was incorporated in 1852. The government is administered under a charter of 1893, which provides for a mayor, elected biennially, and a unicameral council. Population, in 1890, 4789; in 1900, 5099.

MEXICO, GULF OF. A partially inclosed basin of the Atlantic Ocean, having the United States on the north and Mexico on the west and south. It has an extreme length from east to west of about 1000 miles and a breadth from north to south of 800 miles; its area is estimated at 600,000 square miles (Map: North America, J 7). The opening of the gulf eastward is narrowed by the peninsulas of Florida and Yucatan, which approach within 450 miles of each other. Near the middle of the outlet lies the island of Cuba, forming two passages—the Strait of Florida, 125 miles wide, between Florida and Cuba, and the Yucatan Channel, 120 miles wide, between Cuba and Yucatan. The northern entrance connects with the Atlantic, and the southern with the Caribbean Sea. The basin of the gulf attains a maximum depth of 12,700 feet, while a large proportion of its area exceeds 10,000 feet in depth. From Florida west to the Mexican boundary the shores form a part of the coastal plain and slope so gradually that the 100-fathom line is distant 100 miles or more from land. Off the Mexican coast, however, the basin rapidly sinks to the level of the submarine plain known as Sigsbee's Deep, which has an average depth of 12,000 feet. The passages leading to the Caribbean Sea and the Atlantic are relatively shallow. The gulf contains few islands and these are located in proximity to the coasts; the Florida Keys, the delta of the Mississippi, and the islands on the coast of Yucatan are the most important. Numerous small bays and innumerable lagoons inclosed behind sandbars give relief to the coast line, which is otherwise quite regular. The Bay of Campeachy, between Yucatan and the main mass of Mexico, is the only broad indentation. Owing to the low shores, good harbors are not numerous, the best being those of Vera Cruz, Galveston, Mobile, Tampa, Pensacola, and Havana. The principal rivers flowing into the gulf descend from the United States, and include the Mississippi, Rio Grande, Colorado of Texas, Brazos, Sabine, Mobile, and Appalachicola. The gulf is visited by violent gales, which are reflex storms from the tropics, and which prevail mainly in the winter time. The most remarkable feature in connection with the Gulf of Mexico is the Gulf Stream (q.v.), which enters it by the southern channel, passes round it, and emerges through the Strait of Florida. Owing partly to the presence of this heated current, the temperature of the gulf is 8° or 9° higher than that of the Atlantic in the same latitude.

MEYER, mī′ẽr, Adolf Bernhard (1840—). A German zoölogist and ethnologist, born in Hamburg. After a prolonged course of study at the universities of Göttingen, Vienna, Zurich, and Berlin, he explored the Malay and Philippine Islands, and in 1874 became director of the Dresden Royal Museum of Natural History. Among his writings are *Album von Phillippinentypen* (1884-90) and *Abbildungen von Vogelskeletten* (1879-95).

MEYER, Eduard (1855—). A German historian, born at Hamburg; professor in the University of Halle. His principal work is his *Geschichte des Altertums* (1884-1902). He also published: *Geschichte des alten Aegypten* (1877); *Forschungen zur alten Geschichte* (1892-99); *Untersuchungen zur Geschichte der Gracchen* (1894); *Wirtschaftliche Entwickelung des Altertums* (1895); and *Die Entstehung des Judentums* (1896).

MEYER, Hans (1858—). A German explorer. He was born at Hildburghausen and studied science and political economy at Leipzig and Berlin. He traveled in Asia, North America, and South Africa, and in 1887 explored Kilimanjaro in East Africa. After several venturous attempts to ascend the mountain he managed to reach the top of the higher of the two peaks, the Kibo summit, where he found a crater more than a mile wide and about 19,700 feet above the sea. In his *Zum Schneedom des Kilima-Ndscharo* he gives a full account of his experiences and discoveries in that region. His other contributions to geography include *Eine Weltreise* (1885) and *Ostafrikanische Gletscherfahrten* (1890).

MEYER, Heinrich (1760-1832). A Swiss writer on art and antiquity. He was born at Zurich, and studied painting there under Füessli, brother of Henry Fuesli. In 1784 he went to Italy and at Rome in 1788 he met Goethe, with whom he contracted a friendship so intimate that he was known in Germany by the name of 'Goethe-Meyer.' In 1792, through the influence of Goethe, he was appointed a professor in the Weimar Academy of Design. Three years later he revisited Italy, and in 1797 returned to Weimar, where he was made a director of the Academy in 1807. Many of the critical portions of Goethe's essays on art in *Kunst und Altertum* are to be credited to Meyer. As a painter, his production was scanty. It was as a writer on the history and theory of art, and particularly of Greek and Roman art, that he acquired authority. He edited, with extensive annotations of his own, the works of Winckelmann (1808-20). These notes he subsequently expanded into a general history of Greek art, which appeared under the name of *Geschichte der bildenden Künste bei den Griechen und Römern* (with an additional volume by Riemer, 1824-36). He died at Weimar, leaving to that city a bequest of 33,000 thalers for the establishment of a foundation for the poor, which bears his name.

MEYER, Heinrich August Wilhelm (1800-73). A German Bible commentator. He was born at Gotha, studied theology at Jena, and held various pastoral charges. After 1841 he resided in Hanover as a member of the consistory, and died there June 21, 1873. His fame rests upon his *Kritisch-exegetisches Kommentar zum neuen Testament*, of which the first volume, containing the first three Gospels, appeared in 1832. An English translation appeared at Edinburgh, with the exception of the *Revelation* (20 vols., 1873-82); and an American in New York (11 vols., 1884-88).

MEYER, Hermann von (1801-69). A German paleontologist, born at Frankfort-on-the-Main. He wrote: *Palaeologica zur Geschichte der Erde und ihrer Geschöpfe* (1832); and *Die fossilen Zähne und Knochen* (1834). With Duncker he founded the periodical *Palæontographica*, which contains a collection of important essays on paleontology.

MEYER, Johann Georg (Meyer von Bremen) (1813-86). A German genre painter, born at Bremen, October 28, 1813. He was a pupil at Düsseldorf of Sohn and Schadow, and at first painted biblical subjects, but after 1842 practiced genre painting. His favorite subjects were peasants of the Hessian, Bavarian, and Swiss mountain districts. At first he treated scenes from family life, such as "The Anniversary of the Hessian Parson" (1842); "The Penitent Daughter" (1852), Bremen Gallery; "Grandmother," Metropolitan Museum, New York. His scenes from child-life followed after he settled in Berlin in 1852. These include: "Girl Telling Fairy Tales," "Blind-Man's Buff," "The Youngest Brother," and the "Little Mother" (1852), National Gallery, Berlin. He also painted single or group figures of young girls, like his "Awaiting," "The Courting," and "Reading the Love-Letter." The Metropolitan Museum of New York possesses "The Letter," "Evening Prayer," and "The Grandmother." Meyer's pictures have a certain charm and are often naïve and full of humor. They show careful execution and exact detail; the color is harmonious, but smooth. Meyer was a professor at the Berlin Academy and received a medal in Philadelphia in 1876. He died in Berlin, December 3, 1886.

MEYER, Jürgen Bona (1829-97). A German philosophical writer. He was born at Hamburg, and studied science and philosophy in Berlin and Bonn. In 1868 he became professor of philosophy at Bonn, and from 1889 to 1892 he was editor of the *Deutsche Zeit- und Streitfragen*. His publications include: *Zum Streit über Leib und Seele* (1856); *Philosophische Zeitfragen* (1870-74); and *Probleme der Lebensweisheit* (1887).

MEYER, Klaus (1856—). A German genre painter, born at Linden, near Hanover. He studied first at the School of Arts in Nuremberg, then at the Munich Academy under Alexander Wagner and afterwards under Löfftz, whose influence led him to an intimate study of the Dutch masters of the seventeenth century. He acquired such refinement of color and subtle characterization as almost to surpass his models. Even his early "Dutch Interior" (1882) displayed the most sterling qualities, and his next effort, "Sewing Room in a Béguine Convent" (1883), was awarded the great gold medal at the International Exhibition in Munich. An equal perfection of workmanship distinguishes "Old and Young

Cats" (1885, Dresden Gallery); "Players at Dice" (1886, National Gallery, Berlin); "Infants' School" (1888), and others which were immediately acquired for private collections. He was professor at the School of Art in Karlsruhe in 1891-95, and afterwards at the Academy in Düsseldorf.

MEYER, Konrad Ferdinand (1825-98). A Swiss poet and historical novelist. The little volume of historical *Balladen* (Leipzig, 1867), by which he first attracted attention, is halting in expression, as are the verses of *Romanzen und Bilder* (Leipzig, 1870). More plasticity appears in *Huttens letzte Tage* (Leipzig, 1871), and in *Engelberg* (Leipzig, 1873), both narrative poems. Meyer then turned his attention from verse to prose, still remaining faithful to historical themes, and produced six striking epic narratives, which, though they require in the reader too wide a culture to be popular, are an enduring part of German novelistic literature. These are: *Jürg Jenatsch* (1876); *Der Heilige* (1880); *Leiden eines Knaben* (1883); *Die Hochzeit des Mönchs* (1884); *Die Versuchung des Pescara* (1887); and *Angela Borgia* (1891). Meantime he had written a remarkable group of historical short stories, first collected as *Kleine Novellen* (1883) and later as *Novellen* (13th ed. 1899). Characteristic and perhaps best of these is *Gustav Adolfs Page.* His early poems are incorporated, with many changes, almost always for the better, in *Gedichte* (1882). Meyer's literary characteristics, which combine to make him the most important imaginative writer in Switzerland in his generation, are truthfulness of observation, a realistic plasticity in description, clearness of style, objectivity in statement. A uniform edition of Meyer's works appeared in 1892. For his biography, consult Trog (Basel, 1897) and Frey (Stuttgart, 1900). Also Moser, *Wandlungen der Gedichte K. F. Meyer's* (Leipzig, 1900); and Kraeger, *K. F. Meyer, Quellen und Wandlungen seiner Gedichte* (Berlin, 1901).

MEYER, Leo (1830—). A German philologist, born at Bledeln, near Hanover, and educated at Göttingen and Berlin. From 1862 to 1865 he was professor in Göttingen, and in 1865 he became professor of comparative philology at Dorpat. In 1889 he again accepted a chair at Göttingen. His contributions to philological literature are of great merit; they include: *Vergleichende Grammatik der griechischen und lateinischen Sprache* (1861-65); *Die gothische Sprache* (1869); and *Handbuch der griechischen Etymologie* (1901). He also wrote *Glauben und Wissen* (1876), and *Ueber das Leben nach dem Tode* (1882).

MEYER, Lothar Julius (1830-95). A German chemist, born in Varel, Oldenburg. He studied medicine in Zurich and Würzburg and chemistry at Heidelberg, where, in 1857, he made the discovery that the taking up of oxygen by the blood is not accomplished by a simple analysis of the air, but results from the chemical affinity between oxygen and the coloring matter of the blood. This view, published in *Die Gase des Blutes* (1857), was supplemented by the study *De Sanguine Oxydo Carbonico Infecto* (1858). In 1859 he became professor in the chemical laboratory in Breslau; in 1866 he became professor at Eberswalde; and in 1868 at Karlsruhe, whence in 1876 he went to Tübingen. Meyer wrote, besides some important monographs on educational methods, *Die modernen Theorien der Chemie* (1864; 6th ed., partially, 1896), and *Die Atomgewichte der Elemente* (with Seubert, 1883).

MEYER, må'yâr′, Paul (1840—). A French philologist, born in Paris. He studied at the Ecole des Chartes, was appointed to a post in the manuscript department of the Bibliothèque Française in 1863, and became in 1869 professor of Southern European languages and literatures at the Collège de France. In 1882 he was made director of the Ecole des Chartes and professor of Romance languages there. In 1884 he was elected to the Académie des Inscriptions et Belles-Lettres. He also became member and secretary of the Société des Anciens Textes Français. He was a founder of the *Revue Critique* in 1866, and after 1872 was an editor of *Romania.* His researches into the literature of the Middle Ages, which began with a study of that of Provence and included a very comprehensive field, involved laborious investigations of material in many libraries, particularly those of France and England. His original works include: *Etudes sur les auteurs de la chanson de la croisade contre les Albigeois* (1865); *Recherches sur l'épopée française* (1867); and *Alexandre le Grand dans la littérature française du moyen âge* (1886).

MEYER, mī′ẽr, Victor (1848-97). A German chemist, born in Berlin. He was appointed professor in the Stuttgart Polytechnikum in 1871, and in 1872 professor of chemistry and director of the chemical laboratory in the Polytechnic Institute of Zurich. In 1885 he became professor at Göttingen, and in 1889 he was called, as Bunsen's successor, to Heidelberg. He made valuable researches in organic chemistry, and invented apparatus for determining the solubility and density of gas and smoke. In addition to voluminous contributions to the reports of the German Chemical Society, he wrote *Gutachten betreffend den Verkehr mit Petroleum und anderen feuergefährlichen Flüssigkeiten* (1879).

MEYERBEER, mī′ẽr-bâr, Giacomo (1791-1864). A famous German composer. He was born at Berlin, of wealthy Jewish parents, and gave early promise of musical talent, which his parents encouraged. Lauska, considered the best teacher in Berlin, superintended his studies, while Clementi took a special interest in his progress and instruction. He made his first public appearance as a boy of nine. In 1806 he became a student under Vogler, and entered the latter's academy in Darmstadt, where he formed a friendship with Weber, which proved to be lifelong. Meyerbeer's earliest compositions gave little indication of the success he afterwards achieved, and in style were largely ecclesiastical. An opera, *Jephthah's Vow,* dating from this period, is singularly dull and heavy, and when first given was little esteemed by the general public, though the critics thought highly of it. *Abimelek* (1813) was a comic opera which met with a more favorable reception than any of his previous efforts, and was especially fateful in that it took its composer to Vienna, where he first heard Hummel, whose virtuosity on the piano so impressed him that he postponed all his plans and went into retirement with the object of perfecting his own style. After a brief stay in Paris he went to Venice (1815), and attempted to duplicate Rossini's success, with a series of operas in the Italian vein: *Romilda e Costanza* (1815); *Semiramide riconosciuta* (1819); *Emma di Resburgo* (1819); *Margherita d'Angiù* (1820); *L'esule di Granata* (1822); and *Il crociato in Egitto* (1824), which latter made a tremendous success. In none of these operas is there the faintest trace of his German training. An attempt to win German favor with the last-named opera proved a failure, as did a similar attempt in Paris. From 1826 to 1831 little was heard of him publicly, but apparently the time was not wasted. According to Mendel he was devoting himself to the study of the French style, and particularly French opera. His father's death and the subsequent death of two of his children weighed upon him, for he was a man of strong family attachments. He resolved to expatriate himself from Germany, and at the same time to desert the Italian for the French style of composition. *Robert le Diable* (1831) and *Les Huguenots* (1836) were the first fruits of his French studies; operas so intimately descriptive of French history and customs as to appeal irresistibly to the French public. Their success was immediate; so much so that, despite the determined opposition of the German classicists, *Robert le Diable, Les Huguenots, Le Prophète,* and *Dinorah* were all successfully given in Germany. His success in both France and Germany caused the Prussian Government to invite him to Berlin, where, in 1842, he was made Royal Music Director. Although not a great orchestral leader, he nevertheless accomplished important results during his stay in Berlin.

Das Feldlager in Schlesien belongs to this period and had moderate success, as did *Struensee,* a scarcely known work, but one which is considered to contain his best writing. In 1849 he returned to Paris, where *Le Prophète* was performed with phenomenal success. He regarded *L'Africaine,* on which he had worked on and off for over thirty years, as his best work; but *Robert le Diable,* and above all *Les Huguenots,* have by their continued popularity proved the verdict to be in their favor. He was greatly instrumental in developing many famous singers, notably Lucca (q.v.), and in a measure Jenny Lind. To the poor and needy he was especially generous, the *Meyerbeer-Stiftung* in Berlin and many similar bequests bearing ample testimony to the fact. As a composer he belongs to the world's great masters, notwithstanding the feebleness and trivial character of much of his music. Impartial criticism is in agreement with those of his detractors who claimed that his faults were due to his insatiate craving for popularity. He died in Paris. Consult: De Bury, *Meyerbeer, sa vie, ses œuvres et son temps* (Paris, 1865); Mendel, *Giacomo Meyerbeer, eine Biographie* (Berlin, 1868); Pougin, *Meyerbeer* (Paris, 1864); De Lasalle, *Meyerbeer, sa vie et le catalogue de ses œuvres* (Paris, 1864).

MEYERHEIM, mī′ẽr-hīm, Friedrich Eduard (1808-79). A German genre painter. He was born at Danzig, January 7, 1808. He received his first instruction from his father, and then studied at the Berlin Academy. His subjects were the peasants of the Harz Mountains and Thuringia. He became a member of the Berlin Academy in 1838 and professor in 1850. Among his works are: "Altenburgers in the Field" (1838); "The Champion Shot" (1836), "Tid-Bit" (1852), both in the National Gallery, Berlin; "Domestic Happiness" (1847), "Going to Church," and "Good Morning, Dear Father!" (1858), all in the Ravené Gallery, Berlin.

MEYERHEIM, Paul (1842—). A German painter, born in Berlin, son and pupil of Friedrich Eduard Meyerheim. He also studied at the Berlin Academy, and traveled and studied in Germany, the Tyrol, and the Netherlands, finally spending a year in Paris, whence he returned to Berlin, impressed with the brilliant color schemes of the French painters and matured in technical skill. Although he won distinction in genre, landscape, and portraiture, and as a decorative artist, his fame rests chiefly on his masterly rendering of the animal world, the incomparable humorous delineations of the monkey race, portrayed as sharers in the tragi-comedy of human life, constituting his most popular success. Even the following limited selection from a long series of sterling productions may convey an idea of his versatility: "An Amsterdam Antiquary" (1869), "Menagerie" (1885), both in the National Gallery, Berlin, the staircase of which he adorned with a charming frieze in fresco, allegorizing "The Four Seasons" (1883) in the life of birds. To this fanciful creation a realistic cycle of seven paintings on huge copper plaques, illustrating "The Life-Course of a Locomotive" (1878), in the Villa Borsig, Berlin, forms a striking contrast. "Sheep-Shearing" (1872), with its wonderful light effects; "Wild Man's Tent" (1874); "The Young Lions;" "The Card Sharpers" (monkeys, 1882); "Monkeys in a Studio," and, out of many fine landscapes, mostly of mountain scenery with cattle, a "Charcoal Pit in the Bavarian Alps" (1887, Hamburg Gallery), are only a few among his best efforts. Of numerous excellent portraits those of his father and of Daniel Chodowiecki (1887), both in the Museum at Danzig, are representative examples. Consult Meissner, in the *Art Journal* (London, 1895).

MEYER-HELMUND, mī′ẽr-hĕl′mụnt, Erik (1861—). A Russian-German composer, born in Saint Petersburg. He received the rudiments of musical instruction from his father and afterwards went to Berlin, where he studied under Kiel and Stockhausen. He became famous in Germany as a song composer, and for many of his songs he himself wrote the words. All his music is marked by strong local color and a distinct individuality. His larger works include a comic opera, *Margitta* (1889); *Die beiden Klingsberg, Der Liebeskampf* (1893); and the ballet music *Der Berggeist* (1893), followed one year later by the burlesque opera *Tischka.*

MEYER-LÜBKE, lụp′ke, Wilhelm (1861—). A Romance philologist. He was born at Dübendorf, in the Canton of Zurich, January 30, 1861. From 1879 to 1883 he studied at Zurich and Berlin, coming under the influence of Adolph Tobler (q.v.). In 1887 he became a professor extraordinary at Jena, and in 1890 he was made full professor of Romance philology at Vienna. His works include: *Die Schicksale des lateinischen Neutrums im Romanischen* (1883); and the *Grammatik der romanischen Sprachen* (1890-99), trans. as *Grammaire des langues romanes* (1890-1900). This is the most important grammar of the Romance languages since that of Diez. Other books of great value are the *Italienische Grammatik* (1890) and the *Einführung in das Studium der romanischen Sprachwissenschaft* (1901).

MEYNELL, mĕn′nĕl, Alice Christiana. An English poetess and essayist, the second daughter of Thomas J. Thompson, an intimate friend of Charles Dickens, born in London about 1853. With her elder sister, Elizabeth (Lady Butler, well known for "The Roll Call" and other military paintings), she was educated at home by her father. The Thompsons lived much abroad, especially in Italy. While a mere girl, Miss Thompson went over to the Church of Rome and was followed by other members of the family. In 1877 she married Wilfrid Meynell, a London journalist and magazine writer. Her first poems, *Preludes* (1875; new ed. 1893), were warmly praised by Ruskin, Rossetti, and Browning. The volume contained some exquisite pieces, as "Renouncement" and "A Letter from a Girl to Her Own Old Age." In 1901 she collected in a volume called *New Poems* a group of short lyrics, several of which had previously appeared in the *Living Age*. Soon after her marriage, Mrs. Meynell began to contribute to the London periodicals, gaining wide recognition for her graceful and delicate style. She published separately several delightful volumes of essays, as *The Rhythm of Life* (1893); *The Colour of Life* (1896); *The Spirit of Place* (1898); and *John Ruskin* (1900). For an estimate of Mrs. Meynell as a poet, consult Archer, *Poets of the Younger Generation* (New York, 1902).

MEYNERT, mī′nĕrt, Theodor (1833-92). An Austrian neurologist, born at Dresden. He was educated at the University of Vienna; in 1865 was appointed lecturer on the anatomy of the brain at the university, and in 1870 professor of psychiatry. He was a member of the Vienna Academy of Sciences. A member of the staff of the *Psychiatrisches Centralblatt* in 1871-78, he also published several volumes, including *Zur Mechanik des Gehirnbaues* (1874), containing the results of important researches in brain anatomy, and *Psychiatrie Klinik der Erkrankungen des Vorderhirns* (1884).

MEYR, mīr, Melchior (1810-71). A German poet and novelist, born at Ehringen, near Nördlingen. He was educated at Munich and Heidelberg. His most important works are: *Erzählungen aus dem Ries* (3d ed. 1875), a series of admirable village tales of his own peasant region; some very didactic *Gedichte* (1857); the tragedies *Karl der Kühne* (1862) and *Herzog Albrecht* (1862); and the anonymous and extremely clever *Gespräche mit einem Grobian* (1866). He also wrote the philosophical *Religion des Geistes* (1871).

MEYRICK, mĕr′rĭk, Frederick (1827—). A Church of England scholar. He was born at Ramsbury Vicarage, Wiltshire; educated at Trinity College, Oxford, of which he was successively scholar, fellow, and tutor, and has held the university offices of select preacher and public examiner. In 1856 he was appointed one of the Queen's Whitehall preachers, in 1859 inspector of schools, and in 1868 became rector of Blickling with Erpingham in Norfolk, and in 1869 nonresidentiary Canon of Lincoln. He was the chief agent in establishing the Anglo-Continental society for making known the principles of the English Church in foreign countries, and published several controversial treatises in Latin, Spanish, Italian, etc. He is the author of *The Moral and Devotional Theology of the Church of Rome, According to the Authoritative Teaching of S. Alphonso de' Liguori* (1856); *The Outcasts and Poor of London* (1858); *But Isn't Kingsley Right After All?* (1864); *On Dr. Newman's Rejection of Liguori's Doctrine of Equivocation* (1864); *Is Dogma a Necessity?* (1883); *The Doctrine of the Church of England in the Holy Communion* (1883; 4th ed. 1899); *The History of the Church of Spain* (1892); *Justin Martyr* (1896); also commentaries on Leviticus, Joshua, Judges, Joel, and Obadiah.

MEYRICK, Sir Samuel Rush (1783-1848). An English antiquary. He was educated at Oxford, was called to the bar, and practiced law in the ecclesiastical and admiralty courts. He possessed a very fine collection of armor, and his *Critical Inquiry Into Ancient Armor* (splendidly illustrated, 1824) is still considered authoritative. He assisted Rev. T. D. Fosbrooke in 1823-25 in the publication of the *Encyclopædia of Antiquities*. In 1826 he arranged the arms and armor in the Tower of London, and in 1828 performed the same service at Windsor Castle. During his administration of the office of High Sheriff of Herefordshire he revived some of the old ceremonial display, including javelin-men in full accoutrement.

MEYTENS, mī′tĕns, Martin van der (1695-1770). A Swedish painter of Dutch extraction, born at Stockholm. He studied under his father, Peter Meytens, then Court painter. He afterwards traveled in England and France, and while in Paris painted the portraits of Louis XV. and Peter the Great (1717). Afterwards he lived for some time in Italy, and then went to Vienna, where he ultimately became Court painter and Director of the Academy (1759). His works are largely the portraits of his celebrated contemporaries.

MEZEN, mȧ-zĕn′y', or **MESEN**. A river of Northern Russia. It rises near the northern boundary of the Government of Vologda and flows northwest through the Government of Archangel, entering the White Sea at Mezen Bay after a course of about 510 miles (Map: Russia, G 1). It is navigable in its lower part, but is free from ice only about six months in the year.

MÉZERAY, mȧz′rȧ′, François Eudes de (1610-83). A French historian and man of letters. He was born at Ruy, near Argenton, in the Department of Indre, studied at Caen, and after some military service in Flanders came to Paris and set to writing history. Richelieu patronized him and put him into the Academy. His *Histoire de France* (1643-51) brought him fame, and is still of considerable value. During the Fronde he was an active pamphleteer against Cardinal Mazarin.

MEZE′REON (Fr. *mézéréon*, Sp. *mezeron*, from Ar. *māzariyim*, camelia). The bark of Daphne Mezereum, Daphne Gnidum, and Daphne Laureola of the natural order Thymelæaceæ, three shrubs from two to four feet high. Daphne Mezereum has rose-red, sessile, fragrant flowers, in small clusters, preceding the deciduous leaves. It is indigenous to hilly and mountainous regions of Europe, extending to the Arctic Circle, and eastward to Siberia, and cultivated in the United States. The other two species grow in Southern Europe. Daphne Laureola, spurge laurel, has large evergreen leaves and yellowish-green flowers in axillary clusters. Daphne Gnidum, spurge flax, has narrow, deciduous leaves, and small white flowers in terminal racemes. Formerly the bark was extensively employed in medicine. The dried bark is inodorous, but has a persistently acrid and burning taste. The bark of Daphne Gnidum is darker, and that of Daphne Laureola is more gray and has a greenish cast. They resemble mezereon in acridity. The root bark of the three species is the strongest, but the stem bark is the more common. It is used as an adjunct to sarsaparilla in making the compound decoction and the compound extract of that drug. The juice of the fresh bark is irritant and is said to blister the skin. See DAPHNE.

MEZHIRYETCHIE, mĕ'zhê-rĕ'chyĕ. A town in the Government of Siedlce, Russian Poland, about 80 miles from Siedlce. It manufactures leather, brass articles, etc., and had a population of 13,681 in 1897.

MÉZIÈRES, mȧ'zyâr'. A fortified town in the northeast of France. It is the capital of the Department of Ardennes, at the confluence of the Meuse and Vence, and on a branch of the Eastern Railroad (Map: France, L 2). The town manufactures ammunition, and has iron and copper foundries, but most of its iron industry has been transferred to Charleville, with which it is connected by a suspension bridge. In 1521 the Chevalier Bayard, with 2000 men, successfully defended the place against 40,000 Spaniards under Charles V. In 1815 the town held out for six weeks against the Allies, who besieged it after the battle of Waterloo. In the Franco-German war of 1870-71, Mézières capitulated after a cannonade of two days. Population, in 1901, 7884.

MÉZIÈRES, ALFRED JEAN FRANÇOIS (1826 —). A French critic, born at Rehon (Moselle), November 19, 1826. He became professor of foreign literature at Nancy (1854) and Paris (Sorbonne, 1861), Academician (1874), and Deputy (1881). His publications are mainly literary studies. Among them may be named: *Shakespeare, ses œuvres et ses critiques* (1861); *Prédécesseurs et contemporains de Shakespeare* (1863); *Contemporains et successeurs de Shakespeare* (1864); *Dante et l'Italie nouvelle* (1865); *Pétrarque* (1867); *Goethe, les œuvres expliquées par la vie* (1872-73). His later books, *En France* (1883), *Hors de France* (1883), *Mirabeau* (1891), have had a more political tendency. The *Revue des Deux Mondes* and the *Temps* have published many articles by Mézières.

MÉZIÈRES, MARIE JEANNE LABORAS DE. A French novelist. See RICCOBONI, MARIE J. L. DE.

MÉZIRIAC, mȧ'zê'rê'ȧk'. See BACHET.

MEZÖTÚR, mĕ'zē-tōōr. A town of Hungary, situated on an affluent of the Körös, 80 miles southeast of Budapest (Map: Hungary, G 3). It is the seat of a gymnasium and has manufactures of pottery and trade in cereals and domestic animals. Population, in 1890, 23,757; in 1900, 25,383, mostly Magyars.

MEZZO, mĕd'zô (It., middle). A term generally used in music in conjunction with some other word, as mezzo-forte, moderately loud; mezzo-piano, rather soft; mezza-voce, with a moderate strength of tone; mezzo-orchestra, with half the orchestra, etc. When written alone and applied to the grand piano-forte it indicates that the soft pedal is to be used. But mezzo-soprano means a voice lying half way between the high soprano and contralto.

MEZZOFANTI, mĕd'zô-fän'tê, GIUSEPPE (1774-1849). An Italian linguist and a cardinal in the Church of Rome. He was born in Bologna; was educated there, and became a priest in 1797, professor at the university in 1804, and university librarian in 1812. In 1831 he went to Rome, where he was appointed librarian of the Vatican and secretary of the College of the Propaganda, and in 1838 was raised to the rank of cardinal. He acquired a European reputation by his linguistic attainments, and at the time of his death was credited with knowing fifty-eight languages. Consult Russell's *Life of Cardinal Mezzofanti* (London, 1858); and the biographies by Manavit (Paris, 1853), Bellesheim (Würzburg, 1880), and Mitterrutzner (Brixen, 1885).

MEZ'ZOTINT (It. *mezzotinto*, half-black). A style or method of engraving on a copper or steel plate, which is at first prepared by making on it a ground with an instrument called a cradle or a mezzotint grounder. This instrument is a flat plate of hardened steel, of which one side is brought to a segment of a circle with a sharp cutting edge, the bevel of which is so engraved with fine parallel lines that it resembles a file, and the edge itself is brought to a ridge of very fine points. This has to be rocked across the plate many times, in four or more directions, until, by this operation, the whole surface is reduced to a close-set mass of small teeth or points. The plate thus pricked by this grounder offers a uniformly roughened surface, and upon this surface the engraver begins his proper work. Now, this prepared plate, if covered with printers' ink, would yield an entirely black impression; so it is the business of the engraver to work from dark to light, or from black to white. This he does with various instruments adapted to the purpose, such as scrapers and burnishers; the scraper employed to diminish the burr and such asperity of surface as tends to retain too much ink, and the burnisher to remove all surface roughness when the highest light or pure white is required in the design or picture he is producing.

Mezzotint is admirably adapted to the reproduction of those works in which broad effects of light and shade are dominant, as opposed to those where close line, contour, and small detail are demanded.

Among the greatest mezzotint engravers may be mentioned: James McArdell (d. 1765), James Watson, J. Raphael Smith, and Valentine Green. David Lucas was very successful in reproducing the landscapes of Constable. Besides its comparative inadequacy in depicting great detail, mezzotint has another limitation—its failure to bear much printing. The burr is soon destroyed in the copper plates, and although steel is more enduring, mezzotint on this medium is still far behind line engraving in reproductive possibilities. From twenty-five to thirty impressions of the first class are all that may be drawn from copper plates. The original inventor or discoverer of mezzotint engraving was Louis von Siegen, a lieutenant-colonel in the service of the Landgrave of Hesse-Cassel, and his first published work was a portrait of the Princess Amelia-Elizabeth of Hesse, proofs of which are dated 1642, fifteen years anterior to the earliest date on the plates of Prince Rupert, to whom a charming legend ascribes the invention of the art. In the United States the mezzotint style was a favorite with magazine publishers in the early days of magazines, being introduced from England by John Sartain (q.v.), an expert mezzotint engraver, in 1830. He published *Sartain's Magazine*, illustrated after this fashion. Consult: Wedmore's *Studies in English Art* (London, 1876-80); Hamerton, *The Graphic Arts* (London, 1882). See ENGRAVING.

MHOW, mou. A city and important British military station in the native Rajputana State of Indore, 13 miles southwest of the town of Indore, near the Vindhya mountains, on an eminence on the Gumber River 1900 feet above the sea (Map: India, C 4). On the southeast are the cantonments, arranged like a European town, having a church with a steeple on an eminence, a spacious lecture-room, a well-furnished library, and a theatre. They are occupied under the Mandsaur Treaty of 1818 by a considerable force of British and native troops. Population, in 1891, 31,773; in 1901, 36,039.

MIAGAO, mē′ȧ-gä′ȯ. A town of Panay, Philippines, in the Province of Iloilo. It is situated on the southern coast of the island, 22 miles west of Iloilo. Population, 22,100.

MIAKO, mė-ä′kȯ. A city of Japan. See KIOTO.

MIALL, EDWARD (1809-81). An advocate of English Church disestablishment. He was born in Portsmouth, England; studied at Wymondley Theological Institute, Hertfordshire; entered the independent ministry, and was installed pastor at Ware in 1831 and at Leicester in 1834. Becoming an active advocate of the disestablishment of the Church of England, he removed to London and established the *Nonconformist* newspaper as the organ of that policy in 1841; he was elected to Parliament from Rochdale in 1852. He favored universal suffrage and opposed class legislation and compulsory religious education. He led in the establishment, in 1844, of the British Anti-State Church Association, which afterwards became the Society for the Liberation of Religion from State Patronage and Control. In 1856 he introduced in the House of Commons a resolution on the disestablishment of the Irish Church. His motion for a committee on the disestablishment of the English Church was introduced three times in 1871 and 1872 and lost. He was appointed in 1858 a member of the Royal Commission on Education as a representative of the Nonconformists. Among his principal publications are: *Views of the Voluntary Principle* (1845); *Ethics of Nonconformity* (1848); *The British Churches in Relation to the British People* (1849); *The Franchise as a Means of a People's Training* (1851); *Title Deeds of the Church of England to Her Parochial Endowments* (1862); *Social Influences of the State Church* (1867). Of less polemical character is *An Editor Off the Line, or Wayside Musings and Reminiscences* (1865). A *Life* of Miall was published by his son Arthur Miall (London, 1884).

MIAMI, mī-ä′mē. An important Algonquian tribe residing, when first known to the French about 1660, in southeastern Wisconsin. They were somewhat superior to the northern tribes generally in their manner of living, and occupied a stockaded town with mat-covered houses. About the year 1690, in consequence of difficulties with the Illinois and Sioux, they removed to the southeast and established themselves on the site of what is now Chicago and upon the Saint Joseph River of Michigan, whence they soon spread to the Wabash and Maumee and later to the Miami. Their principal band made headquarters at Kekionga, where Fort Wayne now stands, while others, settled lower down on the Wabash, developed later into two distinct tribes, known respectively as Wea and Piankishaw (q.v.). All three, however, continued until the end of the eighteenth century to regard themselves as one people, and first cousins of the Illinois, their western neighbors, whose language differed only dialectically from their own. In the colonial wars the Miami sided alternately with either party, but joined Pontiac's alliance in 1764 and took sides against the Americans in the Revolution, continuing the struggle with the other tribes of the Ohio Valley until their crushing defeat by General Wayne compelled them to make peace at the Greenville Treaty in 1795. The great chief, Little Turtle, who led the allied forces to victory against Saint Clair and Harmar, was a Miami. Under Tecumseh they again joined the English side in the War of 1812. At its close, being now thoroughly broken, they began to sell their lands, and by 1827 had ceded almost the whole of their original territory and agreed to remove to Kansas. Here they rapidly died out from disease, famine, and dissipation, until about 1873 the remnant, only 150 in number, were placed upon the Quapaw reservation in Indian Territory, where they number now only 95. A considerable band had continued to occupy a reservation in Wabash County, Ind., until 1872, when the land was divided and tribal relations dissolved. These now number about 240, practically all of mixed blood.

MIAMI, or **GREAT MIAMI**. A river of western Ohio, flowing southward for 150 miles through a fertile and populous valley, past the cities of Troy, Dayton, and Hamilton, and emptying into the Ohio River on the Indiana boundary, 20 miles west of Cincinnati (Map: Ohio, A 7). It is a rapid stream furnishing extensive water power. The Miami and Erie Canal, connecting the Ohio River with Lake Erie, follows the course of the Miami.

MIAMISBURG, mī-ăm′ĭz-bûrg. A city in Montgomery County, Ohio, 46 miles north by east of Cincinnati; on the Great Miami River and the Miami and Erie Canal, and on the Cincinnati, Hamilton and Dayton and the Cleveland, Cincinnati, Chicago and Saint Louis railroads (Map: Ohio, B 6). It is of considerable importance as an industrial centre, the manufactures being favored by good water power, and is also an important market for tobacco, which is cultivated extensively in the adjacent region. The electric light plant is owned by the municipality. Just outside of the corporate limits is one of the largest Indian mounds in the State. Population, in 1890, 2,952; in 1900, 3,941.

MIAMI UNIVERSITY. A coeducational institution of learning at Oxford, Ohio, founded in 1809. The first school was opened in 1816, and the university proper began its work in 1824. It has a preparatory, a normal, and a collegiate department, in the last of which three courses are offered, all leading to the B.A. degree. A considerable freedom is allowed in the election of studies. In 1903 the faculty numbered 25, and the attendance was 247, divided about equally among the three departments. The library contained 19,000 volumes. The institution was endowed in 1803 with one township of land in Ohio, and receives financial aid from the State, the endowment amounting to $30,000 and the income to about $55,000. The college campus occupies nearly 60 acres. The grounds and buildings were valued in 1903 at $250,000 and the college property amounted to $267,000.

MIANA BUG. See MITE; TICK.

MIANTONOMOH, mĭ-ăn′tô-nō′mô. A Narragansett sachem, who succeeded his uncle, Canonicus, in 1636. He was on friendly terms with the early settlers of Massachusetts, and assisted them during the Pequot war of 1637. In 1643 he conducted an unsuccessful expedition against Uncas, the Mohegan sachem, his bitter rival, with whom, however, he had agreed in 1638 not to open hostilities without first appealing to the whites. Being captured, he was handed over by Uncas to the Commissioners of the United Colonies, and was tried by an ecclesiastical court organized for the purpose, which condemned him to death and commissioned Uncas to carry out the sentence. A brother of the latter soon afterwards killed the unsuspecting captive on the spot now called Sachem's plain (near Greenville), where he had originally been captured. A monument erected there in 1841 commemorates the event.

MIAO-TSE, mē-ä′ō-tsē, or **MIAU-TSI.** The inhabitants of the mountainous regions of Southern China, in parts of the provinces of Hu-peh, Sze-chuan, Yun-nan, Kwei-chow, Hu-nan, Kwang-hsi, and Kwang-tung. They number several millions, and represent an aboriginal population of this portion of the Celestial Empire driven back in recent times by the Chinese. Many of the Miao-tse tribes are under Chinese rule, but some of them still maintain their independence. The Miao-tse are shorter in stature than the Northern Chinese, and apparently not Mongoloid in form and features; some style them "sub-Caucasian." Certain scholars connect them with the Lolos and the non-Mongoloid Tibetans, Lissus, Mossos, and kindred peoples of the border of China and Indo-China. Others can see nothing Mongolian about them; still others seek to detect Malayan or "Indonesian" affinities. Some of the aborigines of the island of Hainan are thought to be related to the Miao-tse. Consult: Edkins, *The Miau-tsi Tribes* (Foochow, 1870); Henry, *Lingnam* (London, 1886); Bourne's *Journey in Southwest China* (London, 1888).

MIAS. See ORANG-UTAN.

MIAS′MA (Neo-Lat., from Gk. *μιασμα*, stain, from *μιαίνειν*, *miainein*, to pollute). A term formerly applied to any disease which was thought to arise from polluted air. Miasma has had slightly different meanings at different times, but has been most generally used to indicate certain imponderable morbific emanations from the soil of particular localities. Since the discovery of the specific plasmodium of malaria, and its conveyance by the mosquito, the term miasma has lapsed into disuse and is now rarely seen in medical literature. See MALARIA AND MALARIAL FEVER; INSECTS, PROPAGATION OF DISEASE BY.

MIASSKIY ZAVOD, mē-ȧs′kē zȧ-vȯd′. A mining town in eastern Russia in the government of Orenburg, situated among the Ural Mountains, 35 miles west of Cheliabinsk and near the railroad to that town. Its mines produce over 17,000 ounces of gold annually. Population, 1897, 16,100.

MIAULIS, mē-ou′lēs, ANDREAS VOKOS (c. 1768-1835). A Greek patriot, born in the island of Negropont. Brought up as a sailor, he gave his services and his property heartily to the cause of the Greek revolution in 1821, and was put in command of the Greek fleet. In March, 1822, he defeated a Turkish squadron at Patras, and in September another squadron near Spezzia. In 1825 he burned the fleet commanded by Ibrahim Pasha near Modon. In 1827, upon the appointment of the Englishman Lord Cochrane as his superior in command, he loyally continued to serve as a subordinate. He was restored to his old rank by President Capo d'Istria. He participated in the insurrection of 1831, and burned the fleet under his command at Poros, to keep it out of the hands of the Russians. He opposed the President's Russian policy and was actively engaged in the bitter controversies of the period. In 1832 the naval stations in the Archipelago were placed in his charge, and he served on the deputation sent to Munich to offer the crown to Prince Otho of Bavaria. He died at Athens June 23, 1835. In 1889 a monument was erected to him in Syra.

MIAVA, mē-ŏ′vŏ. A town of the County of Neutra, Hungary, on the Miava River, 60 miles northwest of Vienna (Map: Hungary, E 2). The manufacture of woolen and linen goods and bagging is the chief industry. Population in 1900, 10,639.

MICA (Neo-Lat., from Lat. *micare*, to flash; confused with and influenced by *mica*, crumb). A group of minerals that crystallize in the monoclinic system, and consist essentially of aluminum silicate with varying proportions of potassium, sodium, lithium, iron, magnesium, etc. The different species are characterized by a basal cleavage, yielding thin, tough scales that are colorless to jet black. The principal members of the group include the following: *Muscovite*, or common mica, called also potassium mica, as it is essentially an aluminum and potassium silicate. The colorless varieties of muscovite are used in the doors of stoves and as lamp chimneys. It is also employed as an insulating material, in wall-paper manufacture, as a lubricant, and when ground it is used as an absorbent for glycerin in the manufacture of dynamite. During 1900 70,587 pounds of sheet mica were mined in the United States. *Paragonite*, or sodium mica, is similar to the foregoing, except that the sodium replaces the potassium in its composition. It is of a yellowish to greenish color. *Lepidolite*, or lithium mica, is a potassium, lithium, aluminum silicate, also containing fluorine, and is of a rose or peach-blossom color. It finds some use for ornamental purposes, and is a source of lithium salts. *Zinnwaldite* is of a complex composition, containing iron in addition to the potassium, lithium, and aluminum silicates. In color it is of a pale violet or yellow to brown and dark gray. *Biotite*, or magnesium iron mica, is a magnesium, potassium, and iron silicate. It is usually dark-colored, as green, brown, or black. *Phlogopite* is also a magnesium mica, generally nearly free from iron, and usually containing some fluorine. It is dark in color, being yellowish-brown to brownish-red. *Lepidomelane* is an iron mica generally black in color. The micas occur in crystalline rocks, muscovite being a normal constituent of granite, gneiss, and similar rocks. The deposits from which sheet mica is obtained are found in a coarse granite called pegmatite. The preparation of mica for the market is comparatively simple. The blocks, after being hoisted from the mine, are freed from adhering rock, and then split by means of wedges or heavy knives. After this the mica is cut up into sizes suitable for the market, usually in pound packages. The mica waste is utilized as described previously under *Muscovite.* Consult the volumes of the *Mineral Resources, United States Geological Survey* (Washington, annual).

MI'CAH (Heb. abbreviation of *mīkāyāh*, interpreted as, 'Who is like Yahweh?'). One of the minor prophets, a contemporary of Isaiah. His book is sixth in the ordinary arrangement of the minor prophecies, but third according to the Jewish canon, and this order is followed in the Septuagint. All that we know of his life is that he was a native of Moresheth, a small town dependent upon Gath (Micah i. 1; Jer. xxvi. 18); and that his activity falls in the reigns of Ahaz and Hezekiah, but hardly in the days of Jotham, roughly speaking, therefore, between B.C. 734 and 700. The Book of Micah, in its present form, may be divided into three sections, each beginning with "Hear ye." (1) Chapters i. and ii., addressed to all the people, describe the coming of Yahweh in judgment on the transgressions of Israel and Judah, and the doom of Samaria; denounce luxury and covetousness as the sources of transgression, and condemn the false prophets for leading the people astray; foretell the banishment of the people into captivity, and promise their return under the guidance of Yahweh. (2) Chapters iii.-v., addressed to the heads and princes of the people, condemn their oppressive rapacity, and declare that as they had been deaf to the cry of the poor in their wrongs, they, too, shall call on Yahweh, but will not be heard. The false prophets also who had deceived others shall themselves be made ashamed. This second threatening of judgment is followed by a second and fuller promise of Messianic times. (3) In chapters vi. and vii., Yahweh, calling on the people to hear, and on the mountains to be witnesses of the controversy, appeals to all His past government over Israel as approving His righteousness. The people, answering, complain that the burden of the sacrifices required is too great to be borne, and Yahweh, in reply, says that He asks of them only to do justly, love mercy, and walk humbly with God. That they had failed to comply with these demands is shown by the treasures of wickedness found in their houses, by the scant measures used, the false balances, the deceitful weights. For these crimes punishments will be inflicted; the wheat, the oil, and wine shall be cut off. The prophet mourns the justice of the sentence, and acknowledges the guilt of all classes of the people. Yet he waits for the salvation of Yahweh, triumphing in His pardoning mercy, which will certainly be manifested, and in His faithfulness, which will perform all that He had solemnly sworn to Abraham in the days of old.

These three divisions, however, do not correspond either to the original order or character of the discourses embodied in the book. The first three chapters (with the exception of ii. 12-13) depict conditions prevalent prior to the destruction of Samaria, and may be attributed to the prophet Micah, though with editorial additions and adjustment to the rest of the book. Chapters iv. and v., however, with their glimpse into Messianic times, embody the views and aspirations of the struggling post-exilic religious community, weighted by the sense of guilt, regarding its own sufferings as a punishment for transgressions in the past, and looking forward to a redemption and restoration of national glory, which can only come from Yahweh Himself. There are reasons for supposing that chapters i.-v. once formed the entire Book of Micah, the first three being by the prophet himself, and forming the text as it were to the last two chapters, justifying the sufferings in post-exilic days. By way of consolation, the prophecy of the Messiah and Messianic times was composed and added. In the same spirit, as a comment upon the real Micah, chapters vi. and vii. were written, which again present the same two sides—Yahweh's justification in bringing such sufferings upon His people and the consolatory promises for the future. Chapters iv.-vii., according to this view, belong to the Persian period and probably to the later half. The text of the Book of Micah, it should be added, is not well preserved, and this enhances the difficulties of a satisfactory interpretation. Consult, besides the general commentaries on the Minor Prophets and the Old Testament introductions, Caspari, *Ueber Micha den Morasthiten und seine prophetische Schrift* (Christiania, 1851-52); Roorda, *Commentarius in Vaticiniam Michæ* (Leyden, 1869); Cheyne, *The Book of Micah*, in the *Cambridge Bible for Schools and Colleges* (Cambridge, 1882); Ryssel, *Untersuchungen über die Textgestalt und die Echtheit des Buches Micha* (Leipzig, 1887); Taylor, *The Massoretic Text and the Ancient Versions of the Book of Micah* (London, 1891).

MICA SCHIST. A metamorphic rock (q.v.) possessing a schistose or foliated structure and composed essentially of the minerals mica and quartz. The mica is generally the colorless variety known as muscovite (q.v.), though the dark variety, biotite, may be present also. When garnet or staurolite is present in addition to the quartz and mica, the rock is designated a garnetiferous or a staurolitic mica schist. Probably the greater number of mica schists have been formed by the metamorphism of sedimentary rocks through the agency of orographic (mountain-building) forces. Other mica schists, and especially the variety known as sericite schists, have been developed from acid igneous rocks (q.v.) by the action of the same forces. Of many mica schists, and especially those of pre-Cambrian age, it has been found impossible as yet to determine whether their origin is sedimentary or igneous.

MICAW′BER, Mr. Wilkins. In Dickens's *David Copperfield*, an improvident, unpractical, and visionary character, noted for his mercurial temperament, his constant financial embarrassments, and his firm confidence that "something will turn up." Micawber is believed to be intended as a portrait of Dickens's father, and Mrs. Micawber is said to represent his mother.

MICEL′LAR THEORY (from Neo-Lat. *micella*, diminutive of Lat. *mica*, crumb). A theory proposed by the botanist Nägeli in 1862 to account for the physical properties of organized bodies like starch grains, cell walls, etc. He assumed that the molecules of the chemist are united into larger unions, constituting molecules of a higher order, which he called micellæ. These hypothetical micellæ are extremely minute, never being visible even with the highest powers of the microscope. He further claims that the growth in thickness of a cell wall is due to the intercalation (intussusception) of new micellæ of cellulose between the micellæ which have become widely separated from each other by the stretching of the wall. Strasburger, the most important opponent of the micellar theory, holds that the growth in thickness of a cell wall is due to the deposition of material upon its inner surface. The micellar theory is still current, but is not so strongly supported as formerly.

MICHABO, mē-chä′bō. See Manabozho.

MICHAEL, mī′kā-ĕl *or* mī′kĕl (Heb., 'Who is like God?'). An angel called in Dan. x. 13 one of the chief princes, who had special care of the Jews (Dan. x. 21. 'Michael your prince'), and who will fight for them and finally redeem them (Dan. xii. 1). In Jude 9 Michael is represented as fighting with the Devil for the body of Moses. In Rev. xii. 7-9 he fights against the Dragon. In the Book of Enoch Michael appears as one of the four angels who stand at the throne of God, Raphael, Gabriel, and Lemuel being the others, and in the oldest list of the seven archangels (Uriel, Raphael, Raguel, Michael, Suriel, Gabriel, and Remiel) the fourth place is occupied by Michael (Ethiopic text of Enoch, chap. xx). His special function, as described in Enoch, is to act as scribe in entering in the heavenly books the deeds of the angelic patrons of nations, while in the *Ascension of Isaiah* he records the deeds of all men in the heavenly books. According to the Talmudic account, Michael is the prince, the chief of the angels, standing in relation to the rest as the High Priest does to Israel on earth. He is therefore looked upon as the medium through whom the Law was given to Moses on Mount Sinai. In the Western Christian Church September 29th (Michaelmas) has been set aside as his day; the Greek Church keeps November 9th. Zimmern (*Keilinschriften und das alte Testament*, p. 376 seq.) has shown that some of the conceptions connected with Michael represent attributes of Babylonian gods, like Marduk and Nebo transformed to 'angels.' Consult: Weber, *Lehre des Talmud* (Leipzig, 1897); Kohut, *Jüdische Angelologie* (Leipzig, 1866); Lucken, *Michael* (Göttingen, 1898).

MICHAEL, mī′kĕl *or* mī′kā-ĕl. The name of nine emperors of Constantinople. Michael I. (died 845) succeeded to the throne on the death of Stauracius, in 811, conducted a war against the Bulgarians, but was a feeble monarch, who abdicated without fighting against Leo, the Armenian, a general in his service, in 813, and retiring to a monastery, passed the remainder of his life in devotional exercises.—Michael II. (died 829), surnamed the 'Stammerer,' was born in Upper Phrygia, of an obscure family, but was ennobled by Leo the Armenian, who, however, afterward condemned him to death on a charge of conspiring against him. His life was saved by the assassination of Leo, and Michael was crowned Emperor in 820. He was cruel and arbitrary; and his attempts to force his subjects to celebrate the Jewish Sabbath and Passover brought about a revolt on the part of his general Euphemius, who proclaimed himself Emperor. The rebellious general was slain near Syracuse, in Sicily. During Michael's reign the Saracens wrested Crete and Sicily from the Empire.—Michael III. (c.838-867), surnamed the 'Drunkard,' was grandson of Michael II., and succeeded his father, Theophilus, in 842, his mother, Theodora, being regent until 856. In his reign the Varangians appear as foes to the Empire, and the foundation for the separation of the Eastern and Western Churches was laid by a quarrel between the Patriarch, Photius, and the Pope, Nicholas I. Michael was assassinated by Basil the Macedonian in 867.—Michael IV. (died 1041), surnamed the 'Paphlagonian,' from the place of his birth, was raised to the throne by the Empress Zoë, who on account of her infatuation for him is suspected of having murdered her husband. He was successful in war against the Bulgarians in 1040, but died in 1041.—Michael V. succeeded the last named, who was his uncle. Having exiled the Empress Zoë, he was overthrown by the people in 1042, and, after having his eyes put out, was sent to a monastery.—Michael VI. succeeded the Empress Theodora in 1056, but retained the throne only a year, when he was compelled to resign in favor of Isaac Comnenus. He retired to a monastery. He was surnamed *Stratioticus*, and with him the Macedonian dynasty became extinct, his successor being of the family of the Comneni.—Michael VII., Ducas Parapinaces, was a son of Constantine XI., and after the regency of his mother Eudoxia he ascended the throne in 1071. Having given too much power to unworthy favorites, he was forced by an insurrection to abjure the throne in 1078, and retire to a monastery.—Michael VIII. Palæologus (1234-82) was the first of his family to ascend the Byzantine throne. He was proclaimed joint Emperor of Nicæa with John Lascaris about 1259, and soon after became sole ruler. In 1261 Constantinople, which had been held by the Latins since 1204, was captured, and Michael caused his young colleague to be blinded and dethroned. In order to retain possession of the capital, he made some pretence at an attempt to bring about a union of the Western and Eastern Churches, which, however, proved to be of short duration.—Michael IX., son of Andronicus II., was associated with his father, but died before him in 1320.

MICHAEL, Arthur (1853—). An American chemist, born in Buffalo, N. Y. He studied at the universities of Berlin and Heidelberg, and at the Ecole de Médecine of Paris, and in 1881 was appointed professor of chemistry in Tufts College (Boston). His researches in organic chemistry include studies in a new process for the formation of aromatic sulphones, in forming aldol from ethyl aldehyde, in the action of aldehydes and aromatic oxyacids on phenols, and in new reactions with sodium malonic ether. His writings include contributions to the *Proceedings* of the National Academy of Science, to the *American Chemical Journal* ("Synthesis of Helicin and Phenolglucoside," 1879; "on *a*- and *b*-Monobromcrotonic Acids," 1880); and to the *Berichte* of the Deutsche Chemische Gesellschaft ("Einwirkung von wasserentziehenden Mitteln auf Säureanhydride," 1878; "Paraconiin," 1881).

MICHAEL, Czar of Russia. See Romanoff.

MICHAEL ANGELO. See Michelangelo Buonarroti.

MICHAEL AT'TALIA'TA. A Byzantine jurist of the eleventh century. By command of Michael Ducas, Emperor of the East, he published in 1073 a work entitled Ποίημα νομικὸν ἤτοι πραγματική, comprising a system of law. Though from its title it might be supposed a poem, versified structure has not been detected in it. A Latin rendering by Leunclavius is to be found in vol. ii. of the compilation *Jus Græco-Romanum.*

MICHAELIS, mē'kȧ-ā'lĭs, Adolf (1835—). A German archæologist. He was born at Kiel and studied at the university of his native town, in Berlin, and Leipzig. After 1862 he was professor of classical philology and archæology at Greifswald, Tübingen, and Strassburg. In 1874 he became a member of the German Central Archæological Institute in Rome, the history of which he published in 1879, *Geschichte des deutschen archäologischen Instituts zu Rom.* Besides his critical edition of Tacitus's *Dialogus de Oratoribus* (1868), he published many archæological treatises, such as *Der Parthenon* (1871); *Ancient Marbles in Great Britain* (English translation by Fennell, 1882); *Strassburger Antiken* (1901); and prepared the sixth edition of Springer's *Handbuch der Kunstgeschichte* (vol. i., 1901).

MICHAËLIS, Carolina. A German philologist and literary critic, who married the Portuguese author Joaquim Antonio Fonseca de Vasconcellos (q.v.).

MICHAELIS, Johann David (1717-91). A German biblical scholar. He was born on February 27, 1717, at Halle, where his father, Christian Benedict Michaelis, was professor. After completing his studies at the university of his native town he traveled in England and Holland. In 1746 he became professor of philosophy at Göttingen, and in 1750 professor of Oriental languages. From 1753 to 1770 he was one of the editors of the *Göttinger gelehrten Anzeigen*, and for some years he filled the office of librarian to the university. He died at Göttingen, August 22, 1791. Michaelis may be regarded as among the earliest of the critical school of German theologians. His chief works are his *Hebräische Grammatik* (1778); *Einleitung in die göttlichen Schriften des neuen Bundes* (4th ed., Göttingen, 1788; Eng. trans., *Introduction to the New Testament*, London, 1823); *Mosaisches Recht* (2d ed., 1776-80; Eng. trans., *Commentaries on the Laws of Moses*, 1810-1814); *Moral* (1792-1823); *Orientalische und exegetische Bibliothek* (1786-93). Consult his *Lebensbeschreibung von ihm selbst abgefasst*, ed. by Hassencamp (Rinteln, 1793), and his letters (Leipzig, 1794-96).

MICHAELIUS, mē-kā'lĭ-ụs, Jonas (1577-?). The first clergyman of the Dutch Reformed Church in New Amsterdam. He was born in North Holland. In 1600 he entered the University of Leyden, and after his graduation became a country pastor. In 1624 he was appointed to San Salvador in Brazil, the next year to a settlement in Guinea, and in 1628, after a short visit to Holland, he sailed for New Amsterdam. His ministrations there probably lasted until 1633, when he was succeeded by Domine Bogardus (q.v.). A letter written by him in 1628, and now in the manuscript collection of the New York Public Library, gives the only extant first-hand account of New Amsterdam as it then was. A translation of this letter appears in the *Collections* of the New York Historical Society for 1880.

MICHAELMAS, mĭk'el-mas (from *Michael* + *mass*). The old English name of the day set apart in commemoration of Saint Michael and the other angels, September 29. The observance of this day is commonly traced to an apparition of the archangel which is supposed to have taken place on Monte Gargano in Apulia in 493, or more probably in 520; but it is likely, for various reasons, that the festival is even older. This particular apparition is commemorated in the Roman Catholic Church on May 8; the feast-day in September has a wider application, in the Eastern and Anglican Churches as well, and is intended to recall the benefits received through the ministry of angels. In England it has been for centuries an important date as a quarter-day and the beginning of legal and university terms.

MICHAEL NIKOLAYEVITCH, mĭ'kĕl nē'-kō-lä'yē-vĭch (1832—). Grand Duke of Russia, the fourth son of the Emperor Nicholas I. In the artillery branch of the army he was elevated to the rank of general. He was for some time Governor of the Caucasus, and in 1877 commanded the army which invaded Turkish Armenia. In 1881 he was made president of the Privy Council of State and commander-in-chief of the cavalry.

MICHAEL OBRENOVITCH, ō-brĕn'ō-vĭch (1823-68). Prince of Servia, born at Kraguyevatz, the younger son of Prince Milosh. After the death of his elder brother Milan in 1839, he was declared Prince of Servia by the Turkish Government. He soon made himself very unpopular by favoring the Russian policy, and the discontent of the Servian people was increased by his policy of arbitrary and heavy taxation. A revolution broke out in 1842, and an act of the National Assembly expelled him and his family from the country. In 1858 he returned to Servia, together with his father, whom he again succeeded in the government in 1860. He was a man of great ability and seemed honestly desirous to do his best for the country. He was successful in effecting cardinal changes in the military organization, and freed the Servian fortresses from Turkish garrisons. On June 10, 1868, he was shot by a follower of Prince Alexander Karageorgevitch.

MICHAUD, mē-shō', Joseph François (1767-1839). A French historian. He was born at Albens, Savoy, June 19, 1767. He studied in the ecclesiastical college of Bourg, and in 1787 published a work, *Voyage au Mont Blanc*, followed by other essays. In 1791 he went to Paris, where he embraced the teachings of

Voltaire and Rousseau, and half espoused Republicanism. He was, however, at heart a conservative and a Royalist. His true opinions soon showed forth in his contributions to the three Royalist papers, the *Gazette Universelle*, the *Postillon de la Guerre*, and the *Courrier Républicain.* In 1794 he founded the *Quotidienne*, and after the fall of Robespierre he contributed articles so openly favoring the Restoration that on October 27, 1795, he was condemned to death, and only escaped by having this sentence commuted to one of banishment. He passed four years in Switzerland and in Southern France, occupied in light literary work. In 1799 he returned to Paris. In 1806, in partnership with a younger brother, he undertook the publication of the *Biographie Moderne*, in which the public men who had taken an active part in the great revolution were painted in the darkest colors. His work *Tableaux historiques des trois premières croisades* began to appear in 1812, though not completed until 1822. Michaud was made member of the French Academy in 1812; the previous year he had founded, with his brother, the *Biographie Universelle.* He also collaborated with Poujoulat in editing the *Collection de mémoires pour servir à l'histoire de France*, which began to appear in 1836. In the *Dernier règne de Buonaparte* (1815), Michaud made a valuable contribution to Napoleonic history. He died at Passy, September 30, 1839. In 1792 Michaud wrote a work, *L'apothéose de Franklin*, of interest to Americans. Consult Sainte-Beuve, *Causeries du Lundi*, vol. vii.

MICHAUX, mē̇'shō̇', André (1746-1802). A French botanist and traveler. He was born at Satory, and studied science under the botanist Jussieu. In 1779 he traveled in England, and the next year through Auvergne and the Pyrenees, and, on his return to Paris, introduced several new varieties of Spanish grain and other plants. In 1782 he was sent to Persia on a scientific mission. From 1785 on he traveled extensively in North America on a similar mission at Government expense, but the French Revolution compelled him to return for want of funds. He was shipwrecked on the voyage to France, and lost nearly all his specimens. In 1800 he sailed for Madagascar, where he died. His most important publications are *Histoire des chênes de l'Amérique septentrionale* (1801), and *Flora Boreali-Americana* (1803).

MICHAUX, François André (1770-1855). A French botanist, son of André Michaux. He accompanied his father to the United States, and his *Histoire des arbres forestiers de l'Amérique septentrionale* (1810-13) contains the result of his explorations and gives an account of the distribution and the scientific classification of the principal American timber trees. Under the title *The North American Sylva* it was translated by Hillhouse, with three supplementary volumes on the trees of the Rockies by T. Nuttall (1841-49).

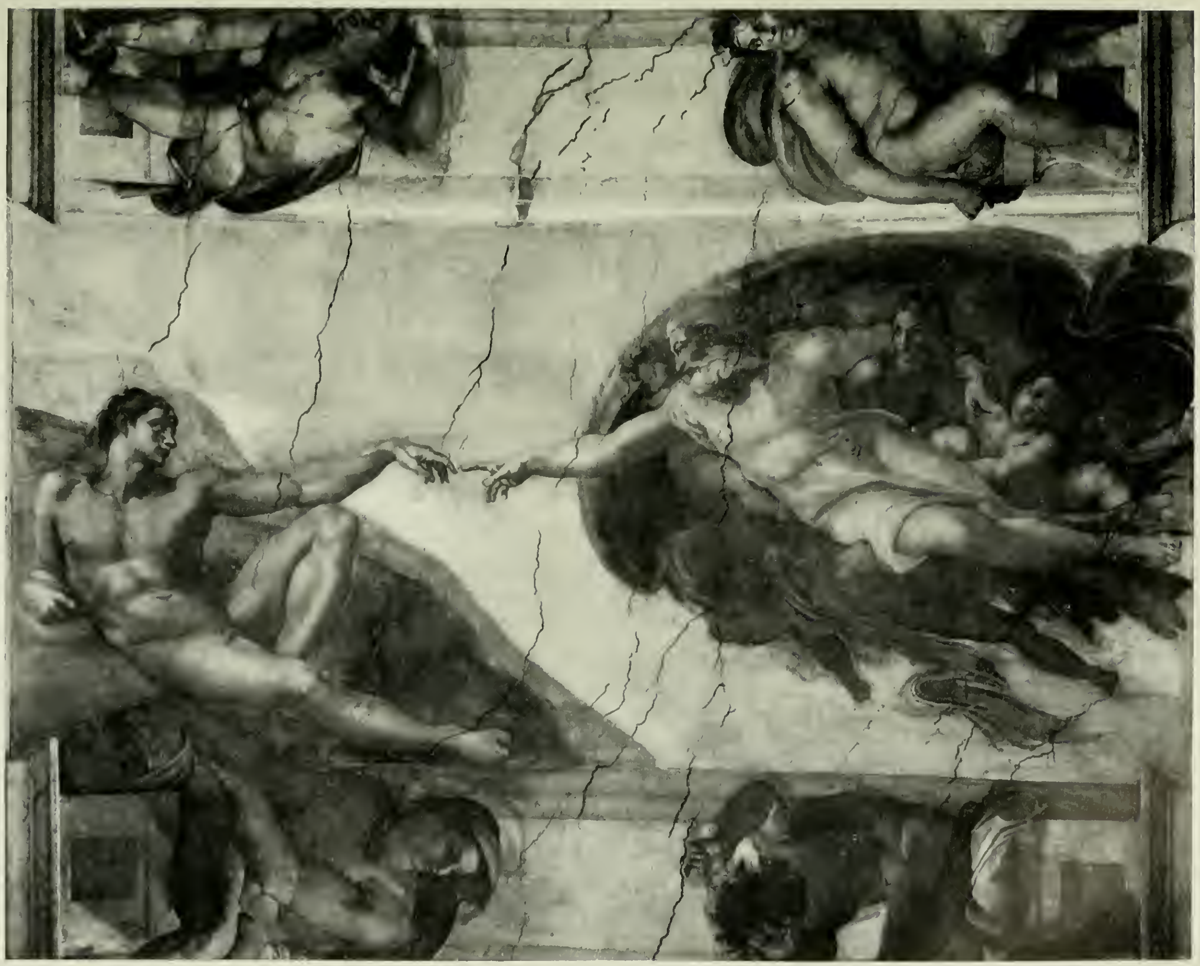
MICH'EL, Dan (i.e. *Dominus* or Master Michael) of Northgate (fl. 1340). An English translator. Nothing is known concerning his personal history except that he was a brother in the cloister of Saint Austin of Canterbury. In 1340 he completed his translation of *La somme des vices et des vertus*, a moral treatise, founded on *Le Miroir du Monde* (c. 1250), and written in 1279 by Frère Lorens, a Dominican monk, for the use of Philip the Second of France. The translation is entitled the *Ayenbite of Inwit* (the again-biting of the inner wit), or the *Remorse of Conscience.* The work gives a detailed exposition of the Ten Commandments, the twelve articles of faith, the seven petitions of the Lord's Prayer, the seven gifts of the Holy Spirit, and the seven heads and ten horns of the beast in the Apocalypse. Interesting in itself, it is of great linguistic value, as it is written in the dialect of Kent. Consult the edition by Morris, Early English Text Society (London, 1866).

MICHEL, mē̇'shĕl', Francisque Xavier 1809-87). A French historian and antiquary. He was born in Lyons, and educated there. He went to Paris, and in 1830 he was sent by Guizot to England to examine documents pertaining to the ancient history of France. In 1837 he was in Scotland on the same mission. He edited many monuments of old French literature, among them the *Chanson de Roland* and the *Roman de la Rose.* His historical works include *Histoire des races maudites de la France et de l'Espagne* (1847); *Les Ecossais en France et les Français en Ecosse* (1862); *Recherches sur le commerce pendant le moyen-âge* (1852-54); *Le pays basque* (1857).

MICHEL, François Emile (1828—). A French painter and writer on art, born in Metz. He was the pupil of Migette and Maréchal, the glass painter, and began to exhibit in 1853. His works include "Une gardeuse d'oies" (1853), in the Nantes Museum; "Nuit d'été (1872), in the Nancy Museum; and "Semailles d'automne" (1873) and "La dune près de Haarlem" (1885), both in the Luxembourg. He contributed articles on art to the *Gazette des Beaux-Arts* and other periodicals, and his separate publications include: *Le musée de Cologne* (1883); *Les musées d'Allemagne* (1885); *Rembrandt* (1886); *Hobbema et les paysagistes de son temps en Hollande* (1890); *Jacob van Ruysdael et les paysagistes de l'école de Haarlem* (1890). He was elected a member of the Institute in 1892.

MICHEL, Louise (1839—). An anarchist agitator, called the Red Virgin. She was the illegitimate daughter of the master of the Château of Vroncourt, in the Department of Marne, France; received a good education from her father and went to Paris, where she taught school till the rising of the Communists in 1871. She joined them, fought among the insurgents, and was taken prisoner by the Versailles troops. Tried by court-martial, she was condemned to death, but her sentence was commuted to transportation to New Caledonia. Freed in 1880, she devoted herself to agitation among the poor in Paris, and was sentenced in 1883 to six years' imprisonment. On her release in 1886 she went to London, whence she continued to carry on her propaganda. In 1895 she returned to Paris. She published two novels, two plays, and her *Mémoires* (1886).

MICHELANGELO BUONARROTI, mē̇'-kĕl-ăn'je-lō̇ bwō'nȧ-rō̇'tē̇ (Michael Angelo) (1475-1564). A Florentine sculptor, painter, architect, and poet, the most prominent artist of the High Renaissance, and the most influential figure in modern art. He was born at Caprese, March 6, 1475, the son of Lodovico Buonarroti. His family, the Buonarroti-Simoni, held small landed possessions, and had long been honorably



MICHELANGELO

"CREATION OF ADAM," FROM THE FRESCO IN THE SISTINE CHAPEL OF THE VATICAN

identified with public office in Florence. At the time of Michelangelo's birth his father was Podestà (governor) of Chiusi and Caprese, Tuscan mountain towns tributary to Florence. The infant was christened Michelagnuolo, and upon his father's return to Florence was put to nurse with the wife of a stonemason of Settignano, imbibing, as he himself said, the love of sculpture with his nurse's milk. Destined for a scholar, he was then placed in the school of Francesco d'Urbino at Florence. Instead of devoting himself to books, he spent his time drawing, and with painters' apprentices. By one of these, Francesco Granacci, with whom he had formed a friendship, he was introduced to the studio of the brothers Ghirlandajo, and after much opposition on the part of his family, he was, in 1488, apprenticed to these masters. He does not appear to have learned much from his master Domenico Ghirlandajo. His drawings while there excited admiration and surprise, as did also his first painting, a transcript on panel of Martin Schongauer's print, the "Temptation of Saint Anthony."

In company with Granacci, Michelangelo left Ghirlandajo's studio in 1489, to study sculpture in the garden of the Medici at San Marco. With the design of reviving sculpture, which had fallen behind painting at Florence, Lorenzo de' Medici had established an academy there, at the head of which he placed Bertoldo, a pupil of Donatello. A marble masque of a faun (Uffizi), which Michelangelo skillfully changed in accordance with the advice of Lorenzo, so pleased the latter that he invited him to live in his house, and procured his father a place in the Florentine customs. In the society of such men as Poliziano, the poet, Pico della Mirandola, Marsilio Ficino, the Platonist, and Lorenzo himself, he became familiar with Italian literature and humanist culture. He was also influenced by the great political and religious movements of the day. To the spell of Savonarola's eloquence may be attributed, at least in part, his intense love for Florentine liberty and his deep religious feeling. His artistic training was an admirable combination of Florentine realistic and classic influences. Through Bertoldo he became grounded in the works of Donatello; he studied the antique in the Medici collection, and sketched Masaccio's frescoes in the Brancacci Chapel. He was also, perhaps at this early period, and certainly later in his career, influenced by the painting of Luca Signorelli, of whose manner his own is a development in its most essential features. Of the two surviving works of his student days—both bas-reliefs now in the Casa Buonarroti, Florence—the seated "Madonna with the Infant Jesus" is in the maner of Donatello. The other, the so-called "Battle of the Centaurs," is in the over-rich style of late Roman reliefs, which were doubtless his models; but it shows the great, though still incipient, dramatic talent which marked his later works.

On the death of Lorenzo in 1492 Michelangelo returned to his father's house. Besides carving a statue of a Hercules, now lost, he devoted much time to the study of anatomy. In 1494 he returned to the palace of the Medici, but, frightened at a vision foretelling their destruction, in October of the same year he fled to Bologna, and thence to Venice. At Bologna he found employment for almost a year upon the shrine of San Domenico. He completed a statue of San Petronio by Nicola da Bari, and carved a kneeling angel of rare beauty, bearing a candelabrum, which, as Grimm has shown, was long confounded with another by Nicola Pisano in the same church. In 1495, after his return to Florence, he carved for Lorenzo de' Medici, of a younger branch of the family, a statue of the youthful Saint John, now in the Berlin Museum, realistic in style and much in the manner of Donatello. The sale of his next work, of which the original is lost, caused his first journey to Rome, and during his stay there, which lasted till the spring of 1501, he executed a number of important works. For Jacopo Gallo he carved the "Bacchus" in the Museo Nazionale, Florence, a statue realistic to the verge of ugliness, and lacking entirely the element of divinity. To the same period belongs the well-known statue in South Kensington Museum, which may be the "Cupid" that Condivi says he executed for Jacopo Galli, although Springer has shown that it is more probably an "Apollo." The subject represented is a beautiful youth kneeling in the act of discharging his bow. But the chief work of this early Roman period, which raised him to the rank of the greatest sculptor of the day, was the "Pietà" in Saint Peter's Church (1498-99), the first group, in the highest sense of the word, in modern sculpture. Seated at the foot of the Cross, the Virgin is represented with the dead Christ in her lap, gazing sadly at His wounded side and gently raising her hand. She is of youthful appearance, and of more heroic proportions than her son, whose dead body, the flesh of which is treated with marvelous delicacy, is reduced in size, to preserve the harmony of the group.

After his return to Florence in 1501 Michelangelo, on June 5, signed a contract for fifteen statues of saints for the Piccolomini Chapel in the Cathedral of Siena. The inferior quality of these works, as they now stand, is such that it is impossible to attribute them to him. In August of the same year he received from the city of Florence a commission for a statue of David, nine cubits in height, to be carved from a single block of marble. The statue was of national importance, intended to mark the deliverance of the city from the Medici and Cesare Borgia. On June 8, 1504, it was erected to the right of the entrance to the Palazzo Vecchio, where it remained as a sort of Palladium until, in 1873, it was removed to the Academy of Fine Arts for protection against the weather. The figure is frankly naturalistic, head and hands being unduly large, as in the case of the undeveloped youthful frame. The expression denotes expectation and confidence of victory; the action represented is at the moment at which the youth is about to unloose the string.

The "David" is the last work of Michelangelo's early or realistic period. A number of other works of the years 1521-24 cannot be exactly dated. While engaged on the "David" he completed, at the request of the Signory, another statue of the same subject in bronze, which was sent as a present to a high official of the French Court. Resembling the "Pietà," though probably somewhat earlier, is the life-size "Madonna of Bruges," purchased by the Mouscron family, and still in their chapel in the Cathedral of Bruges. He also carved two circular bas-reliefs of the Madonna, one in the Museo Nazionale, Florence, another in the Royal Academy, London. While executing the "David" he was also engaged in painting a "Madonna" for Angelo Doni (Uffizi). Though deficient in color, this picture is wonderful in drawing and in the sturdy realism of the figures, and is original in conception. Somewhat earlier than this is the unfinished Madonna in the National Gallery, London.

Michelangelo's second manner is characterized by an increasing departure from the realism of his early days and a reliance upon an unbridled imagination. His first work in which this new style prevails was his cartoon for the fresco of one of the long walls of the hall of the Great Council in the Palazzo Vecchio, executed in rivalry with Leonardo da Vinci (q.v.), to whom the other wall had been assigned. Begun in August, 1504, the cartoon was not completed till 1506, the fresco never having been carried out. The subject was the so-called "Battle of Pisa," an incident from the war between Florence and Pisa, in 1364, when four hundred Florentines were surprised by the enemy while bathing in the Arno at Anghiari. This was considered by contemporaries as his greatest painting, and practically revolutionized Florentine art. The cartoon was destroyed in 1516, and only survives in drawings at Holkham and Vienna (Albertina), and in the well-known line engraving of a single group by Marcantonio, entitled "Les Grimpeurs."

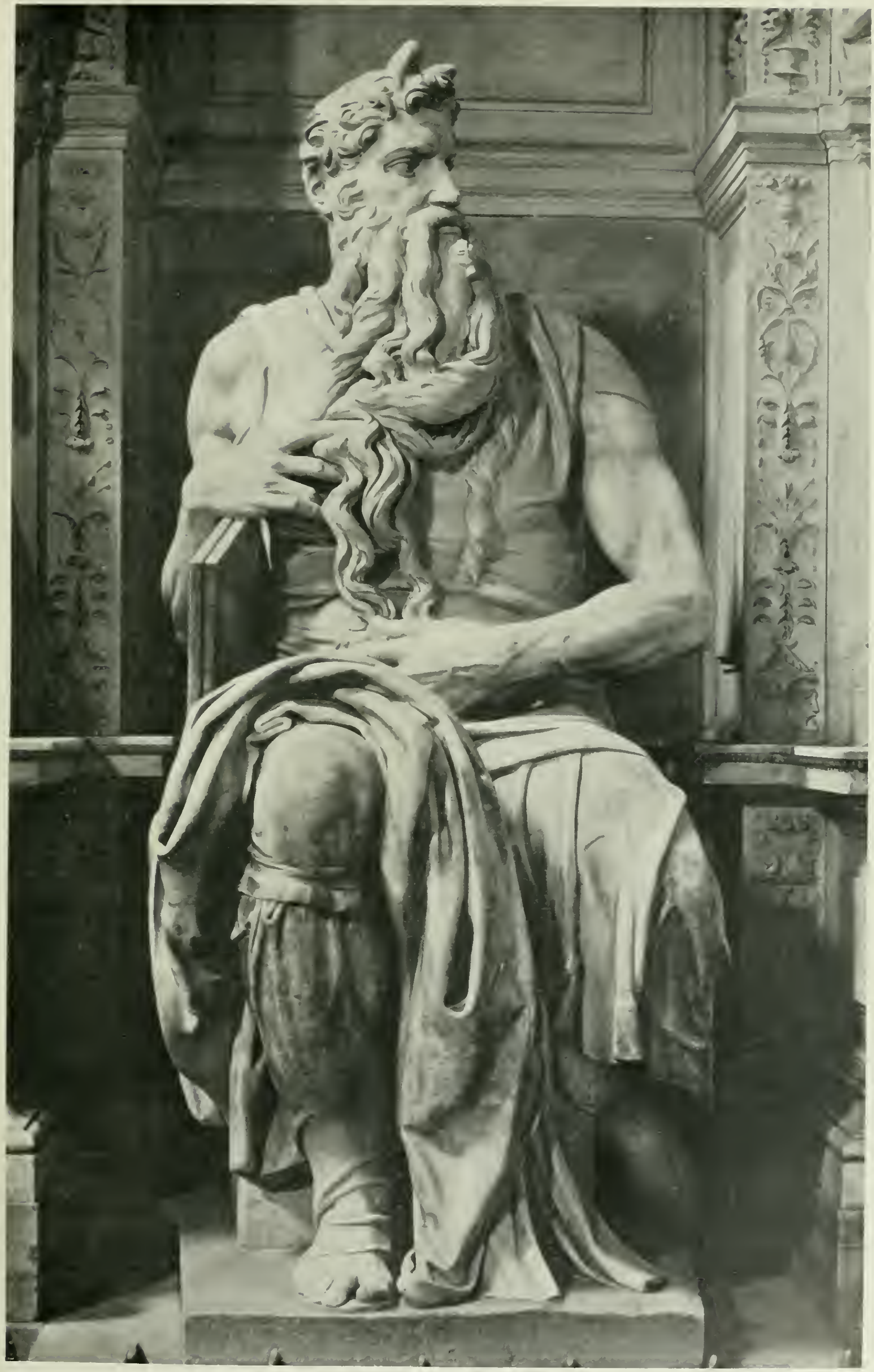
Its execution was interrupted early in 1505 by a summons to the artist from Rome by Pope Julius II., who of all Michelangelo's patrons best understood the man and his art. His first commission was for his own sepulchral monument, to be placed in the tribune of the new Church of Saint Peter's, and to contain forty colossal statues, besides bronze reliefs and other decorations. Michelangelo spent over eight months in Carrara procuring the marble for this, the darling scheme of his life. But when, after his return to Rome, the Pope, moved by the intrigues of Bramante, wished to defer the execution of the monument, and the artist was slightingly treated, he left Rome in a rage, sending the Pope word to seek him elsewhere. Notwithstanding the latter's efforts and the mediation of the Florentine government, a reconciliation was not effected till the end of 1506, at Bologna, which the Pope had just added to the Papal domains. Until February 21, 1508, the artist was occupied with the bronze statue of Julius II., three times life size, which was destroyed when the Bentivogli recovered the city three years later. Upon rejoining the Pope at Rome, he was induced, much against his will, to undertake the decoration of the vault of the Sistine Chapel.

It was a task of colossal proportions (the ceiling alone measuring 132 feet by 44 feet), and he did it practically alone. In October, 1521, the scaffolding was removed. Immediately upon its completion it was hailed as the greatest piece of work ever done by painter's hand. Even Raphael's style was transformed after he had seen it. Michelangelo arranged the vast space as though it had been roofless, framing it with architecture in perspective delusion, and filling the open spaces with paintings. Just above the windows are the figures of the ancestry of Christ in attitudes of eager waiting; above them, twelve gigantic figures of the Prophets and Sibyls; in the corners, four representations from the history of Israel; while in the centre of the vault the stories of the "Creation of the World," the "Fall of Man," and of the "Deluge," are told in nine pictures. The spaces of the architecture are filled with figures of nude boys and genii in various attitudes. Among the central pictures the "Creation of Adam" is preëminent. Adam is depicted just on the point of rising, just as God's touch sends the first thrill of life through his veins. His body is the perfection of anatomical form and action, and the representation of the Almighty as the incarnation of omnipotence and mild compassion has never been equaled. The "Delphic Sibyl" is young and beautiful, with an upturned look of rapture, the "Cumæan" is old and withered, the wisdom of the ages in her countenance. Of the prophets, Jeremiah is the image of deep thought and Zacharias a type of mental absorption; Jonah, the type of restored life, is a nude figure of remarkable foreshortening.

On the death of Julius II. in 1513, Michelangelo resumed work on his mausoleum, in accordance with a second plan on a slightly reduced scale, a pen-and ink drawing of which is in the Uffizi. He was thus occupied till 1516; during this time he executed, at least in part, the most important of the statues intended for it. Foremost of these is the "Moses"—certainly the greatest colossal statue in modern art. Moses is portrayed at the moment when, enraged at the idolatry of the Israelites, he starts, with threatening brow, to quell and crush them. The technical execution is perfect, even to such details as the mighty beard, which his hand grasps convulsively, the muscular forearm, and the wonderful fold of drapery upon his knee. The two "Captive Youths" in the Louvre, also termed "Prisoners" and "Slaves," are ideal representations of the arts, dying and captive because of the death of their great patron.

In December, 1516, Michelangelo was compelled by the wishes of Pope Leo X., a Medici, to remove to Florence and busy himself with a façade for San Lorenzo, the family church of the Medici. He wasted three years of his life in the quarries of Carrara and Pietra Santa procuring the marble for this colossal design, when in 1520 the Pope gave up the plan. Then Cardinal Giulio de' Medici commanded his services for the Medicæan Chapel in the same church, upon which work was begun in 1521. During this period he found time for the "Christ Risen," now in the Church of the Minerva, Rome, upon which the finishing touches were put by the sculptor Frizzi—a figure which may justly be termed mannered, since it is rather an athlete than a Christ. Upon Cardinal Medici's elevation to the Papacy as Clement VII. in 1523, the artist's entire time was taken up by the designs and statues for the Medicæan Chapel and plans for the Laurentian Library. This work, however, was interrupted by the last great struggle of Florence for liberty.

Upon the sack of Rome by the army of Charles V., in 1527, the citizens arose and drove the Medici from Florence. Though he had never taken active part in public life, Michelangelo was an ardent patriot, willing to serve his country. On January 25, 1529, he was chosen one of the nine citizens in charge of the defense of the city, and on April 9th he became governor of the fortifications. His work took him to Pisa and Livorno, and he visited the Duke of Ferrara, the greatest Italian authority on fortifications.



MICHELANGELO

"MOSES," FROM THE STATUE IN THE CHURCH OF SAN PIETRO IN VINCOLI, ROME

Of Michelangelo's "Leda and the Swan," a tempera painting executed some time later for the Duke, there is a copy at Dresden. But convinced that Malatesta Baglioni, the general of the mercenaries, meant to betray Florence—as was actually the case—in September, 1529, he fled to Venice. He was received with great honor by the Doge and nobility, but, declining their hospitality and the flattering invitation of the King of France to enter his service, he returned to Florence and resumed his duties on the fortifications. After the capitulation of the city, August 12, 1530, he remained for some time in hiding, but on the Pope's invitation and pardon, he resumed work on the statues for the Medicæan Chapel.

The Chapel of the Medici—the new sacristy of San Lorenzo—is the most important work of its kind in modern art. In sculpture it marks the culmination of Michelangelo's style. The architectural problem was not constructive, but decorative; and conceived as a framing for the sculptures, the architecture is above criticism. The sculptures were only in part executed. On the entrance wall is an incomplete statue of the Madonna (1522) by Michelangelo, flanked by the patron saints of the Medici, Cosmas by Montosorli, and Damian by Montelupo. Far more important are the tombs of the two Medicæan dukes, on opposite sides of the chapel. The dukes are represented over life size, seated above their sarcophagi, and are rather allegorical than portrait statues—the representatives of contemplative and active life. Lorenzo's head rests heavily on his wrist, and the beaver of his helmet is drawn over his eyes, which gaze on vacancy. Giuliano is represented as the victorious general looking down upon the battle-field. Nothing could exceed the technical perfection of his Roman cuirass, and of his hands resting upon the general's staff. At Lorenzo's feet, reclining upon the sarcophagus, are the figures of "Dawn" and "Twilight;" at Giuliano's "Day" and "Night." "Dawn" is the most finished and beautiful of the statues; she starts as if from a dream, her face full of despondency. In "Night," a sleeping woman of magnificent physique, the sculptor has solved the difficult problem of a reclining figure in profile. "Twilight" and "Day" are male figures of Herculean proportions, the heads of which are unfinished. "Day," the grander of the two, is represented as gazing over his shoulder, showing treatment of the muscles of the back in this difficult position. In reality, these allegories, intended for quite another purpose, were used by the artist to express his sorrow for the loss of Florentine liberty.

Though chiefly engaged upon the Medicæan statues, Michelangelo had also worked at Rome upon the tomb of Julius II. Luckily he was there when Clement VII. died in 1534. As Duke Alessandro of Florence was bitterly hostile to him, he remained at Rome, residing there until his death. At last he hoped to complete the Mausoleum, which had been the darling scheme, as well as the bane, of his life. By threats and lawsuits the heirs of Julius II. had imbittered his existence during the reigns of Leo and Clement, but the popes used their power in his behalf, forcing the heirs to repeated changes of contract, each of which reduced the scale of the monument. Paul III. was as unwilling as his predecessors to forego the glory of being served by Michelangelo. He annulled the contract with the Duke of Urbino, Julius's heir, compelling the latter to make a new one in 1542, according to which the tomb was finally erected before 1550. As it now stands in the Church of San Pietro in Vincoli, the monument is but a shadow of the artist's great design. The statues adorning the lower part are by Michelangelo himself: the colossal "Moses," and on either side "Active Life" ("Leah") and "Contemplative Life" ("Rachel"). In their present position, which was not the one originally intended, the two female statues are dwarfed by the architectural surroundings. The statues of the upper story were imperfectly executed, after Michelangelo's designs, by Montorsoli (q.v.); the best of them being a Madonna, begun by the designer himself. Four rough hewn figures in the Boboli Gardens (Florence), and an incomplete group of "Victory" in the Museo Nazionale, are supposed to have been parts of the original design of the monument.

Having thus freed the sculptor from all cares regarding the monument, Paul III. required his services for the completing of the decoration of the Sistine Chapel. The entire altar wall (18 meters by 16) was to be covered by a painting of the "Last Judgment," the cartoon for which had been executed under Clement VII.; it was carried out in 1534-41. It is the largest fresco in the world, containing above a hundred figures, over life size. The centre of the composition is Christ, a beardless figure of Herculean proportion, in the act of condemnation, and the Virgin sits shrinking beside Him. From all sides the terrified masses stream to the judgment seat. Below the graves are opening and the dead become flesh. The colors have suffered much from dust and candle smoke, and the grand figures are much defaced. Their nudity having aroused adverse criticism, Paul IV., a religious zealot, employed Daniele da Volterra, a pupil of Michelangelo, to clothe the most conspicuous examples—a task for which he received the name of 'Il Braccetone'—the breeches-maker. Michelangelo's last paintings (finished in 1550) were for the same patron—two large frescoes in the Pauline Chapel: the "Conversion of Saint Paul" and the "Crucifixion of Peter," both of which were spoiled by restoration.

The last years of the artist's life were devoted chiefly to architecture. In 1546 he designed the beautiful cornice of the Farnese Palace, and in 1547 he was appointed chief architect of Saint Peter's. He accepted the post as a religious duty, refusing all pay, and until his death, through the reigns of five popes, he filled with credit this responsible position. Only the cupola of the present edifice, for which he left a model, was carried out, at least in part, according to his plans. Unfortunately he left no model for the whole church. We know, however, that he returned to Bramante's plan of a Greek cross, and that his design was much superior to the present building. (See SAINT PETER'S CHURCH.) His architectural works included plans for the Porta Pia, and the transformation of the Baths of Diocletian into Santa Maria degli Angeli, which was unfortunately rebuilt during the eighteenth century, although his court of a hundred columns survives. The general plan of the Capitoline Hill is due to him, the grand staircase and the Palace of the Senators being after his designs. He made a number of grand designs for the Church of the Florentines at Rome, and one for the well-known staircase of the Laurentian Library, Florence, which was carried out by Vasari. Finally, his plans were followed in the new fortifications of Rome.

The latter part of Michelangelo's life was dominated by deep religious feeling, which found expression in his drawings and poetry, besides the grand religious paintings and works of architecture upon which he was engaged. Of wonderful pathos and deep religious feeling is the unfinished sculptured group, the "Deposition from the Cross," which now stands behind the high altar in the Cathedral of Florence. But the Florentine patriot was revealed in his bust of Brutus (Museo Nazionale), carved when Duke Alessandro was assassinated by Lorenzino in 1539. Though living almost like a hermit, Michelangelo received every honor that could come to an artist. Under successive popes he was chief architect, painter, and sculptor of the Vatican; he was made head of the new Academy of Florence. Popes, kings, and princes sought the honor of a work by his hand. He died February 18, 1564. His body was conveyed secretly from Rome and buried at Santa Croce, the Pantheon of Florence. His house in Florence was left by the last surviving member of the family to the city, and is now used as a museum of his works, containing the family archives.

In appearance he was of medium height and broad-shouldered; he had a large head, with broad forehead and protruding temples, small eyes, and a nose disfigured by a fist blow of Torrigiano, a fellow pupil in the Medici Gardens. He was of a noble and generous character. If lovingly treated, any favors could be obtained from him: but if treated otherwise, not even the popes could influence him. Some of his most charming traits were his devotion to his family; his obedience and humility toward his father, a querulous and whimsical man; and his kindness to his greedy brothers. He was kind and gentle to his dependents, and fair in his judgment of other artists; but if he thought himself ridiculed his tongue could be sharp enough. The sad experiences of a highly sensitive nature tended to make him increasingly suspicious and irritable. Nevertheless, he remained charitable and generous, and he was scrupulously honest at a time when this was a virtue exceedingly rare.

No biography of Michelangelo could omit mention of the beautiful friendships which formed the chief joy of his declining years. Chief among these was his friendship for Vittoria Colonna. The popular idea, which sees in this noble old lady the artist's Juliet, is quite erroneous, for their relation was based on a common love of literature and art and common religious views. In Cavalieri, a handsome and accomplished young Roman nobleman, as in other young friends, he saw an idealization of youthful beauty.

Michelangelo has been admirably characterized by Burkhardt as the 'Man of Destiny' in the arts. Never in history were they so dominated by a single personality. For centuries the forms which he originated dominated architecture and sculpture, as the Baroque style, and, to a large extent, painting as well. That which most impressed them and his contemporaries was the quality which the Italians call *terribilità*—his stormy energy of conception, and intense dramatic, even violent action. With him this was natural, the result of his own stormy emotions; with his imitators it was mannerism. His art is sublime rather than beautiful; its chief attribute is power. It does not condescend to win, but overwhelms by intellectual grandeur of conception and technical perfection of execution. It is absolutely original and unique. Evident in his earliest works, this quality predominates increasingly in his art, becoming arbitrary in later life. He is a destroyer of traditions, a creator of new types. Such an artist cannot be said to belong to any school; he stands apart in a class for himself.

He had, perhaps, the most perfect command of line of any artist of whom we know. For his own works, as well as independent of them, he drew great numbers of designs, sometimes as many as a dozen heads to evolve an ideal type. Nearly all the chief galleries of Europe possess specimens of these drawings. In early life the pen was his favorite instrument; but later, when he relied more upon memory, he preferred chalk as a softer medium. To this last period belong the most celebrated examples, like the "Phaeton," "Tithyus," and "Ganymede," drawn for Tommaso Cavalieri, the series of designs for Christ's "Crucifixion" and "Deposition," meditative and deeply religious in mood; and the "Arcieri" ("Archers," Windsor Collection), nude figures of wonderful beauty and grace.

His knowledge of anatomy is probably more nearly perfect than that of any artist since the Greeks. He acquired it in long years of diligent study, not only of the nude model and of classic sculpture, but through use of the dissecting knife in a laboratory furnished by his enlightened friend, the Prior of Santo Spirito, in Florence. He preferred to represent the human body as highly developed, and he inclined to the male type. His women, likewise of high development, are mostly types of middle life, although he created a few youthful examples of rare beauty, like the "Delphic Sibyl" and the "Madonna of Bruges." Like the Greeks, he used the human figure as expressive of emotion, only that with him the emotion is particular instead of general. Unlike other Italians, he generalizes the faces, refusing all portraiture.

Michelangelo was essentially a sculptor, and only painted under protest. In every block of marble he saw an imprisoned idea awaiting the sculptor's art to be freed. He probably made previous sketches, and in his early period used the human model, but his usual method was to use only a small wax model. Unlike present-day sculptors, he did all the work, even the rough-hewing, himself. He finished the bodies first, reserving the heads for the last. In his paintings the essentially pictorial qualities of perspective, atmosphere, and light are absent; nor was he a colorist in the Venetian sense. His color scheme was broadly massive and subdued, being subordinated to the human figures in his pictures. His paintings are decorative in the highest sense, and in his artistic development they are of especial importance, because he found a more facile medium in painting than in sculpture for the expression of his titanic thoughts. His architecture was decorative rather than constructive. He regarded only the general effect, which he obtained by heavy masses of light and shade, requiring of detail only a sharp and effective formation. In the cupola of Saint Peter's, however, he created a complete constructive masterpiece, as perfect as any of the early Renaissance.

Michelangelo's poetry was valued as highly by his contemporaries as were his other artistic activities. They admired especially its deep philosophic thought, in which respect he indeed stands above the other poets of his day. Indeed, the value of his poetry is rather psychological than literary; it is often obscure and labored in expression. But when his nature was stirred by powerful emotions, it found expression in some of the most beautiful sonnets and madrigals in the Italian or any other language. Some of the very finest are dedicated to Vittoria Colonna and Tommaso Cavalieri; these are mostly love poems. Others, like madrigals on the loss of Florentine liberty, are patriotic in character and many are deeply religious, expressing the dignified attitude of a great soul, calmly awaiting the end.

Bibliography. The most important sources for the life of Michelangelo are the documents preserved in the Casa Buonarroti, Florence, consisting mainly of letters to and from the artist, his poems, memoranda, contracts, and like material, and a large collection of his letters purchased by the British Museum in 1859 from one of the Buonarroti family. The latter were first made known to the public by Hermann Grimm in his *Leben Michelangelos;* a selection of the former was indifferently edited by Milanesi, *Le lettere di Michelangelo* (Florence, 1875), and *Les correspondants de Michel Ange,* tome i. (Sebastiano del Piombo, Paris, 1891). By far the best edition of the letters, comprising all of historical importance, many for the first time published, is that of Carl Frey (Berlin, 1899). Of high importance are the contemporary biographies of Michelangelo. The earliest of these appeared in the first edition of Vasari's *Lives* (Florence, 1550). The inaccuracies of this account impelled Ascanio Condivi, then an inmate of Michelangelo's household, to write his brief biography (Rome, 1553; later edition, Pisa, 1823). Based on the recollection of the great artist himself, this is the most important and reliable source, after his correspondence. It was pirated without acknowledgment by Vasari in his second edition of the *Lives* (1568; edited by Milanesi, Florence, 1878), who supplied valuable additional information on Michelangelo's later years. Both of these biographies, together with other contemporary biographical materials, are best edited by Frey, *Sammlung ausgewählter Biographien Vasaris* (Berlin, 1887).

The most important modern biographies of Michelangelo are those of Duppa (London, 1806); Quatremère de Quincy (Paris, 1835); Harford (London, 1857); Grimm (Hanover, 1860); Clement (Paris, 1860; translated in "Great Artist Series"); Gotti (Florence, 1875); Black (London, 1875); Heath Wilson (London, 1876); Perkins (Boston, 1878); Springer (Leipzig, 1892); Scheffler (Altenburg, 1892); Symonds (London and New York, 1892); Knackfuss (Bielefeld, 1895); Justi (Leipzig, 1900); Ricci (Florence, 1901); Thode (Berlin, 1902). The first critical work, in the modern sense, was that of Grimm (10th ed. Berlin, 1901; English translation, New York, 1896), in which the artist is sympathetically treated, and with high literary skill. Although as much space is devoted to his time and environment as to the artist himself, it remains the best work for the general reader. Wilson's work is valuable from a technical standpoint, as is also the admirable volume of the *Gazette des Beaux-Arts,* entitled *L'œuvre et la vie de Michel Ange,* written by seven French artists. Of value for the artist's youthful period is Wölflin, *Die Jugendwerke Michelangelos* (Berlin, 1887). Springer's *Raffael und Michelangelo* (Leipzig, 1892) is a work of sound learning and criticism. The most complete English life, of high literary and historical value, is that of Symonds. Thode's *Michelangelo und das Ende der Renaissance* (Berlin, 1902, of which the first of three volumes has appeared) gives an exhaustive treatment from the psychological standpoint.

Michelangelo's poems suffered much by being known through the garbled and mutilated edition of his grandson, Michelangelo the younger. A more complete edition was that of Guasti (Florence, 1863); but the best is by Frey (Berlin, 1897). Symonds has made an excellent English translation of selected examples of the sonnets. Consult, also, Lang, *Michelangelo als Dichter* (Stuttgart, 1861); Thomas, *Michel Ange, poète* (Paris, 1891); and the admirable essay of Walter Pater, in his *Studies in the History of the Renaissance* (London, 1873).

MICHELET, mē̇'shlȧ', Jules (1798-1874). The greatest French historian of the Romantic School, born in Paris, August 21, 1798, the son of a printer. He studied literature under Villemain (q.v.), and at twenty-three became professor of history in the Collège Rollin. He delivered lectures at the ancient Collège Sainte-Barbe and the Ecole Normale, and, after the Liberal triumph in 1830, received an appointment at the Record Office, was made assistant of Guizot at the Sorbonne, and tutor of the Princess Clémentine. In 1838 he was made Academician and professor in the Collège de France, where he presently became involved in a bitter controversy with the Jesuits, the popular echoes of which may be felt in Sue's (q.v.) famous novel *Le juif errant*. In 1851 he refused the oath of allegiance to Napoleon, lost his offices, and lived mainly in Brittany and on the Riviera, giving himself wholly to literature, chiefly poetically romantic impressions of nature: *L'oiseau* (1856); *L'insecte* (1857); *La mer* (1861); *La montagne* (1868); of society, *L'amour* (1858); *La femme* (1860); *La sorcière* (1862); *La bible de l'humanité* (1864); and *Nos fils* (1869). From this imaginative and sociologic work he returned in his last years to history, adding three volumes (1872-75) to the eighteen (1833-67) of his *Histoire de France,* and bringing the narrative to Waterloo. Besides this monumental work, he had contributed to history a *Précis d'histoire moderne* (1828); *Introduction à l'histoire universelle* (1831); *Origines du droit français* (1837); *Le procès des templiers* (1841-51); *Mémoires de Luther* (1845); and to religious and political controversy, *Les Jésuites* (in collaboration with Edgar Quinet, 1843); *Du prêtre et de la famille* (1845); *Du peuple* (1846). Characteristics of all Michelet's work are democratic enthusiasm, hatred of priests, sympathy for the oppressed, and a picturesque imagination that transformed vast learning into poetry and history into intuition. He is seldom an objective observer and rarely a dispassionate judge. Michelet's style, like his history, lacks continuity, it is striking rather than flowing, proceeds by leaps and bounds, appeals by rhythm as well as thought to emotion rather than reason. Michelet died at Hyères, February 5, 1874. An edition of Michelet's *Works* in 40 volumes (1895 et seq.) is nearly completed. Besides the autobiographical *Ma jeunesse* (Paris, 1884) and *Mon journal* (ib., 1888), consult for his life: Simon (ib., 1886), Corréard (ib., 1886), Monod (ib., 1897), Brunhes (ib., 1898), and Madame Quinet (*Cinquante ans d'amitie*, ib., 1900); for criticism, Faguet, *XIXe siècle* (ib., 1891); Taine, *Essais* (ib., 1855-56); and *Quarterly Review* (London, 1901).

MICHELET, mĭsh'lȧ', Karl Ludwig (1801-93). A German philosopher. He was born at Berlin and graduated at the University of Berlin. In 1829 he was appointed professor of philosophy at the university. He published a large number of works on metaphysical subjects, including *Die Ethik des Aristoteles* (1827); *Das System der philosophischen Moral* (1828); *Geschichte der letzten Systeme der Philosophie in Deutschland von Kant bis Hegel* (1837-38); and *Anthropologie und Psychologie* (1840). From 1860 to 1875 he edited *Der Gedanke* (Berlin, 1860 et seq.), representing the Philosophical Society of that city.

MICH'ELIN'IA. A fossil coral allied to Favosites, found in the Devonian and Carboniferous rocks, and commonly known as 'petrified honeycomb.' See Favosites.

MICHELL, mĭch'el, John (1724-93). An English physicist and astronomer. He graduated at Queen's College, Cambridge, in 1748, became a fellow there the next year, and in 1762 was appointed professor of geology. He made several important discoveries in physical science; invented the torsion balance, with the aid of which Cavendish later determined the mean density of the earth; and devised an 'easy and expeditious method' of making magnets, described in a *Treatise of Artificial Magnets* (1750). He advanced an ingenious theory concerning the ultimate constitution of matter, and rendered important services to astronomy through numerous original contributions, including his *Enquiry into the Probable Parallax and Magnitude of the Fixed Stars from the Quantity of Light Which They Afford Us* (1767).

MICHELOZZI, mė'kĕ-lŏt'sė, Michelozzo (1391-1472). A Florentine architect and sculptor. Information about Michelozzi is meagre, but is sufficient to indicate that he was one of the principal figures of the formative period of the Italian Renaissance. He was the preferred artistic adviser of Cosmo de' Medici. Michelozzi was born at Florence, the son of Bartolomeo, a Burgundian tailor, who was made a citizen of Florence in 1376. His name is a variation of Michele. He was brought up as a die-cutter and goldsmith, and assisted Ghilberti on the doors of the Baptistery. At an early period he appears to have come under the influence of Brunelleschi, and in 1492 he entered into an association with Donatello which lasted until about 1435. (For their joint work, see Donatello.) As he worked in association with the principal Florentine sculptors of his time, it is rarely possible to separate his productions from theirs.

The little independent sculpture which can be definitely ascribed to Michelozzi is inferior, and is a resultant of the influences of Donatello and Luca della Robbia. The bas-reliefs of the Aragazzi Monument, in the Cathedral of Montepulciano, are the best of this work; another well-known example is the silver figure of John the Baptist in the Opera del Duomo, Florence.

After 1435 his work became increasingly architectural. In 1446 he succeeded Brunelleschi as architect of the Florentine Cathedral, but appears to have done very little on that building. He built or rebuilt the churches of Mugello, of the Frati Zoccolanti near Caffagiuolo, of San Girolamo near Volterra, of San Girolamo near Fiesole, and the Chapel of the Medici in Santa Croce, Florence. Between 1437 and 1452 Michelozzi superintended the construction of the Monastery of San Marco in Florence. The library and the two courts, where the Ionic order appears for the first time in the Renaissance, are especially interesting. From 1444 to 1455 he was chief architect of the Monastery of the Annunziata in Florence. In 1457 he went to Milan to rebuild the fine palace presented by Francesco Sforza to Cosmo de' Medici. Of his work in this city only the chapel of the Portinari, on the exterior of San Eustorgio, survives. He was associated with Luca della Robbia in the construction of the Capella del Crocifisso in San Miniato, Florence.

His most famous work, however, is the Riccardi Palace in Florence, built for the Medici, and begun about 1440. Models were made by both Michelozzi and Brunelleschi, the former receiving the preference on account of its simplicity. The Riccardi Palace, which is perhaps the finest city house in existence, is really only a development of the typical Florentine palace of the Middle Ages under the refining influence of classical ideals. The last of Michelozzi's larger undertakings, his work upon the Palazzo Vecchio in Florence, was begun in 1454. The charming forecourt is after his designs, except the defacing stucco ornament. His last recorded work is the Palazzo Rettorale at Ragusa in Dalmatia (1464). Consult: Schmarsow, in *Archivio storico dell' arte*, vol. vi.; Geymüller, *Jahrbuch der königlich preussischen Sammlungen*, vol. xv.

MICHELSON, mī'kel-son, Albert Abraham (1852—). An American physicist, born in Strelno, Germany, and brought up in San Francisco. He graduated from the Naval Academy in 1873, and after several years' service in the navy went abroad and studied at Berlin, Heidelberg, and Paris (1880-82). On his return to America, Michelson became professor of physics at the Case School of Applied Science, Cleveland, Ohio; then held a like chair in Clark University (1889-92); and in 1892 became head of the department of physics in the University of Chicago. Professor Michelson's achievements in optics secured for him an international reputation. His determinations of the velocity of light are of the greatest importance, and his results are marked by a high degree of accuracy. These experiments were begun in 1878, when Professor Michelson was at the Naval Academy, and were concluded in 1882. His invention, in 1887, of an interferential refractometer enabled him to determine linear distances in terms of the wave length of light, and he was invited by the International Bureau of Weights and Measures at Paris to ascertain the length of the standard meter in terms of the wave length of cadmium light. This investigation was of great importance in that it enables the Meter of the Archives to be reproduced at any time by reference to certain known quantities which are not only constant, but also are readily reproducible. In connection with Professor Morley, Professor Michelson carried on a series of elaborate experiments designed to show the relative motion of matter and ether. He also devised the echelon spectroscope, by which he was able to secure greater dispersion than with a prism, and thus was able to study the Zeeman effects and other phenomena. He was elected a member of the National Academy of Sciences and of the International Committee on Weights and Measures, a fellow of the Royal Astronomical Society, and of other learned bodies.

MICHETTI, mê-kĕt'tê, FRANCESCO PAOLO (1851—). An Italian painter, born at Tocco da Casauria. He was a pupil of Morelli at the Naples Academy, and belongs to the new school of Italian painters. His works are genre subjects of peasant life in Southern Italy, painted with a rich color and much dramatic insight. His "Corpus Domini" (1877), "Domenica delle Palme" (1879), "Ottava," "I Morticelli," and, above all, "Il Voto" (1884), at the Capitoline Museum, Rome, are good examples of this school of Italian art.

MICHIE, mĭk'ĭ, PETER SMITH (1839-1901). An American educator and soldier. He was born in Brechin, Scotland, came to the United States in 1843, and was brought up in Cincinnati. He graduated second in the class of 1863 at West Point and entered the engineer corps; served in the campaign of 1864 against Richmond; was chief engineer of the Army of the James (1865); and was at the head of all engineering operations of the left column at Hatcher's Run and in the pursuit of Lee's army. After the war, having attained brevet rank of brigadier in 1865, he was for a year engaged in the Government survey of the theatre of the war; from 1867 to 1869 he taught various branches at West Point; was member of a coastal fortification commission which visited Europe in 1870; and for the last thirty years of his life was professor of natural and experimental philosophy at West Point. He wrote: *Elements of Wave Motion Relating to Sound and Light* (1882); *Life of General Upton* (1885); *The Personnel of the Seacoast Defense* (1887); *Analytical Mechanics* (1887); *Hydrodynamics* (1888); and *General McClellan* (New York, 1901), in the "Great Commanders" series.

MICHIELS, mê'shê'ĕl', ALFRED (1813-92). A French historian and writer on art and literature, born in Rome of Dutch-Burgundian parents. He began his law studies at Strassburg (1834), but made his home in Paris. His publications include: *Etudes sur l'Allemagne* (1830); *Histoire des idées littéraires en France au XIXe siècle et de leur origines dans les siècles antérieurs* (1842); *Angleterre* (1844), of which a fourth edition (1872) was called *Voyage d'un amateur; Histoire de la peinture flamande et hollandaise* (1845, new ed., enl., 1865-76), and its sequel, *L'art flamand dans l'est et le midi de la France* (1877); *L'architecture et la peinture en Europe depuis le IVe au XVIe siècle* (3d ed. 1873); *Rubens et l'école d'Anvers* (4th ed. 1877); *Histoire secrète du gouvernement autrichien* (4th ed. 1879); *Le comte de Bismarck* (1871); *Histoire de la guerre franco-prussienne* 1872); *Van Dyck et ses éleves* (1880; *Le monde du comique et du rire* (1887).

MICHIGAN, mĭsh'ĭ-gan (Algonquin *michi*, great + *guma*, water). One of the States of the American Union, situated in the region of the Great Lakes. It lies between 41° 42′ and 47° 32′ north latitude and 82° 24′ and 90° 31′ west longitude, and consists of two natural divisions, the Upper Peninsula and the Lower Peninsula. The Upper Peninsula, with an extreme length of 318 miles, and an extreme width at Keweenaw Point of 164 miles, is bounded on the north by Lake Superior and on the south by Wisconsin and Lakes Michigan and Huron. On the east the Saint Mary's River separates it from the Province of Ontario, Canada, and the Menominee River forms about one-half of its Wisconsin boundary. The Lower Peninsula is in the form of a mitten, the thumb being separated from the hand by Saginaw Bay, the whole division being surrounded, except in the south, by Lakes Michigan and Huron, the Saint Clair River, Lake Saint Clair, the Detroit River, and Lake Erie, and bounded on the south by the States of Indiana and Ohio. It has a length of 300 miles from north to south, and an average width of 200 miles. The State has an area of 58,915 square miles, including 1485 square miles of water, ranking eighteenth in size among the States of the Union.

TOPOGRAPHY. Michigan occupies an exceptional position. Lying within the embrace of the three largest of the Great Lakes, it possesses a coast line longer in proportion to its area than any other State in the Union. Further, the coast waters possess many good harbors and are navigable for large craft. Ships of 2000 tons can sail within sight of land all round the State. The surface of the State is in general level and monotonous, the northern peninsula being somewhat rugged and rocky. The highest elevation is in the west end of the northern peninsula in the Porcupine Mountains, a gentle ridge running northeast and southwest into Wisconsin. It includes the famous Copper Range. The highest point in the State is about 1800 feet above the sea, or about 1200 above lake level; in the southern peninsula the elevation nowhere exceeds 600 feet above the lakes. The mean elevation of the State is less than 200 feet above lake level. There are two high areas to the southeast and northwest of Saginaw Bay, respectively. The glacial sheet descending from the northeast encountered this resisting wall and split, turning in the direction of the softer rocks on each side into the Huron-Erie and the Lake Michigan regions, and cutting out basins for the present lakes. Southern Michigan is marked by two parallel ridges or topographic axes running northeast and southwest. The southern axis runs along a line roughly from Ann Arbor to Pontiac; the northern axis runs from the region north of Saginaw Bay southwest toward the Muskegon River.

The rivers of Michigan follow the morainal valleys around in a circular course—usually southward. The largest streams in the Upper Peninsula are the Taquamenon and Ontonagon, draining into Lake Superior, and the Ford, Escanaba, and Manistique, draining into Lake Michigan. The Lower Peninsula is watered by the Ministee, Muskegon, Grand, Kalamazoo, and Saint Joseph, which flow into Lake Michigan; by the Cheboygan, Thunder Bay, Au Sable, and Saginaw, flowing into Lake Huron; and by the Huron and Raisin, flowing into Lake Erie. Most of the rivers are small, and the largest are navigable by river boats only for short distances. The morainal districts are also crowded with lakes and ponds, some tributary to the rivers, draining the valleys, others deep tarns caught between the moraines and possessing no outlet. These lakes and ponds of Michigan are estimated at from 5000 to 15,000 in number. The Kalamazoo River alone has within its basin 175 tributary and 150 non-tributary lakes, and other rivers are similarly supplied. They are valuable sources of water supply, and when they disappear their beds furnish a black muck soil with a shell marl subsoil which is excellent for garden culture. Other lakes owe their origin to the erosion of limestone forming caves and sink holes, or to the sand bars built across the mouths of bays or rivers by the Great Lakes at the present or at a higher stage of elevation. Still another source of these numerous lakes is the tilting of the earth's crust which flooded old river valleys and landlocked the waters within. If Professor Gilbert's theory is true, this process is even now going on. If the land is rising five inches a century per hundred miles along an axis through Niagara Falls and northeastern Michigan, it is easy to see that Saginaw Bay will soon be a lake. In fact, even now it is practically stagnant.

Upward of 200 islands belong to Michigan. The largest are Isle Royale and Grande Isle in Lake Superior; Sugar Island, Encampment Island, Drummond Island, Bois Blanc, Mackinac, and Marquette at the head of Lake Huron; and the Beaver, Fox, and Manitou groups at the head of Lake Michigan. The chief indentations of the coast of the Lower Peninsula are Grand and Little Traverse bays on the northwest, and Thunder and Saginaw bays on the east side. In the northern peninsula are Keweenaw Bay east of Keweenaw Peninsula, and White Fish Bay on the northern shore at the west end of Saint Mary's River. On the south are the Big Bay and the Little Bay of Noquet at the head of Green Bay. One of the interesting features of the Michigan coast is the 'Pictured Rocks' on the northern coast of the northern peninsula, where the Cambrian sandstones are carved by the action of the water into fantastic shapes—arches, towers, castles, etc. In some places steamers can pass directly under the rocks and behind falling cascades.

CLIMATE. Though Michigan lies in the heart of the north temperate zone, the northern peninsula has a rigorous climate. Only in the southern tier of counties are the plant and animal species wholly austral. The average track of the extra-tropical cyclonic storms for all the continent crosses the State. Over 450 such disturbances passed that way in ten years. The average temperatures for July are 65° F. for Bessemer and Mackinac, and 70° F. for Detroit. The southwestern side of the Upper Peninsula and the southeastern corner of the Lower Peninsula have a maximum temperature of 100°. The winter minimum is 20° below zero for Detroit, and 30° below at Keweenaw Point. This gives a range of 130° for the Upper Peninsula and of 120° for the Lower. Sault Sainte Marie holds the United States record for the frequency of cold waves, with a fall of 20° F. or over in twenty-four hours. The average rainfall for the State is 30 inches. The northern peninsula from Keweenaw Point to Sault Sainte Marie holds the record in the United States for the heaviest annual snowfall, 130 inches. This is reduced to only 40 inches at Ann Arbor. Presque Isle County has precipitation, on the average, 170 days in the year, sharing with Buffalo the highest record in the United States east of Cape Flattery. The prevailing winds for January and July alike are southwest for the Lower Peninsula and northwest for the Upper. There are on the average twenty thunderstorms per year, with a maximum frequency in July.

For FLORA and FAUNA, see these sections under UNITED STATES.

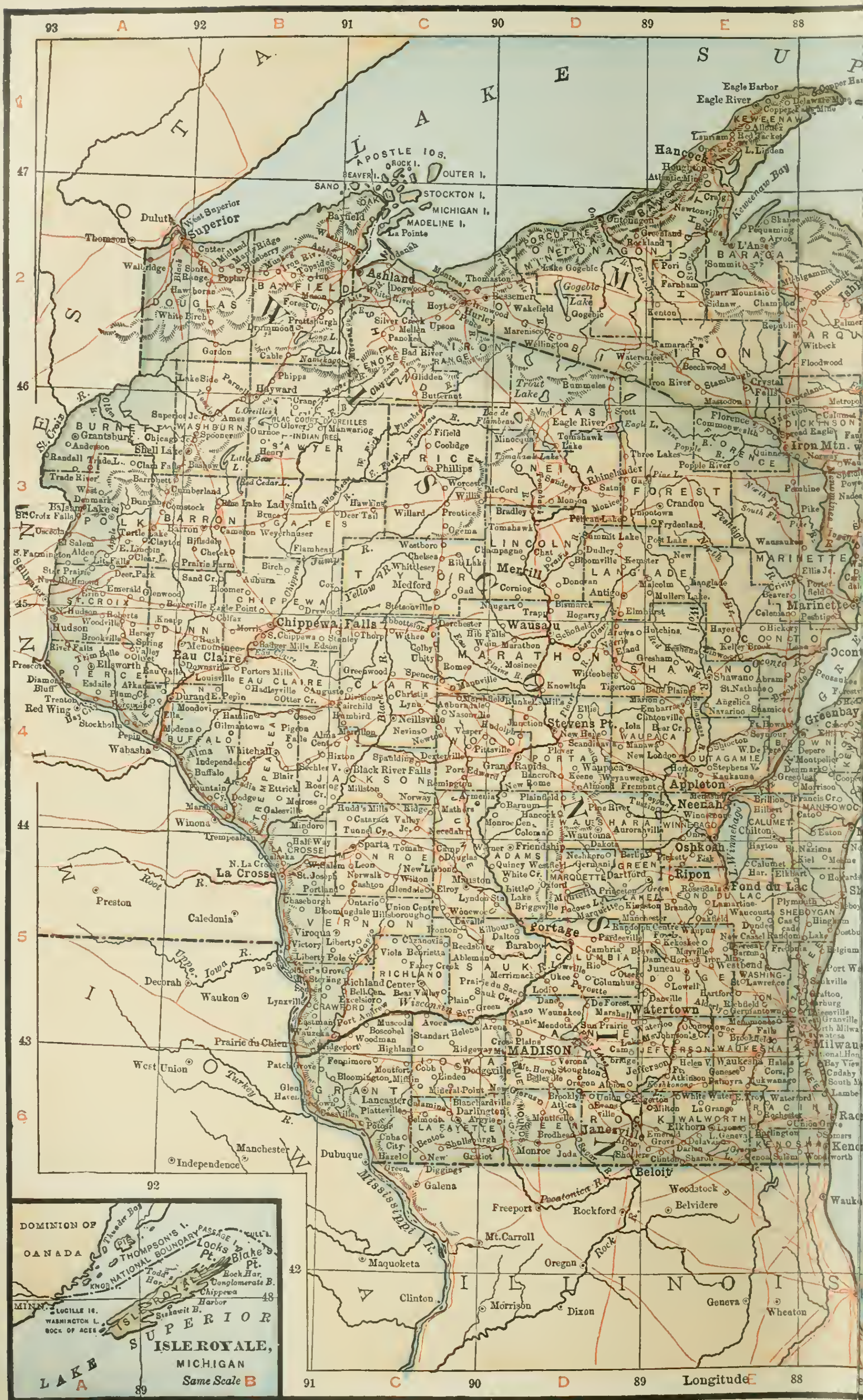
GEOLOGY. The State of Michigan in its Upper and Lower peninsulas has all the recognized series of rocks from Archæan to Carboniferous inclusive. The earlier part of this record is represented in great detail in the rocks of the northern peninsula. In fact, the region around Lake Superior, including northern portions of Minnesota, Wisconsin, and Michigan, has had an extremely involved geological history, the careful and detailed study of which, by a host of geologists, has added more largely to our knowledge of pre-Cambrian geology than any equivalent area in the world. This study has disclosed a whole system (Algonkian) of rocks below the Paleozoic, representing perhaps a longer lapse of ages than all the time since the beginning of the Cambrian. The earliest beds of the Algonkian are much metamorphosed and cut in every direction by dikes and sills of igneous intrusives and extrusives. The Penokee-Gogebic and the Marquette-Menominee members of this system are the great iron-bearing beds of the northern peninsula. They dip down under the bed of Lake Superior and outcrop again in the Vermilion and Mesabi ranges in Minnesota. At the top of the Algonkian are the copper-bearing beds. The copper is found usually in clastic beds, largely in conglomerates, though sometimes in sandstone and adjacent lava sheets.

The Lower Peninsula of Michigan is essentially a bowl-shaped depression in the pre-Cambrian crust, between the old Archæan island of North Wisconsin and the similar island of the Adirondacks. This grand synclinal trough was being filled with sediments through Cambrian, Ordovician, Silurian, Devonian, and Carboniferous ages, the successive deposits lying like a pile of saucers, with outcropping edges all dipping toward the centre. In Sub-Carboniferous time the basin was a narrow-mouthed bay, acting as a saltpan, concentrating sea-water and depositing beds of rock salt. In upper Carboniferous some beds of coal were laid down. The State has evidently been continuously above the sea since Carboniferous time. The present surface of the State is largely determined by glacial action, being very much smoothed over, and covered with a sheet of till, in some places some hundreds of feet in thickness. The present rivers are consequent upon the drift surface, and many smaller lakes have a glacial origin.

The soil on the whole is extremely fertile, being made up of the glacial detritus of lime-

AREA AND POPULATION OF MICHIGAN BY COUNTIES.

County.	Map Index.	County Seat.	Area in square miles.	Population.	
				1890.	1900.
Alcona	K 4	Harrisville	690	5,409	5,691
Alger	G 2	Autrain	924	1,238	5,868
Allegan	K 4	Allegan	839	38,961	38,812
Alpena	K 4	Alpena	584	15,581	18,254
Antrim	H 4	Bellaire	491	10,413	16.568
Arenac	J 4	Standish	365	5,683	9,821
Baraga	E 2	L'Anse	890	3,036	4,320
Barry	H 6	Hastings	572	23,783	22,514
Bay	J 5	Bay City	437	56,412	62,378
Benzie	G 4	Frankfort	309	5,237	9,685
Berrien	G 7	Saint Joseph	566	41.285	49,165
Branch	H 7	Coldwater	504	26,791	27,811
Calhoun	H 6	Marshall	697	43,501	49.315
Cass	G 7	Cassopolis	500	20,953	20,876
Charlevoix	H 3	Charlevoix	423	9,686	13,956
Cheboygan	J 3	Cheboygan	785	11,986	15,516
Chippewa	J 2	Sault Sainte Marie	1,580	12,019	21,338
Clare	J 5	Harrison	575	7,558	8 360
Clinton	J 6	Saint Johns	570	26.509	25.136
Crawford	J 4	Grayling	575	2,962	2.943
Delta	F 3	Escanaba	1,127	15,330	23,881
Dickinson	F 3	Iron Mountain	756	......	17,890
Eaton	J 6	Charlotte	566	32,094	31,668
Emmet	J 3	Harbor Springs	462	8,756	15,931
Genesee	K 5	Flint	648	39,430	41,804
Gladwin	J 5	Gladwin	510	4,208	6,564
Gogebic	C 2	Bessemer	1,152	13,166	16,738
Grand Traverse	H 4	Summit City	496	13,355	20,479
Gratiot	J 5	Ithaca	572	28,668	29,889
Hillsdale	J 7	Hillsdale	605	30,660	29,865
Houghton	E 2	Houghton	1.077	35,389	66,063
Huron	K 5	Badaxe	841	28,545	34,162
Ingham	J 6	Mason	547	37,666	39,818
Ionia	H 5	Ionia	575	32,801	34,329
Iosco	K 4	Tawas City	560	15,224	10,246
Iron	E 2	Crystal Falls	1,143	4,432	8 990
Isabella	J 5	Mount Pleasant	568	18,784	22,784
Jackson	J 6	Jackson	695	45.031	48,222
Kalamazoo	H 6	Kalamazoo	575	39,273	44,310
Kalkaska	H 4	Kalkaska	570	5,160	7,133
Kent	H 5	Grand Rapids	862	109,922	129,714
Keweenaw	E 1	Eagle River	570	2,894	3.217
Lake	H 5	Baldwin	575	6,505	4,957
Lapeer	K 5	Lapeer	667	29,213	27,641
Leelanaw	H 4	Leland	355	7,944	10.556
Lenawee	J 7	Adrian	742	48,448	48,406
Livingston	J 6	Howell	575	20,858	19.664
Luce	H 2	Newberry	915	2,455	2,983
Mackinac	H 2	Saint Ignace	1,146	7,830	7,703
Macomb	L 6	Mount Clemens	460	31,813	33,244
Manistee	G 4	Manistee	547	24 230	27.856
Marquette	F 2	Marquette	1,839	39,521	41.239
Mason	G 4	Ludington	501	16,385	18,885
Mecosta	H 5	Big Rapids	567	19,697	20,693
Menominee	F 3	Menominee	1,044	33,639	27,046
Midland	J 5	Midland	518	10,657	14,439
Missaukee	H 4	Lake City	566	5,048	9,308
Monroe	K 7	Monroe	572	32,337	32,754
Montcalm	H 5	Stanton	720	32,637	32,754
Montmorency	J 4	Atlanta	561	1,487	3,224
Muskegon	G 5	Muskegon	522	40,013	37.036
Newaygo	H 5	Newaygo	851	20,476	17.673
Oakland	K 6	Pontiac	897	41,245	44.792
Oceana	G 5	Hart	565	15.698	16,644
Ogemaw	J 4	Westbranch	568	5.583	7.765
Ontonagon	D 2	Ontonagon	1,355	3,756	6.197
Osceola	H 5	Hersey	575	14,630	17,859
Oscoda	J 4	Mio	572	1,904	1,468
Otsego	J 4	Gaylord	529	4,272	6,175
Ottawa	G 6	Grand Haven	561	35,358	39,667
Presque Isle	J 3	Rogers	660	4,687	8,821
Roscommon	J 4	Roscommon	535	2,033	1,787
Saginaw	J 5	Saginaw West Side	832	82,273	81,222
St. Clair	L 6	Port Huron	690	52,105	55.228
St. Joseph	H 7	Centerville	506	25,356	23.889
Sanilac	L 5	Sanilac Center	966	32,589	35 055
Schoolcraft	G 2	Manistique	1,151	5.818	7,889
Shiawassee	J 6	Corunna	542	30,952	33,866
Tuscola	K 5	Caro	814	32,508	35,890
Van Buren	G 6	Paw Paw	625	30.541	33,274
Washtenaw	K 6	Ann Arbor	690	42,210	47,761
Wayne	K 6	Detroit	626	257,114	348,793
Wexford	H 4	Cadillac	575	11,278	16.845


93
A
92
B
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C
90
D
89
E
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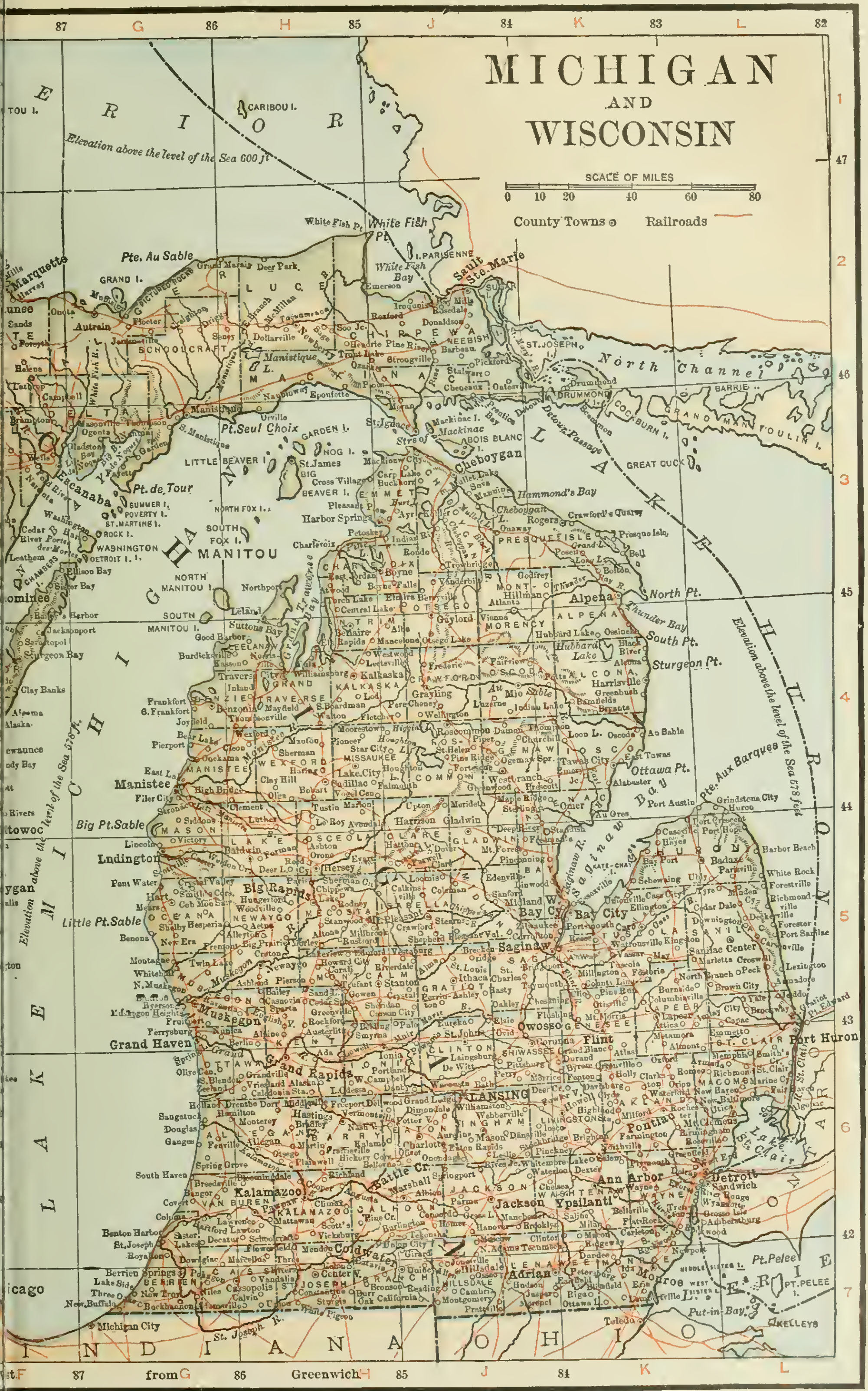
LAKE SUPERIOR
APOSTLE IDS.
OUTER I.
STOCKTON I.
MICHIGAN I.
MADELINE I.
Duluth
Superior
Ashland
Bayfield
BAYFIELD
DOUGLAS
WASHBURN
SAWYER
BURNETT
POLK
BARRON
PRICE
ONEIDA
FOREST
FLORENCE
MARINETTE
LINCOLN
LANGLADE
TAYLOR
CHIPPEWA
ST. CROIX
DUNN
PIERCE
EAU CLAIRE
CLARK
MARATHON
SHAWANO
OCONTO
BUFFALO
TREMPEALEAU
JACKSON
WOOD
PORTAGE
WAUPACA
OUTAGAMIE
BROWN
LA CROSSE
MONROE
ADAMS
WAUSHARA
WINNEBAGO
CALUMET
MANITOWOC
VERNON
JUNEAU
MARQUETTE
GREEN LAKE
FOND DU LAC
SHEBOYGAN
RICHLAND
SAUK
COLUMBIA
DODGE
WASHINGTON
CRAWFORD
GRANT
IOWA
DANE
JEFFERSON
WAUKESHA
LA FAYETTE
GREEN
ROCK
WALWORTH
RACINE
KENOSHA
GOGEBIC
ONTONAGON
HOUGHTON
KEWEENAW
BARAGA
IRON
DICKINSON
Hancock
Houghton
Iron Mtn.
Chippewa Falls
Eau Claire
Wausau
Merrill
Stevens Pt.
Grand Rapids
Appleton
Neenah
Oshkosh
Ripon
Fond du Lac
Green Bay
Marinette
La Crosse
Winona
Portage
Watertown
MADISON
Janesville
Beloit
Milwaukee
Dubuque
Galena
Freeport
Rockford
Prairie du Chien
Mississippi R.
Wisconsin R.
ILLINOIS
IOWA
MINNESOTA
WISCONSIN
MICHIGAN
GREEN BAY
47
46
45
44
43
42
2
3
4
5
6
DOMINION OF CANADA
MINN.
THOMPSON'S I.
NATIONAL BOUNDARY
ISLE ROYALE
LAKE SUPERIOR
ISLE ROYALE, MICHIGAN
Same Scale
48
89
Longitude



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AREA AND POPULATION OF WISCONSIN BY COUNTIES.

County.	Map Index.	County Seat.	Area in square miles.	Population.	
				1890.	1900.
Adams	D 5	Friendship	682	6.889	9.141
Ashland	C 2	Ashland	930	20,063	20.176
Barron	A 3	Barron	878	15.416	23.677
Bayfield	B 2	Washburn	1.497	7.390	14.392
Brown	E 4	Greenbay	518	39,164	46,359
Buffalo	B 4	Alma	662	15,997	16.765
Burnett	A 3	Grantsburg	881	4.393	7,478
Calumet	F 4	Chilton	317	16,639	17,078
Chippewa	B 3	Chippewa Falls	1,938	25,143	33,037
Clark	C 4	Neillsville	1,200	17,708	25,848
Columbia	D 5	Portage	776	28,350	31,121
Crawford	B 5	Prairie du Chien	557	15,987	17,286
Dane	D 5	Madison	1,188	59.578	69.435
Dodge	E 5	Juneau	884	44,984	46.631
Door	F 4	Sturgeon Bay	454	15.682	17,583
Douglas	A 2	Superior	1.319	13,468	26.335
Dunn	A 4	Menomonie	844	22,664	25.043
Eau Claire	B 4	Eau Claire	620	30,673	31,692
Florence	E 3	Florence	498	2.604	3,197
Fond du Lac	E 5	Fond du Lac	720	44,088	47,589
Forest	E 3	Crandon	1,421	1,012	1,396
Gates	B 3	....	..	......	......
Grant	C 6	Lancaster	1,157	36.651	38,881
Green	D 6	Monroe	576	22.732	22.719
Green Lake	D 5	Dartford	364	15,163	15,797
Iowa	C 6	Dodgeville	763	22.117	23.114
Iron	C 2	Hurley	786	......	6.616
Jackson	C 4	Black River Falls	978	15.797	17.466
Jefferson	E 5	Jefferson	548	33.530	34,789
Juneau	C 4	Mauston	790	17.121	20.629
Kenosha	E 6	Kenosha	274	15,581	21,707
Kewaunee	F 4	Kewaunee	327	16.153	17,212
La Crosse	B 5	La Crosse	475	38,801	42,997
Lafayette	C 6	Darlington	634	20.265	20.959
Langlade	D 3	Antigo	855	9.465	12,553
Lincoln	D 3	Merrill	885	12,008	16.269
Manitowoc	F 4	Manitowoc	590	37.831	42,261
Marathon	D 4	Wausau	1.532	30,369	43.256
Marinette	E 3	Marinette	1.396	20,304	30.822
Marquette	D 5	Montello	451	9.676	10.509
Milwaukee	F 5	Milwaukee	228	236.101	330.017
Monroe	C 5	Sparta	915	23.211	28.103
Oconto	E 4	Oconto	1.0 0	15.009	20.874
Oneida	D 3	Rhinelander	900	5.010	8,875
Outagamie	E 4	Appleton	634	38,690	46,247
Ozaukee	F 5	Port Washington	226	14.943	16,363
Pepin	A 4	Durand	238	6.932	7,905
Pierce	A 4	Ellsworth	543	20.385	23,943
Polk	A 3	Balsam Lake	933	12,968	17,801
Portage	D 4	Stevens Point	800	24.798	29.483
Price	C 3	Phillips	1.241	5.258	9.106
Racine	E 6	Racine	323	36,268	45.644
Richland	C 5	Richland Center	576	19.121	19.483
Rock	D 6	Janesville	706	43.220	51,203
St. Croix	A 3	Hudson	711	23.139	26,830
Sauk	E 5	Barabos	820	30,575	33.006
Sawyer	B 3	Hayward	1,342	1.977	3,593
Shawano	D 4	Shawano	1.135	19.236	27.475
Sheboygan	E 5	Sheboygan	510	42,489	50.345
Taylor	C 3	Medford	965	6,731	11,262
Trempealeau	B 4	Whitehall	934	18,920	23,114
Vernon	B 5	Viroqua	792	25.111	28,351
Vilas	D 3	Eagle River	907	......	4.929
Walworth	E 6	Elkhorn	562	27,860	29.259
Washburn	B 3	Shell Lake	831	2,926	5,521
Washington	B 5	Westbend	423	22,751	23.589
Waukesha	E 5	Waukeska	562	33.270	35.229
Waupaca	D 4	Waupaca	749	26.794	31,615
Waushara	D 4	Wautoma	639	13.507	15,972
Winnebago	E 4	Oshkosh	472	50.097	58.225
Wood	C 4	Grand Rapids	785	18,127	25,865

stones, with large contributions from the older rocks of Canada. In the northern portions, where the outcropping rock was a Paleozoic sandstone, the soil is light and worthless and fit only for pine and other trees.

Mineral Resources. The minerals for which Michigan is best known are copper and iron. Copper mining in the State dates from 1845. The output developed at a much faster rate than that of the whole country, so that in 1870 Michigan produced about 11,000 tons out of a total of 12,000 tons. By the time Montana and Arizona began to produce copper, the output of Michigan had doubled, amounting to over 22,000 tons in 1880. With the rapid development of the Montana deposits Michigan fell to the second place (1887) as a copper producer, and, although its output has been steadily growing, its contribution to the total copper output of the country has relatively decreased. The copper deposits of Michigan are confined to the peninsula protruding into Lake Superior, and the best-known mines are the Calumet and Hecla. They yield over one-half of the output of the State. In 1901 Michigan produced 69.772 long tons of fine copper, or 25.9 per cent. of the total for the United States, as compared with 38.2 per cent. produced by Montana and 21.7 by Arizona.

Next to copper the chief mineral of Michigan is iron, in regard to which the State occupies the foremost position in the country, although its output in 1901 was exceeded in quantity by that of Minnesota. The iron deposits are found chiefly in the Marquette, Menominee, and Gogebic ranges, and consist almost entirely of red hematite. Iron was first discovered in the State near Marquette in 1844, and mining operations were begun in 1846. The development of the industry was greatly retarded by the lack of transportation facilities, so that in 1872 the output of iron from the Marquette range amounted only to 948,553 tons of ore. In 1885 the Marquette, Menominee, and Gogebic ranges yielded 2,240,887 tons. The improvement of the facilities for the transportation of the ore and the extension in the use of iron and steel gave a new impulse to iron mining and brought Michigan to the position of the foremost iron-producing State of the Union. In 1901 the total yield of its iron ore amounted to 9,654,067 long tons, valued at the mines at $21,735,592. Only a small part of the iron output is smelted in the State, most of the ore being transported by way of the lakes to the Lake Erie ports. The chief shipping ports are Escanaba on Lake Michigan and Marquette on Lake Superior.

Previous to 1893 Michigan was the leading salt-producing State. In that year it was displaced by New York, which held the first rank until 1901, when Michigan again became first. The total production of salt in Michigan in 1901 was 7,729,641 barrels, or 37.6 per cent. of the output of the United States. The value of the salt output of Michigan for the same year was $2,437,677. The chief salt mines are around Saginaw Bay. Michigan is also the leading gypsum-producing State, the output amounting in 1901 to $267,243, or over 17 per cent. of the total for the country. Most of the gypsum is found in Kent County. Among the other minerals may be mentioned Portland cement, which was produced to the value of $1,128,290; coal, $1,753,064; gold, 81,000 oz.; mineral waters (in which Michigan leads all other States), $1,195,614; and various clays (furnishing material for the manufacture of bricks, tiles, and pottery), $1,542,034. These figures were for 1901.

For Fisheries, see that section under the United States.

Agriculture. The southern half of the Lower Peninsula of Michigan has been generally cleared of its forests, and being of great fertility, is one of the most productive agricultural regions in the Union. Originally a large part of it was considered irreclaimable because of its extensive swamp areas, but these have been very greatly reduced by drainage. The northern part of the Lower Peninsula, and the Upper Peninsula, are more extensively wooded, and a considerable portion of the latter is too rugged to be adaptable for agriculture. The farming area is continually spreading to the northward, and every decade has witnessed large additions to the farm acreage. In 1900, 17,561,698 acres, or 47.8 per cent. of the total area, was included in farms, of which 67.2 per cent. were improved. In Michigan the average size of farms is smaller than in other North Central States, the average in Michigan in 1900 being 86.4 acres. In the northern peninsula the farms are generally larger than in the southern. In 1900, 32.4 per cent. of the farm area of the State was included in farms, which ranged in size from 100 to 174 acres; and 30.2 per cent. of the farm area was included in farms of from 50 to 99 acres. The percentage of rented farms is not large, 4.8 per cent. being rented for cash rent and 11.1 per cent. on shares. The agricultural products are not characterized by the predominance of any one crop. The northern location of Michigan adapts it as a whole to the production of wheat, oats, and the hardier cereals rather than corn, yet corn is largely raised south of the 43d parallel. In the table appended the acreage shown for corn, oats, and barley in the last census year is scarcely normal, since a late spring had reduced the acreage of the two last, resulting in turn in an increase in the acreage of the former. Wheat in the decade 1890-1900 more than regained the amount lost in the preceding decade. Michigan ranks third in the production of buckwheat, and is also one of the leading States in the production of rye. Hay and forage are extensively raised, the total acreage devoted to them being greater than that of any other crop.

The State has become noteworthy for vegetables and fruits. The great fertility of the soil, the influence of the lakes in moderating the climate, and the easy access to large markets—particularly Chicago—have favored this branch of agriculture. New York alone exceeds Michigan in the area devoted to potatoes. In 1900 this acreage was 57.2 per cent. greater than in 1890, the absolute gain being greater than that made by any other State. The State is far in the lead of all others in the production of beans, peas, and celery, and produces the bulk of the peppermint and chicory of the country. The number of fruit trees about doubled in the decade 1890-1900. More than half of the gain was in the number of peach trees, of which there were 8,104,415 in 1900. The number of plum trees in that year was more than eight times the number reported for 1890; and other varieties of trees also increased remarkably. The number of apple trees is still in excess of any other variety, there being, in 1900, 10,927,899. The most marked recent gains have been in the counties bordering on Lake Michigan. The soil is well adapted to beet culture. Michigan surpasses every other State in the acreage of sugar beets. While the industry began as early as 1880, its chief development has been since 1890. Large additions have been made to the beet-growing area since the census year shown in the table.

The following figures show the acreage of the leading crops for the census years indicated:

CROPS	1900	1890
Wheat	1,925,769	1,501,225
Corn	1,501,189	994,597
Oats	1,019,438	1,085,759
Rye	174,096	140,754
Buckwheat	55,669	70,046
Barley	44,965	99,305
Hay and forage	2,328,498	2,024,736
Potatoes	311,963	198,476
Sugar beets	40,247	
Dry beans	167,025	
Dry peas	71,376	

Stock-Raising. The increased interest in mining and fruit and vegetable raising has tended to lessen the attention paid to stock-raising. There were, however, noteworthy increases in the number of dairy cows and other neat cattle from 1890 to 1900. The number of horses and of swine has increased every decade since 1850. The number of sheep reached a maximum in 1890, the following decade showing a decrease of 32.3 per cent., but the number in 1900 was exceeded in only one State east of the Mississippi River—Ohio. The following table gives the number of domestic animals on farms in 1890-1900:

DOMESTIC ANIMALS	1900	1890
Dairy cows	563,905	497,611
Other neat cattle	812,503	549,160
Horses	586,559	516,117
Mules and asses	3,011	3,822
Sheep	1,625,930	2,400,318
Swine	1,165,200	1,126,141

Manufactures. Michigan's prominence as a manufacturing State is largely due to its enormous timber resources, a description of which with their products will be found below. The percentage of the population engaged in the manufacturing industry was 2.3 in 1850, and 7.1 in 1890, but declined to 6.7 per cent. in 1900. The number engaged increased 91.6 per cent. between 1880 and 1890, but only 9.2 per cent. in the following decade, the actual number of persons employed in 1900 being 162,300. The smaller growth of the latter decade is due to the diminishing forest resources. The employment figures are noteworthy because of the small number of children included, the result of the State law which forbids children from working in any establishment. After the timber products the most important are those which depend on the agricultural resources of the State. The flouring and grist-mill industry is quite extensive. In recent years it has shown a tendency to centralize at points convenient to water-power or superior shipping facilities. Other industries which belong to this group are slaughtering and meat-packing, the manufacture of malt liquors, beet sugar, and the tanning, currying, and finishing of leather, all of which are in a flourishing condition. The State facilities for the leather industry are full of promise, inasmuch as it is found more economical to transport the hides to the tanning-bark region in Michigan than to transport the bark to outside centres. The State ranks second in the production of beet sugar, the industry having developed wholly from 1890 to 1900.

The abundant high-grade iron ores obtained in the northern peninsula are within easy reach of the manufacturing centres in the south, but the inferiority of the State's coal resources greatly hinders the development of those industries which the local wealth of iron ore would otherwise guarantee. The iron and steel industry gained very little from 1890 to 1900, but the products of the foundry and machine shop increased 54.3 per cent. during that period. The industry is well distributed throughout the State, and is the third largest of the State's manufactures. The manufacture of cars is another of the State's leading industries, and a thriving chemical manufacturing business is located in Detroit. The advantages of Detroit for transportation, being located conveniently for lake navigation, and at the point of union between the railroad systems of Canada and the States, make that city the largest manufacturing centre in the State. The other manufacturing points are also in the older developed southern portion of the State, where the access to the country's markets is easiest. A decided tendency toward centralization is evident in a number of industries.

The table following shows the relative importance of the leading industries for the years indicated.

Forests and Forest Products. From the table below it will be seen that the lumber industry and those which use its products constitute together by far the most important group of manufactures in the State. The greater portion of the forests were formerly conifers, though hard woods were intermingled with these in the south. The white pine was originally the most usual variety, but has been so extensively drawn upon that the estimated stand of timber in 1896—6,000,000,000 feet—was less than one-sixth the amount of the estimate in 1880. Hemlock is the most important of the other conifers. Maple, elm, basswood, ash, and white oak are the most important hard woods. The lumber and timber product had not acquired large proportions until about 1870, but from that date until 1890 the State ranked first in the value of its product. It suffered a heavy decline in the following years, and was exceeded in 1900 by Wisconsin. The total forest area, including stump land, was estimated in 1900 at 38,000 square miles. The method of exploiting the forests has been extremely wasteful, but a sentiment has developed in the State in favor of the application of approved methods of forestry, and a commission has been created to secure better protection for the forests.

In the earlier lumbering period the logs were usually floated to the mills located on the rivers and lakes. With the extension of railroads into the lumbering region the mills were established closer to the supply of timber. It will be seen from the following table that, although the value of lumber and timber products decreased from 1890 to 1900, all the industries using these products made noteworthy gains, particularly the manufacture of carriages and wagons and furni-

INDUSTRIES	Year	Number of establishments	Average number wage-earners	Value of products, including custom work and repairing
Total for selected industries for State	1900	3,818	81,980	$189,517,713
	1890	3,950	93,141	184,268,704
Increase, 1890 to 1900	......	*132	*11,161	$5,249,009
Per cent. of increase	......	*3.3	*12.0	2.8
Per cent. of total of all industries in State	1900	22.7	50.5	53.1
	1890	32.6	62.6	66.3
Flouring and grist mill products	1890	765	1,423	$23,593,991
	1900	544	1,852	22,778,829
Slaughtering	1890	29	456	5,337,417
	1900	30	329	3,998,978
Liquors, malt	1890	77	980	5,296,825
	1900	78	687	2,979,258
Leather, tanned, curried and finished	1890	27	1,427	6,015,590
	1900	20	337	1,743,760
Iron and steel	1890	10	1,972	5,902,058
	1900	19	1,427	5,829,843
Foundry and machine shop products	1890	364	13,502	20,615,864
	1900	260	7,892	13,363,030
Cars and general shop construction and repairs by steam railroad companies	1890	42	3,938	4,332,927
	1900	17	2,098	2,645,314
Cars, steam railroad, not including operations of railroad companies	1890	4	3,187	9,920,780
	1900	5	3,723	11,078,281
Chemicals	1890	51	2,897	5,364,724
	1900	4	1,315	3,380,388
Lumber and timber products	1890	1,705	26,199	54,290,520
	1900	2,124	54,308	83,121,969
Lumber, planing mill products, including sash, doors, and blinds	1890	235	5,281	12,469,532
	1900	230	4,788	10,007,603
Paper and wood pulp	1890	27	2,014	4,217,869
	1900	31	1,219	2,919,166
Furniture, factory product	1890	124	11,870	14,614,506
	1900	116	8,688	10,767,038
Agricultural implements	1890	59	1,944	6,339,508
	1900	65	1,585	3,955,306
Carriages and wagons	1890	299	4,890	11,205,602
	1900	407	2,893	5,699,941

* Decrease.

ture. The furniture industry is centred largely in Grand Rapids, where it has been promoted especially by means of semi-annual fairs.

Transportation. Michigan's extremely favorable location with respect to water transportation has been of great value in the exploitation of the local mineral and forest resources. (For a discussion of lake transportation, see Great Lakes.) Besides the canals connecting the main lakes, a short canal has been constructed connecting the northern end of Lake Portage with Lake Superior. The small rivers were formerly much used for the transportation of logs. Owing to its peninsular form, the State is not traversed by many of the great trunk lines of the country. A large mileage, however, was early recorded for the southern part of the State, and railway construction has steadily spread to the northward, until recently almost every region is well supplied with railway advantages. Detroit ranks first among the lake ports in the amount of its exports, and second in the amount of its imports. The customs districts Huron and Superior also have a large foreign trade, and a small trade is done from the Michigan district. The first railway began operation in 1836. In the following year the State undertook the building of railways, but owing to financial embarrassment the lines were sold after a decade to private corporations. The chief lines are the Lake Shore and Michigan Southern, the Michigan Central, the Chicago and Grand Trunk, and the Père Marquette. In recent years there has been a very extensive construction of interurban electric car lines. There is one railroad commissioner. His duties chiefly pertain to the physical condition of the roads and to accommodations.

Banks. The Bank of Michigan, organized in Detroit in 1817, was the first in the Territory. It incurred large losses in the panic of 1837-38, and was placed in the hands of trustees for liquidation in 1842. In 1835, shortly before Michigan was admitted as a State, nine new banks were organized. The free banking law of 1837 was the first in the United States to put into practice the system of securing the circulation of banks by deposit of collaterals. It also provided for examination of banks by bank commissioners. The law was imperfectly administered, however, and in 1839 42 banks were in the hands of receivers, and more than a million dollars of bills became worthless. In 1844 the banking law was declared unconstitutional. The banking system of the State did not recover from this depression for many years, and the banking business was carried on mainly by brokers and private bankers. In 1857 a new banking law was adopted, similar to the law of New York. In 1902 there were 84 national banks, with a capital of $11,380,000; surplus, $3,416,000; cash, etc., $6,019,000; loans, $59,464,000, and deposits, $64,657,000; 223 State banks with a capital of $13,941,200; surplus, $3,916,280; cash, $8,471,249; loans, $64,674,091, and deposits, $132,517,710.

Government. The original Constitution of 1835 was revived in 1850, when many features, radical for the time, were introduced. It has been amended in 1866, 1870, and 1876, and also in 1900, when it was provided that railway corporations might be taxed on the gross value of their property and franchises. Amendments to the Constitution may be proposed in either House, the approval of two-thirds of the members elected to each being necessary to adoption, followed by the approval of a majority of the qualified electors of the State. Every sixteenth year, and oftener if provided by law, the question of the general revision of the Constitution is submitted to the electors, and if approved by a majority vote a convention must be called by the Legislature for that purpose. Suffrage is granted to male citizens above twenty-one years of age, who have resided in the State six months, and in the township or ward twenty days.

EXECUTIVE. The Lieutenant-Governor and the president *pro tempore* of the Senate are in the line of succession to the Governorship in case of vacancy. The Governor may convene special sessions of the Legislature and exercise the usual pardoning power, subject to certain regulations. Other State officers are the Secretary of State, superintendent of public instruction, treasurer, commissioner of the land office, auditor, and attorney-general. All these officers are elected at the general biennial election, and serve for two years.

LEGISLATIVE. There are 32 Senators elected for two years from single districts, in the composition of which counties cannot be divided unless they are entitled to two or more Senators. The minimum and maximum constitutional limits to the number of members in the House are 64 and 100 respectively. They are also elected for two years, from districts composed of contiguous territory, in the formation of which no township or city can be divided. Members are paid for mileage and stationery, and $3 per day of actual attendance and when absent on account of sickness; but extra compensation may be granted to members from the Upper Peninsula. Bills may originate in either House, and a two-thirds vote of the members elected to each overcomes the Governor's veto. No new bill can be introduced after the first fifty days of a session. Election of members is on the Tuesday after the first Monday of November of even years. The Assembly opens on the first Wednesday of January of odd years.

JUDICIAL. The Supreme Court consists of one Chief Justice and three associates, chosen by the people for eight years. The State is divided into judicial circuits, in each of which one circuit judge is elected for six years. In each county organized for judicial purposes there is a court of probate, the judge being elected by the county for four years. Justices of the peace, not exceeding four to each township, are elected for four years.

LOCAL GOVERNMENT. The Legislature may confer upon townships, cities, and villages, and upon the board of supervisors of the several counties, such powers of a local, legislative, and administrative character as it may deem proper; and may organize any city of 20,000 inhabitants into a county when the majority of the electors of the county in which the city is located consent. Each county biennially elects a sheriff, clerk, treasurer, register of deeds, and a prosecuting attorney, the sheriff not being eligible to office more than four years in any period of six years. The board of supervisors, composed of one representative from each organized township, has charge of bridges, etc., and may raise by tax $1000 per year, or a greater amount, if the electors consent. There are annually elected in each township a supervisor, clerk (*ex-officio* school inspector), commissioner of highways, treasurer, school inspector, not exceeding four constables, and an overseer of highways for each highway district.

STATUTORY PROVISIONS. The legal rate of interest is 6 per cent.; 10 per cent. is allowed by contract. The penalty for usury is forfeiture of debt if over 12 per cent. A local-option liquor law was passed in 1887, under which both manufacture and sale may be prohibited within the county. A married woman may carry on business in her own name, and her property is not liable for the debts of her husband.

Michigan has twelve members in the National House of Representatives. The capital of the State is Lansing.

FINANCE. The first Legislature of the State authorized in 1837 a loan of $5,000,000, to be devoted to public improvements. Only a small part of the bonds were sold direct and paid in full. About two-thirds of them were deposited with the United States Bank of Pennsylvania, which failed in 1841 after selling some of the bonds. The State became liable for interests on these bonds, for which it never received any payment. It could not meet the interest payment in 1842. An adjustment was soon reached, which amounted to a partial repudiation of the State debt. The State debt amounted in 1861 to $2,316,328, increased during the war to $3,880,399, but fell to $904,000 in 1880, and was almost altogether extinguished in 1890. The present Constitution contains very strict provisions against formation of a State debt, any debts over $50,000 being absolutely prohibited except in case of war or insurrection. The indebtedness dates from the Civil War, and amounted in 1902 only to $416,300. The State must not subscribe to the stock of any company, shall not lend its credit to any one, and must not undertake any internal improvement unless it possesses a specific grant of land or other property for that purpose. The income of the State grows steadily, and was $1,510,000 in 1870, $2,607,000 in 1880, and $3,181,000 in 1890. In 1902 the total receipts were $7,079,429, and expenditures $6,253,141, leaving a surplus of $826,288, and a total balance in June, 1902, of $3,453,811. The revenue of the State is derived partly from direct taxation (about 65 per cent.), and partly from specific taxes on railroads (about 23 per cent.), and on mining companies, banks, insurance and express companies. Altogether, about one-third of the income comes from these specific taxes.

MILITIA. The militia is composed of all able-bodied male citizens between the ages of eighteen and forty-five, except such as are exempted by law. In 1901 the organized militia numbered 3106 enlisted men and commissioned officers.

POPULATION. The population of Michigan increased from 4762 in 1810 to 31,639 in 1830; 212,267 in 1840; 397,654 in 1850; 1,184,059 in 1870; 2,093,889 in 1890; and 2,420,982 in 1900. The rate of gain for the last decade was 15.6 per cent., as against 20.7 per cent. for the United States. From twenty-seventh in rank in 1830, the State rose to ninth in 1880, where it has remained. The density of the population is 42 persons to the square mile. The prairie region in the south was naturally the first portion of the State settled, and the mass of the population is still found in the southern half of the Lower Peninsula. The population is steadily increasing, however, in the more northern regions. The early settlers were largely from New England and New York, but a very considerable German element settled in the State about the middle of the nineteenth century. The position of Michigan relative to Canada has resulted in giving it a large Canadian element—greater than that of any other State except Massachusetts. The Canadians form the most numerous foreign-born element in the State. They predominate in many northern localities. The German-born population is second in importance among the foreign-born. The total foreign-born population in 1900 was 521,653. In that year there were 26 cities having each over 8000 inhabitants, and aggregating 30.9 per cent. of the total population. The largest cities, with their population in 1900, are as follows: Detroit, 285,704; Grand Rapids, 87,565; Saginaw, 42,345; Bay City, 27,628; Jackson, 25,180; Kalamazoo, 24,404; Muskegon, 20,818; Port Huron, 19,154; Battle Creek, 18,563; Lansing, 16,485; Ann Arbor, 14,509; Manistee, 14,260.

Religion. The Methodist and the Roman Catholic churches are in the lead, followed in the order named by the Lutherans, Baptists, Presbyterians, Congregationalists, and Protestant Episcopalians.

Education. In 1900 the total illiterate population ten years of age and over was 4.2 per cent. In 1900 there were 498,665 pupils enrolled in the public schools, of whom 350,000 were in average attendance. In 1899 there were 692 graded and 6469 ungraded school districts in the State, but the attendance in the former was much greater than in the latter. The average duration of the graded schools was 9.26 months; of the ungraded, 8.05 months. There are county boards of three school examiners, who determine the qualifications of persons proposing to teach in public schools; township boards of three school inspectors, whose title indicates their work; and district boards of six trustees for graded school districts and boards of three trustees for ungraded ones, their duties being to look after the educational interests of the respective districts, specify the studies to be pursued, prescribe textbooks, and elect teachers. No separate school for any race is allowed. Schools must be unsectarian and must be taught at least nine months in districts having eight hundred or more youths of school age, and at least five months in districts having from thirty to eight hundred, and three months in smaller districts. In 1899-1900 there were 15,564 teachers, of whom 12,093 were females. The average monthly wages of men in 1900 were $44.48, and of women $35.35. The State contains normal schools at Mount Pleasant, Ypsilanti, and Marquette. The primary school fund amounted in 1897 to $4,646,204. The greater part of this fund was acquired from the sale of the sixteenth section of land in every township. The remainder was acquired from the sale of swamp lands. The total expenditure of the State for public schools in 1899-1900 was $6,539,146, of which $4,312,245 was paid as salaries to teachers and superintendents. The State University, located at Ann Arbor, is one of the foremost higher educational institutions in the country. The university fund amounted in 1897 to $549,621. The State also maintains an agricultural college and a school of mines. In 1897 there was a State educational fund of $569,951. Besides the State institutions, there are the following denominational schools: Adrian College, at Adrian (Methodist); Albion College, at Albion (Methodist); Alma College, Alma (Presbyterian); Detroit College, Detroit (Roman Catholic); Hillsdale College, Hillsdale (Free Baptist); Hope College, Holland (Reformed); Kalamazoo College, Kalamazoo (Baptist); Olivet College, Olivet (Congregational).

Charitable and Penal Institutions. There is a State board of correction and charities appointed by the Governor for a term of 8 years. This board is authorized to examine into the conditions of every city and county poor-house and county jail, visit the State charitable, penal, and reformatory institutions, and make reports and recommendations concerning the same. The law authorizes the Governor to appoint an agent of the board in every county to look after the care of juvenile offenders and dependent children. The system is intended to secure reformation without commitment to State institutions, and only one-third of the children arrested are sent to the Industrial School for boys at Lansing, and to the Industrial Home for girls at Adrian. The State Public School for the care of dependent and neglected children is located at Coldwater. The Michigan School for the Deaf is located at Flint, and the School for the Blind at Lansing. The State insane asylums, with the number of patients June 30, 1900, were as follows: Michigan Asylum for the Insane, at Kalamazoo, 1392 patients; Eastern Michigan Asylum, at Pontiac, 1056 patients; Northern Michigan Asylum, at Traverse City, 1050 patients; and the Upper Peninsula Hospital for Insane, at Newberry, 345 patients. The charge of maintenance of the State's insane has been gradually decreased from $4.06 per week in 1883-84 to $3.08 in 1899-1900. The Wayne County Asylum at Eloise (414 patients) is recognized by the State and is under the supervision of the State board. The State has a home for the feeble-minded and epileptics at Lapeer. The State penal institutions are the Michigan State Prison at Jackson; the State House of Correction at Ionia; and the Upper Peninsula Prison at Marquette. On June 30, 1900, 1372 convicts were confined in these institutions. Besides these the Detroit House of Correction receives prisoners from different counties. Most of the convicts in this institution are on short-time sentences. The State has a parole law under which certain prisoners are allowed to be at large, while still under the control of the prison authorities. The State House of Correction was intended as an adult reformatory, but new legislation has converted it into an ordinary prison, to which all classes of prisoners are sentenced. Part of the prisoners are employed under the State account system, others by contractors who hire the convicts. Various occupations are followed, shirt-making and laundering probably being the most important. The prisoners in county jails are generally kept in idleness.

History. Remains of ancient mines and mining implements have been found within the present limits of the State. The white discoverers and first settlers were French missionaries and fur traders, some of whom visited the site of Detroit as early as 1610. In 1641 French Jesuits found their way to the falls of the Saint Mary. The first actual settlement by Europeans within the limits of the State was the mission at Sault Sainte Marie, founded by Father Marquette and others in 1668. Three years later Michilimackinac (now Mackinac) was established. In 1679 and 1686 forts were built at the mouth of the Saint Joseph, and at the outlet of Lake Huron, and in 1701 Antoine de la Mothe-Cadillac founded Detroit. Through the entire period of French occupation the town dragged out a painful existence, though the centre of a considerable fur trade and a place of meeting for friendly Indian tribes. The territory, with other French possessions, fell into the hands of the English at the end of the French and Indian War. Detroit was occupied in 1763, but early in May of that year the Indians, loyal to the French, rose under Pontiac (q.v.), massacred the garrison at Mackinac, and besieged Detroit for about five months. The English showed no capacity for government and the country made no progress under their rule. By the Quebec Act of 1774 the territory became a part of Canada, and during the Revolution Detroit was the starting point for many Indian expeditions which laid waste the American frontier. By the Treaty of Paris in 1783 the region passed to the United States, although England did not at once relinquish possession. After 1784 the Indians of the Northwest, deeming themselves unjustly treated by the Americans, waged a bloody warfare against the Western settlements till they were brought to terms by General Wayne in 1795. By the treaty of peace concluded in that year, they ceded large tracts of land on the eastern shore of the southern peninsula of Michigan and in the north to the United States. It was not until July 11, 1786, that the United States took actual possession of Detroit, though the region was included within the boundaries of the Northwest Territory, so called, and amenable to the ordinance of 1787. In 1800 Ohio was set off from the Northwest Territory, including the eastern portion of Michigan, but in 1802 the whole of the Lower Peninsula was annexed to the Territory of Indiana. Its southern boundary was a line drawn east from the southerly extreme of Lake Michigan to Lake Erie. At that time the white population of Michigan was about 4000, consisting for the most part of Canadian traders and *coureurs de bois*. On June 30, 1805, Michigan was set off as a separate Territory, with substantially its present limits, and Gen. William Hull was appointed Governor. During the War of 1812 the inhabitants were harassed by the British and Indians; Mackinac was captured by the British; Detroit was surrendered by Governor Hull (q.v.); and at Frenchtown, in 1813, a number of American prisoners of war were massacred by the Indians. (For military operations during the War of 1812, see UNITED STATES.) At different times after 1814 the Indians ceded large tracts of land, and by 1836 all the Lower Peninsula and part of the Upper Peninsula had been freed from Indian title. Surveys were made as early as 1816, and in 1818 a large tract of land was put on the market. In 1819 the Territory was authorized to send a delegate to Congress, and in 1823 the system of rule by a Governor and three judges was replaced by that of a Governor and a council of nine, selected from eighteen chosen by the people; in 1825 the council was increased to thirteen, and after 1827 the members were elected by popular vote. In 1835 a State Constitution was adopted by a convention called for that purpose, but the admission of Michigan into the Union was delayed by a dispute with Ohio concerning a strip of land on the southern boundary. There was danger that the dispute would lead to bloodshed, but in 1836 Congress agreed to admit Michigan upon condition that she should surrender her claim to the disputed territory and accept in lieu thereof a larger area in the Upper Peninsula. The first convention called to consider this proposal, January 26, 1836, rejected it, but it was accepted by a second in December, 1836, and on January 26, 1837, Michigan was admitted into the Union.

The following have been Governors of the State since its organization as a Territory:

TERRITORIAL

William Hull	1805-13
Lewis Cass	1813-31
George B. Porter	1831-34
Stevens T. Mason	1834-35
John S. Homer	1835-36

STATE

Stevens T. Mason	Democrat	1836-40
William Woodbridge	Whig	1840-41
James W. Gordon (acting).	"	1841-42
John S. Barry	Democrat	1842-46
Alpheus Fetch	"	1846-47
William L. Greenly (acting)	Democrat	1847-48
Epaphroditus Ransom	Democrat	1848-50
John S. Barry	"	1850-52
Robert McClelland	"	1852-53
Andrew Parsons (acting).	"	1853-55
Kinley S. Bingham	Republican	1855-59
Moses Wisner	"	1859-61
Austin Blair	"	1861-65
Henry H. Crapo	"	1865-69
Henry P. Baldwin	"	1869-73
John J. Bagley	"	1873-77
Charles M. Croswell	"	1877-81
David H. Jerome	"	1881-83
Josiah W. Begole	Democrat and Greenback	1883-85
Russel A. Alger	Republican	1885-87
Cyrus G. Luce	"	1887-91
Edwin B. Winans	Democrat	1891-93
John T. Rich	Republican	1893-97
Hazen S. Pingree	"	1897-1901
Aaron T. Bliss	"	1901-05

The first printing press in Michigan was set up in 1809, and in 1817 the first newspaper was published at Detroit. The opening of the Erie Canal (1825) poured a vast stream of immigration into Michigan, and at the time of the admission of the State the population was nearly 70,000, many of them from New England and New York. The first bank was established at Detroit, in 1818, and by 1837 there were fifteen such institutions. After 1835 the country went speculation mad, a general banking law was passed in 1837, and the State was flooded with paper money. The panic of 1837 did not interfere with the completion of the elaborate system of internal improvements that had been planned. The State undertook the building of three railways across the Lower Peninsula, but after running greatly into debt was forced in 1846 to sell them to private persons at a loss. An act establishing the University of Michigan was passed in 1817, academies and high schools were projected in 1821, and a board of education was created in 1829, but the common schools did not really come into existence till after 1835, and teaching in the university was begun on an appreciable scale about 1845. In 1847 the capital was removed from Detroit to Lansing. From 1853 to 1876 prohibition of the sale of liquor was a part of the Constitution. In 1876 prohibition was abolished and a heavy liquor tax substituted.

Legislation after the Civil War was concerned largely with the taxation of corporations. In 1889 the Australian ballot was adopted; a law providing for the election of Presidential electors by districts, instead of on a general ticket, was passed in 1891. but was repealed in 1893. A factory inspection act was enacted in 1894, and a stringent anti-trust law in 1899. Michigan has consistently supported the Republican Party since its formation, except for three lapses—in 1882 and 1883, when the Democrats and Greenback party in fusion elected their candidate for Governor, and in 1890, when the Democrats alone carried the State.

Bibliography. *Michigan Geological Survey Report* (Lansing, 1839 et seq.); Lamman, *History of Michigan Civil and Topographical* (New York, 1839); Sheldon, *The Early History of Michigan* (New York, 1856); Campbell, *Outline of the Political History of Michigan* (Detroit, 1876); Cooley, *Michigan: A History of Governments* (Boston, 1885); Farmer, *The History of Detroit and Michigan* (Detroit, 1889); McLaughlin, *History of Higher Education in Michigan* (Washington, 1891); Beal and Wheeler, *Michigan Flora* (Lansing, 1892); Champlin, "Industrial Prosperity," in *Michigan Political Science Association Publications* (Lansing, 1897).

MICHIGAN, Lake. The second in size of the great fresh-water lakes of the North American continent, and the only one lying wholly in the United States, bounded on the north and east by Michigan, on the south by Indiana, and on the west by Illinois and Wisconsin (Map: United States, H 2). It contains an area of 22,450 square miles. It is over 300 miles long, and its mean breadth is about 75 miles; the mean depth is about 870 feet. It is 581 feet above the level of the sea, and has been found by accurate observations to have a slight lunar tidal wave. Its banks are low and sandy, containing rocky sections of sandstone and limestone, but few high bluffs. Inland the sand-hills rise to the height of 150 feet. On the Wisconsin side the land is being gradually worn away, while a gain is noticeable on the Michigan side. The lake communicates with Lake Huron through the Straits of Mackinac, and is connected with the Mississippi, supposed to have been its ancient outlet, by the old Illinois and Michigan Canal and the new Chicago Drainage Canal (q.v.) at Chicago. Like all the Great Lakes, it is subject to violent storms, and its shores are guarded by twenty-three light-houses. The best harbors are at the mouths of tributary rivers; the chief ones are Chicago, Milwaukee, Escanaba, and Grand Haven. Its islands are in the northern portion, forming the Manitou group; the largest, Beaver Island, is 50 miles long. It has two large bays—Green Bay, 100 miles long, and Grand Traverse Bay, 30 miles long—and three of lesser dimensions, Little Traverse Bay, Little Bay of Noquet, and Big Bay of Noquet. Ice remains longer in the Straits of Mackinac than elsewhere, and navigation is usually closed for four consecutive months. Lake Michigan has important fisheries; white-fish and lake trout are taken and exported in large quantities, fresh and canned. The largest rivers which empty into it are the Saint Joseph, Muskegon, Grand, Kalamazoo, and Manistee, all in Michigan; the Fox in Wisconsin, emptying into Green Bay; and the Menominee on the borders of Michigan and Wisconsin, also discharging into Green Bay. The lake forms, with the Saint Lawrence and the Lower Lakes, a natural outlet for one of the richest grain-growing regions in the world.

MICHIGAN, University of. A coeducational State institution at Ann Arbor, Mich., chartered in 1837. According to the terms of the charter, branches were established at various places to serve as preparatory schools of the university. These existed only a short time and were the forerunners of the State high schools, which are now in intimate relation with the university. The institution was opened in 1841, graduating its first class in 1845. It is intended primarily for the higher education of residents of the State, but receives students from all parts of the country on payment of a small tuition fee. The governing body is a board of regents, elected for terms of eight years. The university is organized in seven departments: literature, sciences, and the arts (including the graduate school); engineering (opened in 1853); medicine and surgery (1850); law (1859); pharmacy; the Homœopathic Medical College (1875); and the College of Dental Surgery (1875). Each department has its special faculty, with representation on the University Senate, which considers questions of common interest. The degrees conferred are bachelor and master of arts, science, and law; civil, mechanical, and electrical engineer; and doctor of philosophy, science, medicine, dental surgery, and dental science. The total attendance in 1902, including the summer session, was 3782, of whom 1400, including 668 women, were students in the department of literature, science, and the arts, 854 in law, and 513 in medicine. The total attendance of women was 725. The university, to 1901, had conferred 18,883 degrees, of which 1968 were given to women. The university was a pioneer in coeducation, women having first been admitted in 1870. They now constitute about one-fifth of the student body. Coeducation at the university has been uniformly successful. The libraries of the university, including a number of important collections, aggregated 165,000 volumes, with a recorded circulation of 167,949. The university museums contain collections illustrative of natural history, the industrial arts, chemistry, materia medica, anatomy, archæology, ethnology, the fine arts, and history, including a very full Chinese exhibit sent by the Chinese Government to the New Orleans Exposition and presented to the university in 1885. The Detroit Astronomical Observatory contains a meridian circle by Pistor and Martins, of Berlin, mounted clocks by Tiede and Howard, and a refracting telescope with a thirteen-inch object glass, constructed by the late Henry Fitz, of New York. A smaller observatory, used in the work of instruction, contains an equatorial telescope of six inches aperture and a transit instrument of three inches aperture. There are two hospitals connected with the university. The Waterman Gymnasium, for men, and the Barbour Gymnasium, for women, are free to all students. The general supervision of athletic sports is vested in a board of control of nine members, five chosen from the University Senate and four from the Students' Athletic Association. The university is a member of the Northern Oratorical League, which includes the universities of Chicago, Minnesota, and Wisconsin, the State University of Iowa, Northwestern, and Oberlin. It belongs to the Central Debating League, with the universities of Chicago and Minnesota, and Northwestern University, and has maintained for several years a series of debates with the University of Pennsylvania. Entrance is based upon examination or upon certificates from accredited schools. The university has no dormitories and no commons. Recent extension of the elective system has resulted in a considerable loss in the choice of Latin, Greek, and mathematics, and a marked gain in the modern languages. Among other developments, the establishment of courses in marine engineering and in the training of students for foreign consular service are noteworthy. The faculty in 1902 numbered 247. The endowment of the university was $545,964; its gross income, $741,000. The total value of the college property was $2,501,138, and that of the grounds and buildings $1,583,925. James B. Angell became president in 1871.

MICHIGAN CITY. A city in Laporte County, Ind., 56 miles east of Chicago, Ill.; on Lake Michigan, and on the Lake Erie and Western, the Chicago, Indianapolis and Louisville, and the Michigan Central railroads (Map: Indiana, C 1). It is the seat of the Northern Indiana State Prison, and has a public library, a United States life-saving station, a public park on the lake front, and a soldiers' monument. There are good transportation facilities, to which are due the city's large commercial interests, the trade being principally in lumber, salt, and iron ore. The manufactures of railroad cars, chairs, hosiery and knit goods, lumber and products of lumber are important. The government, as provided by the charter of 1867 and numerous amendments thereto, is vested in a mayor, who holds office for two years, and a common council, which elects all administrative officials, excepting the statutory municipal officers, who are chosen by popular vote. The city owns and operates the water-works. Michigan City was laid out in 1832 and settled in the following year. It was incorporated in 1837. Population, in 1890, 10,776; in 1900, 14,850.

MICHIGAN HERRING. The cisco (q.v.).

MICHIGAN STATE AGRICULTURAL COLLEGE. A coeducational State institution at Lansing, Mich., the oldest institution of its kind in the country. It was established in pursuance of a constitutional provision in 1855, and was opened in 1857. Its endowment consists of a fund of $800,000 derived from the sale of part of the lands (235,673 acres) given by the General Government through the act of 1862. There are three courses, agricultural, mechanical, and women's or domestic science, which were attended in 1902 by 850 students under a faculty of 60. The library contained 23,000 volumes. Farmers' institutes are carried on annually in each county of the State, the total attendance at these instruction schools in 1902 being about 100,000. The income from the endowment fund, with other Government grants and State appropriations, amounted in 1902 to $225.000. In that year the buildings and grounds were valued at $700,000.

MICHMASH, mĭk′măsh. The site of the camp of the Philistines in the war at the beginning of Saul's reign, connected with the notable exploit of Jonathan (q.v.) related in I. Sam. xiv. It was a town of Benjamin, about seven miles north of Jerusalem. Its importance arose from its position on one of the two main roads from Jerusalem northward, at a point where the road descends into a steep and rugged valley. Josephus (*Ant.*, vi. 6, 2) gives a detailed account of Jonathan's exploit, which tallies well with the features of the locality to-day. Men of Michmash returned with Zerubbabel (Ezra ii. 27; Neh. vii. 31). It is mentioned in the fictitious invasion of the Assyrians in Isaiah x. 28 sqq. In the time of the Maccabees it became the headquarters of Jonathan (I. Macc. ix. 73), and was a large village in the time of Eusebius. It is the modern Muhmas.

MICHOACÁN, mē̇-chō′ȧ-kän′. A Pacific Coast State of Mexico, bounded by the States of Jalisco and Guanajuato on the north, Mexico on the east, Guerrero and the Pacific Ocean on the south, and Colima and Jalisco on the west (Map: Mexico, H 8). Area, 22,874 square miles. The surface is generally mountainous, although its highest elevations are below 13,000 feet. The northern part is the more elevated, being in general over 6000 feet above the sea, with a few peaks exceeding 10,000 feet. The southern part slopes toward the coast, which is mostly low. The extreme northern part is rather flat and interspersed with a number of lakes. With the exception of the large rivers Lerma and Las Balsas, forming part of the boundaries, and the Tepalcatepec, a tributary of Las Balsas, crossing the State from east to west, the rivers are small, but lakes are abundant, and some of them, such as Cuitzeo, are of considerable size. The climate is on the whole healthful, except in the southern part, where fever prevails to some extent. The soil is of remarkable fertility; the principal products are cereals in the more elevated parts, and sugar, coffee, vanilla, tobacco, and other tropical plants in the valleys. Stock-raising and mining are also important industries, and trade is considerable. The province is crossed by the Mexican National and the Mexican Central railway lines. Population, in 1895, 896,495. Capital, Morelia (q.v.). Michoacán was inhabited by the Tarascos, who had successfully resisted the domination of the Aztecs up to the time of the Conquest.

MICKIEWICZ, mĭts′kĭ-ȧ′vĭch, ADAM (1798-1855). The greatest of Polish poets. He was born near Novogrodek, Lithuania; his father was a lawyer of the lesser nobility. Inclined to the study of nature, he took up mathematics and physics at the University of Vilna, but later passed to biology and literature (1815-19). After that he taught Latin and Polish at the gymnasium in Kovno until 1823, publishing there the first collection of his poems in two volumes in 1822. The legends, superstitions, and tales of the Polish nation contained in it were given a wonderfully poetic form, and Mickiewicz at one bound became the national poet of the Poles. The volumes contained two longer works: *Dziady* (Ancestors, Festival in honor of the Dead), a romantic drama; and *Grażyna*, an historical epic. The former contains much autobiographical material. The poem is deficient in orderliness, the episodes being flung together with almost reckless freedom, but the chief theme—love—has, perhaps, never been better sung. *Grażyna* relates the noble death of a princess of that name, who dons the armor of her husband, and thus disguised leads his army against the Teutonic Knights.

In 1824 Mickiewicz was arrested in Vilna on suspicion of revolutionary plotting, and was sent to Saint Petersburg. In the capital he formed a warm friendship with Pushkin, but soon went to Odessa (1825) as instructor in the Richelieu Lyceum. After nine months he visited the Crimea, and this was a turning point in his career. *The Crimean Sonnets* recording his impressions are glowing with Oriental color and graceful in form. In December, 1825, he obtained a position in the office of the Governor-General, Prince Golitzin, at Moscow. In 1828 he returned to Saint Petersburg, and there published his second epic, *Wallenrod,* descriptive of the struggle of the Lithuanians against the Teutonic Knights. In 1829 the poet was given permission to travel in Italy, Germany, and France. In Weimar he met Goethe, who became greatly interested in him. After staying for a time in Rome, where he met James Fenimore Cooper, he started for Poland on hearing of the uprising of 1830, but, unable to cross the strictly guarded frontier, he went to Dresden, after lingering in Posen for a while, and soon settled in Paris. In 1832 he published the third part of his *Dziady.* In poverty and distress, he published his masterpiece, *Sir Thaddeus* (Pan Tadeusz), in 1834. In 1839 he was called to the chair of Latin literature at Lausanne, and in the year following he was appointed the first incumbent of the newly founded chair of Slavic literatures at the Collège de France. But after a year or two he began to intermingle his lectures with irrelevant discussions on politics, religion, and mysticism, and the French Government was forced to stop his lectures in 1844. In 1848 he went to Italy, and there undertook to form Polish regiments against Austria. Then, in 1849, he edited at Paris the *Tribune des Peuples,* which was soon stopped by the French Government. In 1852 he was appointed a librarian in the Arsenal, and on the outbreak of the Crimean War Louis Napoleon sent him to Constantinople to organize Polish regiments against Russia. Here he died shortly afterwards. He was buried in Paris; in 1890 his body was transferred to Cracow.

The best edition of Mickiewicz's works is that of 1838, in eight volumes, published in Paris, under the poet's personal supervision; and the latest by Dr. Biegeleisen, in four volumes (Lemberg, 1893). They have been translated into most European languages. His ballads and sonnets are to be found, in German, in Reclam's *Universal Bibliothek; Dziady* (Ahnefeier), in German by Lipiner (Leipzig, 1887); *Gražyna,* in German by Nitschmann in *Iris* (Leipzig, 1880); *Wallenrod,* by Weiss (Bremen, 1871); *Herr Thaddäus,* by Weiss (Leipzig, 1882) and Lipiner (Leipzig, 1883). *Conrad Wallenrod* was translated into English by Leo Jablonski, and a poetical version of it by Cattley appeared in London in 1840. The best biography in French is by his son, Wladislaw Mickiewicz (Paris, 1888); revised and enlarged in Polish (Posen, 1890-94). His *Œuvres complets* appeared in eleven volumes in Paris, 1860.

MICKLE, William Julius (1735-88). A Scottish poet, born at Langholm, Dumfriesshire. Mickle failed as a brewer, settled in London as a writer, and became corrector to the Clarendon Press, Oxford (1765). In 1767 he published a narrative poem called *The Concubine,* reissued in 1778, as *Sir Martyn.* Excepting Thomson's *Castle of Indolence,* it is the best of the eighteenth century imitations of Spenser's *Faerie Queene.* Retiring to a farm near Oxford, Mickle made a free version of the *Lusiads* of Camoens (1775). To Evans's *Old Ballads* (1777-84) he contributed the fine ballad *Cumnor Hall,* which suggested Scott's *Kenilworth.* He may also have written the exquisite Scotch song *There's nae Luck About the House* (ascribed also to Jean Adams). In 1779 Mickle went to Lisbon as secretary in the *Romney* man-of-war. He was most hospitably received and made a member of the Royal Academy of Portugal. He died at Forest Hill, near Oxford. Consult his *Poetical Works,* with biography, ed. by Sim (London, 1807).

MIC'MAC. An important Algonquian tribe of Canada, occupying all of Nova Scotia, Cape Breton Island, and Prince Edward Island, with large portions of New Brunswick, Quebec, and Newfoundland. The name is of uncertain etymology. In all the colonial wars the Micmac sided with the French, those of Southern Nova Scotia especially making a reputation by their inroads upon the New England settlements. They are now all civilized, fairly industrious as hunters, fishers, guides, and basket and curio makers, but without any appreciable desire to advance their condition; moral, sober, and law-abiding, and almost solidly Catholic through the effort of early French missionaries and their successors. They number in all about 4000, and are divided approximately as follows: Nova Scotia (including Cape Breton Island), 2050; New Brunswick, 950; Quebec, 630; Prince Edward Island, 320; Newfoundland (not reported)—perhaps 50. Their language and traditions have been investigated by the missionary Rand.

MI'CON (Lat., from Gk. Μίκων, *Mikōn*). An Athenian painter and sculptor, who flourished about the middle of the fifth century B.C. He painted three of the walls of the temple of Theseus at Athens, and is said to have had a hand in the great picture of the battle of Marathon in the *Poikile.* He was especially skillful in the painting of horses.

MICROBE. A microscopic organism; especially applied to bacteria. Various infectious diseases are caused by their presence. See Bacteria.

MI'CROCLINE (from Gk. μικρός, *mikros,* small + κλίνειν, *klinein,* to incline). A potassium-aluminum silicate that crystallizes in the triclinic system, and is near orthoclase in its properties, being a member of the triclinic group of feldspars. It has a vitreous lustre and is white to cream-yellow in color, and sometimes red or green. The green varieties are known as Amazon stone. The ordinary microcline, which is found both as crystals and in masses in granitic rocks, is of common occurrence; excellent specimens are found at Magnet Cove, Ark.

MI'CROCOC'CI. See Bacteria.

MI'CROCON'ODON (Neo-Lat., from Gk. μικρός, *mikros,* small + κῶνος, *kōnos,* cone + ὀδούς, *odous,* tooth). A small fossil jaw of uncertain affinities found in the Triassic rocks. It has been considered by some American authors to belong to a group of vertebrates, intermediate in position between the highest anomodont reptiles, the Theromorpha, and the lowest polyprotodont mammals. Consult Osborn, "On the Structure and Classification of the Mesozoic Mammalia," in *Journal of the Philadelphia Academy of Natural Sciences* for 1888 (Philadelphia, 1888). See PALEONTOLOGY; MAMMALIA.

MI'CROCOSM (Lat. *microcosmus*, Gk. *μικρόκοσμος*, *mikrokosmos*, little world, from *μικρός*, *mikros*, small + *κόσμος*, *kosmos*, world) and **MAC'ROCOSM** (from Gk. *μακρός*, *makros*, great + *κόσμος*, *kosmos*, world). The belief, current in ancient times, that the world or cosmos was animated, or had a soul, led to the notion that the parts and members of organic beings must have their counterparts in the members of the cosmos. The natural philosophers of the sixteenth century took up this notion anew in a somewhat modified shape, and considered the world as a human organism on the large scale, and man as a world, or cosmos, in miniature; hence they called man a microcosm, and the universe itself the macrocosm. With this was associated the belief that the vital movements of the microcosm exactly corresponded to those of the macrocosm, and this led to the further assumption that the movements of the stars exercised an influence on the temperament and fortunes of men.

MI'CROCOS'MIC SALT, or SALT OF PHOSPHORUS. An ammonium-sodium-hydrogen phosphate that crystallizes in the monoclinic system, and is found native as the mineral *stercorite*. It was known to the older chemists, who extracted it from human urine. It may be made by dissolving crystallized sodium phosphate and ammonium chloride in water, heating the solution to boiling, then filtering and cooling to crystallization. On heating, the crystals melt readily, giving up water of crystallization, and later ammonia, and leaving sodium phosphate, which melts and solidifies on cooling to a clear colorless glass. It is used chiefly as a flux in blowpipe analysis.

MI'CRODIS'CUS (Neo-Lat., from Gk. *μικρός*, *mikros*, small + *δίσκος*, *diskos*, disk). A small Cambrian trilobite with body of oval outline, head and tail shields alike, and only three or four thoracic segments. See AGNOSTUS; CAMBRIAN SYSTEM.

MI'CRO-FAR'AD. See ELECTRICAL UNITS.

MI'CROLES'TES (Neo-Lat., from Gk. *μικρός*, *mikros*, small + *λῃστής*, *lēstēs*, robber). A small fossil jaw with multituberculate teeth found in the Triassic rocks of Württemberg and England. This fossil has figured prominently in discussions on the origin of the mammalia, and it is usually placed among the prototherian mammals; but, as the skull to which it belongs is entirely unknown, its exact systematic position is undeterminable, and it may prove to be the jaw of an anomodont reptile (Theromorpha) instead of that of a mammal.

MI'CROM'ETER (from Gk. *μικρός*, *mikros*, small + *μέτρον*, *metron*, measure). Any device by means of which it is possible to make a linear measurement more accurately by using levers, screws, or magnifying glasses than by using a simple rule or scale. Fig. 1 shows a simple form of lever micrometer adapted to the measurement of thicknesses, diameters, and the like. The movable lever AB turns on a pivot at C, and since the arm CB is five times as long as the arm CA, the pointer at the end of B will move over the scale D five times as far as the points are opened at A; and consequently the measurement is about five times as accurate as if a scale were applied directly. Fig. 2 illustrates a form of simple screw micrometer. The screw has ten threads to the inch, and consequently one complete revolution will remove the point of the screw, A, from the plate, C, one-tenth of an inch. The head, B, of the screw has its rim divided into one hundred equal parts; hence a rotation of the screw through one of these parts means one one-hundredth of a complete revolution, and such a motion would remove the point from the plate by a distance of 1/100 of 1/10, or 1/1000 inch. A very common form of screw micrometer, described and illustrated under CALIPERS, has forty threads to the inch, and the head is divided into twenty-five parts, making the accuracy 1/25 of 1/40, or again 1/1000 of an inch.

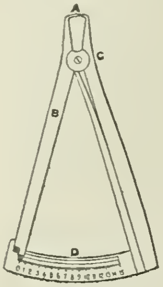


FIG. 1. LEVER MICROMETER.

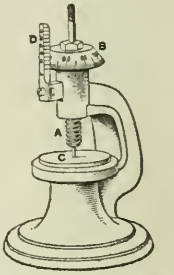


FIG. 2. SIMPLE BENCH MICROMETER.

In working with the telescope and the microscope it becomes necessary to make measurements upon the image formed by the objective, and for this purpose a micrometer ocular is employed. The simplest form of this device is a fine scale ruled upon glass in hundredths of an inch, or tenths of a millimeter, and so mounted in the draw tube that it will be seen distinctly by means of the eye-piece, and hence will be in the plane of the image formed by the objective. The scale appears to lie upon the object, and it is only necessary to read off the dimensions. A revolution of the draw tube makes measurements in different directions possible without moving the object.

A more accurate and satisfactory micrometer ocular is that devised by Ramsden, and illustrated in Fig. 3. H is the divided head of a micrometer screw, S, reading to a hundredth of a screw revolution, 1/200 millimeter for example. The screw is so arranged that it will cause a rectangular frame, AA, to move backward and forward as the screw revolves. Across the middle of the frame, AA, are stretched two fine spider-lines, at right angles to the axis of the screw, and quite close together. The whole device is so attached to the draw tube of the microscope or telescope that the spider-lines lie in the focal plane of the objective, and hence are distinctly seen magnified by the ocular. In making measurements with this instrument the screw S is turned until the spider-lines straddle one point, and then a reading is made of the position of the head, H. Next the screw is again turned until the lines straddle the other point, another reading is made, and the difference of the two readings gives the distance between the points upon the image. By placing a known scale, for example a tenth of a millimeter, upon the stage of the microscope, and measuring the image as above, the magnifying power of the microscope objective is obtained, and it is possible to calculate what distance upon the stage, or in the object, corresponds to one revolution of the micrometer screw. The whole number of revolutions of the screw is sometimes read by means of a second wheel, so geared to H that it makes one revolution for twenty or thirty revolutions of the screw S. In other cases a strip of metal with small teeth like saw teeth, and as far apart as the threads of the screw S, is placed across the side of the opening so that the double spider-line appears to move over it from tooth to tooth, each tooth corresponding to one complete revolution of the screw. Such micrometers are used in measuring objects under the microscope, in most accurate linear and angular determinations, and in telescopes for obtaining star distances, and for a great variety of measurements. A very elaborate and delicate micrometer attached to the eye end of the telescope and used in star work is called a position micrometer. A special form of micrometer is used for measuring the star distances on the photographic plates that are taken of star groups and clusters. See Microscope; Telescope.

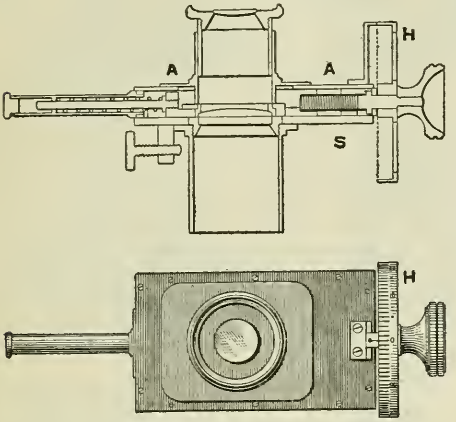


Fig. 3. micrometer ocular.

MICROMETER CALIPERS. See Calipers and Micrometer.

MI'CRONE'SIA (Neo-Lat., from Gk. μικρός, *mikros*, small + νῆσος, *nēsos*, island). A name of Greek origin, meaning 'small islands.' It is used to designate that part of Oceanica which consists of the Ladrone and Caroline islands, Marshall Islands, the Gilbert group, and many others of small size. All of these lie northwest of Polynesia, north of Melanesia, and east of the Philippines, being all north of the equator, and between longitudes 130° and 180° E. The group also forms an ethnological division of Oceanica. (See Micronesians.) The most important of the groups are described under the proper titles.

MI'CRONE'SIANS. The inhabitants of Micronesia (q.v.). They belong undoubtedly to the Malayo-Polynesian race, although the authorities differ concerning their ethnic purity. The languages of Micronesia are probably Melanesian, but the natives are extremely mixed, showing all shades of color and transitional forms between the Papuan, Malay, and Polynesian types. The mass differ in type slightly from the Polynesians; they are more hairy, are shorter, their head is more elongated, and they possess some ethnic characters apart. They use rope armor, and have weapons of sharks' teeth, special money, and other distinguishing marks. The Ladrone, Pelew, Marshall, Caroline, and Gilbert groups, collectively called Micronesia, would appear to have been originally peopled by Papuans from Melanesia, and to have afterwards received numerous colonists from both Polynesia and Malaysia (the Philippines), besides occasional settlers from Japan and China. But the extent of the Papuan element in Micronesia has yet to be determined and has probably been overestimated. The Gilbert group form the natural transition to Polynesia proper. For information in detail concerning the Micronesians, the following works may be consulted: Kubary, *Ethnographische Beiträge zur Kenntnis des Karolinen-Archipels* (Leyden, 1889-95); Meinicke, *Die Inseln des Stillen Ozeans* (Leipzig, 1875); Cabeza Pereira, *Estudios sobre las Carolinas* (Manila, 1895); Heinsheim, *Südsee Erinnerungen* (Berlin, 1883); id., *Beitrag zur Sprache der Marshall-Inseln* (Leipzig, 1880); Bastian, *Die mikronesischen Colonien aus ethnologischen Standpunkten* (Berlin, 1899); Christian, "On Micronesian Weapons," in the *Journal of the Anthropological Institute* (London) for 1899, and *The Caroline Islands* (London, 1899); Bartolis, *Las Carolinas* (Barcelona, 1885). See Polynesians.

MI'CROPHONE. See Telephone.

MI'CROPYLE (from Gk. μικρός, *mikros*, small + πύλη, *pylē*, gate) (in plants). In an ovule, the passageway left by the integument or integuments, through which the pollen-tube passes to the nucellus. It also marks the point in the seed at which the escaping plantlet first emerges. See Ovule.

MI'CROSCOPE (from Gk. μικρός, *mikros*, small + σκοπεῖν, *skopein*, to view). An instrument by which objects are made to appear of greater magnitude. Undoubtedly the oldest microscope on record is a plano-convex lens of quartz found by A. H. Layard amid the ruins of Nineveh, surrounded by articles of bronze and other materials. It is now in the British Museum, and is 0.5 cm. (less than 0.2 inch) in thickness, 3.5 cm. (1.4 inches) in diameter, and its focal length is 10.7 cm. (about 4 inches). Many authorities believe with good reason that this lens was used as a burning glass, as similar ones were used for that purpose at the time of Socrates. On the other hand, there can be no doubt that such lenses were used as simple microscopes, or magnifying glasses, inasmuch as the apparent increase of size of an object seen through them must inevitably have attracted the attention of such good observers, and moreover the elaborate and delicate engraving on many of the seals and gems of that period furnish sufficient evidence that some means must have been employed to aid the eye in executing this work. Spherical glass vessels filled with water would also have called attention to their employment as magnifiers; spherical drops of glass would act similarly.

During the later Middle Ages such simple lenses came more and more into use, especially as aids to the eye in ordinary vision, as spectacles. A spectacle-maker of Middelburg, Holland, Zacharias Janssen, undoubtedly was the first to build a compound miscroscope, and about 1590 constructed such an instrument and presented it to Charles Albert, Archduke of Austria. It was nearly six feet long, supported upon brass dolphins on an ebony board. It contained only two lenses. Robert Hooke (1635-1703), secretary of the Royal Society, made many improvements in the construction and use of the microscope, and Divini in 1668 improved the instrument by using two plano-convex lenses as an eye-piece (see below). In 1686 Campani improved the form of the instrument and introduced the use of a screw for proper focusing. Nevertheless the development of the microscope took a different direction, on account of the serious difficulties with aberration (q.v.) in short focus lenses, and under the influence of Leeuwenhoek attention was returned to the development of the simple microscope. Antony von Leeuwenhoek (1632-1723) constructed very efficient and convenient simple miscroscopes, developing the method already tried by Hooke and Hartsoeker of making high-power lenses by allowing a drop of molten glass to occupy a small hole in a plate of brass. Even a drop of water or oil was also used in this way. Leeuwenhoek is said to have made 247 miscroscopes, observing the circulation of the blood in the feet of frogs, spermatozoa, and many other interesting things. To this period belong also the names of Wilson (1708-88), Hartsoeker (1656-1724), Stephen Gray (?-1736), Jan van Musschenbroek (1687-1748), Leutmann (1667-1736), and others.

About this time Samuel Reyher (1635-1714) employed such a lens to project an image upon the wall, or a screen, using the sunlight for illumination, and is thus probably the inventor of the 'solar microscope.' Baker (1698-1774) with the aid of the mechanic Scarlett constructed in 1736 a catoptric miscroscope, using mirrors instead of lenses in a manner suggested by the Gregorian telescope. But such instruments never came to be of much importance, since Dolland (1706-61) in 1757 confirmed the theoretical conclusions of Euler (1707-83) and Klingenstierna (1698-1765) that for the same refraction the dispersion might be different, and thereupon proceeded to construct an achromatic objective, that is, a lens in which the color effects are eliminated by the use of two kinds of glass. Nevertheless, the great difficulty of grinding such small lenses with sufficient accuracy for the correction of the errors due to aberration prevented their use in a manner at all commensurate with their successful employment in astronomical telescopes.

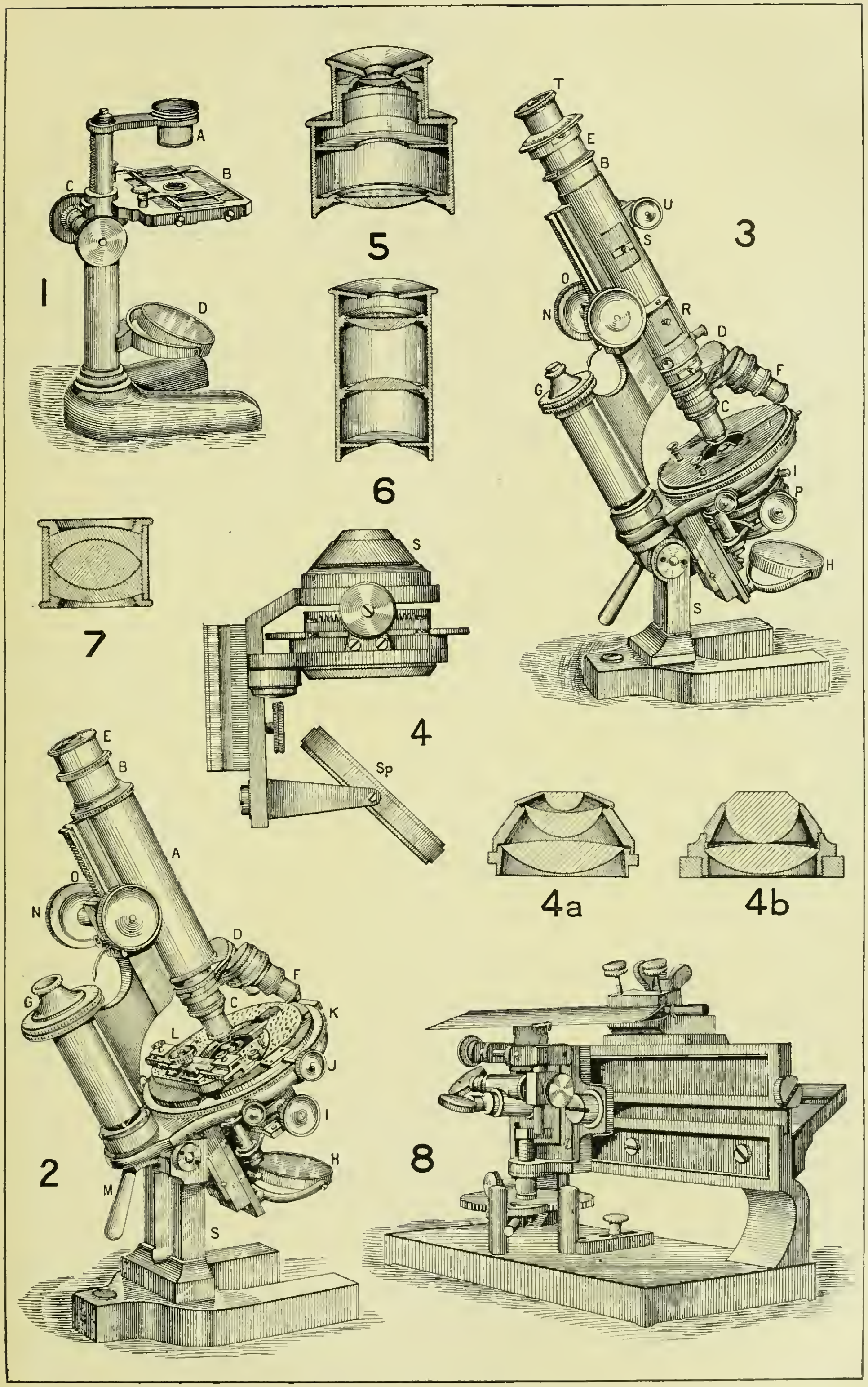
In 1823 Selligues and Chevalier departed from the plan of using only two lenses to correct aberration and employed two or three pairs of lenses (see Fig. 6), each pair consisting of a plano-concave of flint glass which dispersed the colors far apart, combined with a double convex of crown glass, which has a low dispersion. In this way excellent achromatic objectives were produced. In the next year Tulley of London, upon the suggestion of Dr. Goring, constructed an achromatic combination of three lenses, without knowing of the work of Selligues and Chevalier. Amici of Modena had been endeavoring to produce achromatic miscroscope objectives as early as 1812, and, encouraged by the success of Selligues and Chevalier, he took up the work with new energy, and produced in 1827 a combination much superior to any known at that time. His work was soon rivaled by that of Andrew Ross and Powell in London. J. J. Lister, as a result of his theoretical investigations, directed James Smith in the construction of an objective that surpassed all others in the perfection of its correction, angular aperture, and flatness of field.

With these lenses A. Ross soon discovered that the presence or absence of a cover glass over the object affects the success of the correction. In other words, he discovered that the cover glass must be considered as a part of the objective system. He pointed out that its effect may be counteracted by undercorrecting the first pair of lenses in the objective and overcorrecting the other two pairs; moreover, if the distance between the first and second pair of lenses of the objective can be varied, this makes it possible to adapt the correction of the objective to various thicknesses in the cover glass, and to various kinds of cover glasses.

For a long time the best microscope objectives of high power were composed of three pairs of achromatic lenses, but Amici himself tried a single plano-convex lens next to the object and recently this has become quite popular. (See Fig. 7.) Amici also pointed out that where very short focus lenses are used a drop of water may be introduced between the cover glass and the first face of the objective, thereby reducing the loss of light. It is, however, evident that this would affect the refraction and dispersion of the system and hence throw out the correction. Apparently Amici was never able to adapt his systems to this method of use, and it remained for Hartnack and Nachet to succeed in constructing objectives for such use, and to point out their great superiority in many ways over the older form, which came to be called 'dry' objectives, in distinction from this new form, which were called 'immersion' objectives. The immersion system has very great advantages over the dry on account of the gain in light by avoiding the strong reflection from the front lens in air, also because the correction of the cover glass is greatly simplified, and besides the range or working distance is considerably increased. Naturally a lense constructed for immersion cannot be used satisfactorily for dry work, but Messrs. Powell and Lealand so arranged their objectives that by exchanging the front lens it could be changed from dry to immersion, or vice versa. Wenham still further improved upon this by so constructing the system that the objective could be changed from one form to the other by simply changing the distance between the first and second elements of the system, this being accomplished by turning a screw as in correcting for cover glasses in dry systems. See Fig. 6.

Wenham also seems to have been the first to suggest the advantage of substituting for water a liquid which should have the same dispersion and refraction as the cover glass and first lens of the objective, and it is to the zeal and energy of Zeis of Jena, under the able guidance of Dr. Abbé, that is due the almost perfect objectives which are available at the present day. The complex form shown in Fig. 7 is due to Abbé, and is known as an 'apochromat;' its cor-

MICROSCOPE



1. SIMPLE MICROSCOPE on stand for biological work
2. HIGH-POWER COMPOUND MICROSCOPE
3. PETROGRAPHIC MICROSCOPE
4. ABBÉ SUB-STAGE CONDENSER: 4a and 4b, lenses in section
5. HUYGENIAN EYEPIECE
6. RAMSDEN EYEPIECE
7. STEINHEIL POSITIVE EYEPIECE
8. MICROTOME

rections are so perfect that it appears that the theoretically ideal conditions have been reached. Bausch and Lomb in America and Carl Zeis in Germany are now constructing lenses under the specifications of Dr. Abbé. It should be stated in this connection that the present great success in the construction of lenses of all sorts is in large measure due to the manufacture by Schott of Jena of glass upon scientific principles, so that it is not only possible to get glass with the same optical properties in large quantities, and at any time, but it has been possible to make glass with just those optical properties which are wanted for any particular purpose. Objectives designed to be used as immersion lenses with a liquid of refraction and dispersion identical with that of the glass in contact with the liquid are called 'homogeneous' immersion lenses. Oil of cedar and oil of fennel are well adapted to use with such objectives.

Simple Microscope. A simple lens, or a combination of two or more lenses nearer together than the sum of their focal lengths, and acting as a single lens, so used as to supplement the optical system of the eye and increase the apparent size of an object, is properly called a simple miscroscope, or magnifying glass. The observer judges of the size of an object by the visual angle which it subtends. For example, AB, Fig. 1, appears larger than CD because the visual angle AEB is greater than the visual angle CED. Any device which increases the visual angle which an object subtends makes it appear larger. It is impracticable to bring the object indefinitely near to the eye and thus enlarge the visual angle, because the accommodation of the normal eye does not enable it so to adjust its optical system as to see distinctly an object much less than 20-25 cm. (eight or ten inches) distant. In other words, the normal eye can bring to a sharp focus on the retina only such rays of light as are parallel or slightly divergent. If a convex lens is placed close in front of the eye and an object in front of it, and distant a little less than its focal length, as shown in Fig. 2, the lens will form a virtual image, I, of the object, O, at A′B′, and the light issuing from LL is of such divergence as to be readily brought to a focus upon the retina by the lenses of the eye, and hence vision is distinct, and the visual angle and apparent size of the object are increased. From a consideration of Fig. 1 it is evident that practically the apparent increase in size is approximately proportional to the decrease in distance between the object and the eye. Under the normal conditions that the distance IE, Fig. 1, is at least 20-25 cm. (8 to 10 inches), and we can see distinctly only a comparatively small area at once, the angle AEB is small and approximately proportional to the ratio of AB to IE, hence AEB ÷ CED = FE ÷ IE, and the visual angle is inversely proportional to the distance from the eye to the object. Applying this to Fig. 2 gives A′B′ ÷ AB = IC ÷ OC, inasmuch as C is very close to the eye. IC is the distance of distinct vision, and OC is practically the focal length of the lens C. It is hence evident that the magnifying power of a simple lens is equal to the ratio of its focal length to the distance of distinct vision. For example, a lens of a focal length of 1 cm. (two-fifths of an inch) would magnify 25 cm. ÷ 1 cm. or 25 diameters. Magnifying powers are always given in 'diameters,' that is, in the magnifying of any linear dimension and not of the area of the object.

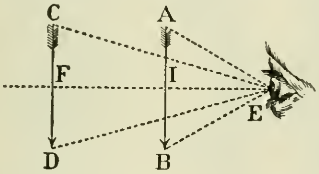


Fig. 1.

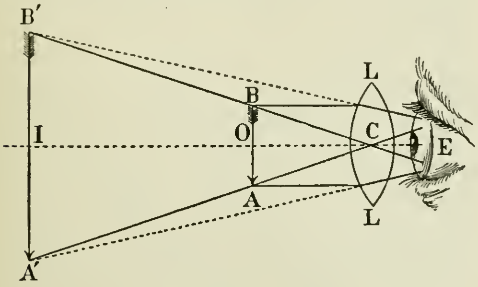


Fig. 2.

Simple lenses of very short focus are not well adapted to obtaining very high magnifying power, on account of their chromatic and spherical aberrations, which render the image so colored and indistinct that accurate work is impracticable. A form of stand for simple microscope especially convenient for biological work is shown on the accompanying plate (Fig. 1). A is the lens, or lens combination; B is the table for holding the object, and D is the mirror for concentrating light upon the latter; C is the rack and pinion enabling a convenient adjustment of the focus. Such instruments are useful for dissecting small organisms, and can be furnished with magnifying power up to 100 diameters. Fig. 3 shows several methods of obtaining strong combinations with less aberration, and without the cost of elaborate correction. Fraunhofer designed the doublet, *a*; *b* is a form used by Wilson; *c* is a so-called aplanatic triplet by Steinheil; *e* is the original Coddington, modified to the form *d* by Brewster, and *f* is the common cylindrical lens that obtains

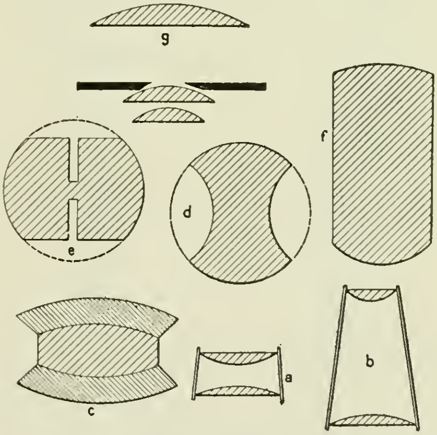


Fig. 3. lenses for simple microscope.

good results on account of the slight curvature of the face nearest the object; *g* is the original Holland triplet in which the diaphragm cuts off the stray light and improves the correction greatly, a result attained in *e* and *d* by the side cuts in toward the axis. Wollaston pointed out that the improvement in using the two lenses is in the fact that the aberration of one is in large measure corrected by the other, the diaphragm serving to cut off that portion of stray light which would interfere with the distinctness of the image. The field of vision is also larger and more nearly flat than when a single lens is used.

Compound Microscope. In its simplest form as invented by Janssen the compound microscope consists of two lenses as shown in Fig. 4. The so-called objective lens *cd* forms a greatly enlarged image of the object, *ab*, at *a'b'*. The eyepiece *lm* is a simple microscope, or magnifying glass, and the eye of the observer is at *e*. The magnifying power of such a combination is obtained as follows: the image *a'b'* is larger than the object in the proportion of *b'c* to *ca*, and the eye-piece *lm* magnifies the image *a'b'* in the proportion of its focal length to the distance of distinct vision, 25 cm. In a particular case: suppose *ca* is 0.2 cm., *cb'* is 20 cm. and the focal length of *lm* is 2 cm. Then the image *a'b'* will be larger than the object in the proportion of 20 to 0.2, i.e. 100; and the eye-piece *lm* will magnify the image in the ratio of 25 cm. to 2 cm., i.e. 12.5, and the total apparent increase in size will be 100 × 12.5, or 1250 diameters. The Huygens eye-piece, so called from its inventor, is also called a negative eye-piece, because the two lenses are too far apart to make its use possible in the same manner as other forms. The action of this eye-piece is shown in Fig. 5, and also on the accompanying plate. The objective would form an image at *aa* if it were not that the lens *ff* of the eye-piece is introduced, and consequently the combined effect is to form the image really at *bb*; this is then viewed by the eye-lens *ee*. A diaphragm is interposed at *bb* to cut off stray light and improve the distinctness. *ff* is called the field lens of the eye-piece, and *ee* is the eye-lens. The great advantage of this form of eye-piece lies in the fact that the chromatic and spherical aberration of the field lens, *ff*, is opposite and about equal to that of the eye-lens, *ee*. Although this lens is very satisfactory for general microscopic work, it is practically little used where it is necessary to use a micrometer (q.v.) in the eye-piece, or a cross-hair.

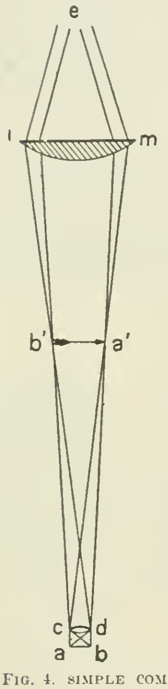


Fig. 4. simple compound.

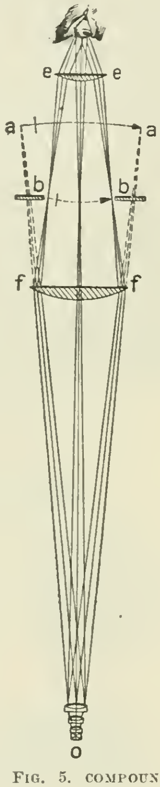


Fig. 5. compound microscope with huygens eye-piece.

Naturally the most important optical part of the microscope is the objective, as upon its perfection depend the satisfactory results of the whole combination. In its simplest form it is only a plano-convex lens with its flat side toward the object. As usually seen it is as shown in Fig. 6, with two or more achromatic pairs; the Zeis objective there shown also illustrates how the cover-glass correction is accomplished by varying the distance between the first two and the last two pairs of the objective, by means of a screw, E. Fig. 7 illustrates the lenses of one of Dr. Abbé's most perfect objectives, the 'apochromat.' In general the eye-piece must not be astigmatic, i.e. it must be able to form a real sharp image of a point. It must be orthoscopic, i.e. it must magnify all parts of the image equally. It must be achromatic, i.e. it must not show any colors not really present in the object.

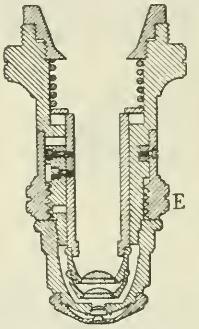


Fig. 6. section of zeis objective.

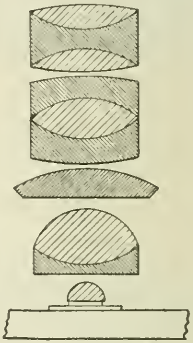


Fig. 7. 'apochromat' of abbé.

The above characteristics must also be possessed by the objective, even more essentially and perfectly than the eye-piece. In addition it is necessary to understand what is meant by other peculiarities of the objective. Under 'aperture' is meant the angle between the limiting rays of the effective beam in the formation of the image by the objective, for example, the angle *cad* or *cbd*, Fig. 4. This is naturally affected by the index of refraction of the medium between the object and the objective, and would hence be different with the same objective if it were used dry, as water immersion, or homogeneous immersion, and consequently it has been proposed to use the product of the sine of half this angle by the index of refraction, as indicating the effective aperture irrespective of the method of using the objective, and this constant is called the numerical aperture. The resolving power of an objective must not be confused with the magnifying power, for theoretically any desired degree of magnification can be obtained, but there is a definite limit to the resolving power set by diffraction phenomena, as pointed out by Dr. Abbé. Owing to the fact that a lens on account of diffraction is not able to form an actual point, as the image of a point, it is evident that if the little rings which are formed overlap, then no degree of further magnification can separate them, and they will confuse the vision. It has been shown that the success of an objective in gathering in all the components due to diffraction is directly dependent upon the numerical aperture. Abbé has calculated that the theoretical limit of resolving power for an aperture of 180° would be lines about 120,000 to the inch, falling to about 95,000 for 107°. This has been nearly reached in some of the best instruments. Theoretically two lines must be distant from each other at least $\lambda /2a$, in order to be seen distinctly, where a is the numerical aperture and λ is the wave length of the light.

In order to make use of the highest efficiency of the objective it is necessary to devote much attention to the concentration of the light upon the object in order that the image may be well lighted and also that the full aperture of the objective may be utilized. A form of condenser which is placed under the object is shown in the accompanying plate (Fig. 4); S*p* is the mirror for reflecting the light into the condenser S, and the rest is mechanism for suitable adjustments. The adjoining figures show the section of such a condensing lens.

On the accompanying plate (Fig. 2) is shown a modern microscope of a high order as fitted for general and biological work. The main stand S is so hinged that the top may be tilted at any angle and clamped by the lever M. The 'tube' A carries at its lower end a 'triple nose-piece,' D, enabling the observer rapidly and easily to exchange objectives, C, F, etc. In the upper end of A is the 'draw tube,' B, enabling the observer to change the distance between his objective, C, and eye-piece, E. LCKJ is the stage or table on which the objects are placed. K is a vernier reading the angular rotation of the stage. L and J are milled heads operating the mechanical stage, making it possible to move the object regularly up and down or right and left in searching for an object in the slide, in counting, and the like. I is the substage condenser and its mounting, including a diaphragm. NO is the rack and pinion for rough adjustment of the focus, and G is the fine adjustment making it easy to adjust accurately the focus of a high-power objective and in some cases to make measurements.

A similar instrument as fitted for petrographic work where polarized light is used is also illustrated on the plate. This particular microscope is not fitted with a mechanical stage. At P is introduced a 'polarizer,' Nicol prism for furnishing a beam of polarized light, and another Nicol prism used as the analyzer is slid into the side of the tube at R or for other combinations at S. U is a rack and pinion for the adjustment of the draw tube, B. For some purposes the analyzer is put on top of the eye-piece at T. Either the polarizer or the condenser may be turned out from under the stage when not wanted. Between the objective and the analyzer is a side slot, into which may be introduced the quartz wedge, mica plate, etc., which are used in the determination of the optical constants of the minerals under study. For use in such instruments the rock to be investigated is ground to a very thin section mounted upon a glass strip, like any microscope preparation. Under these circumstances most minerals are quite transparent and the student is enabled not only to learn the size and form of the grains, but also to subject them to an investigation under polarized light and identify their optical properties and determine completely their nature. The petrographic miscroscope has revolutionized the study of rocks.

There is also the binocular microscope, in which two eye-pieces are used in order to secure a stereoscopic effect. (See STEREOSCOPE.) In a binocular microscope there is the usual arrangement of the objective, but one or more prisms of special design are interposed so as to deflect some of the rays to a second eye-piece. It is unavoidable that a certain amount of light is cut off in passing through the prism, or that the path of the rays is increased so that where the highest powers are employed the binocular is not used.

There are used in connection with the microscope many forms of the 'camera lucida' (q.v.), a device to enable the operator to make a drawing of the object under study by tracing over the virtual image which he seems to see on the paper as the eye of the observer sees both the light which comes up from the object and that which comes from the paper and pencil below the miscroscope. In preparing slides for work in microbiology it is necessary that the material should be in very thin sections, and this is accomplished by imbedding the whole object in paraffin and then shaving off thin sections with a 'microtome,' one form of which is shown on the accompanying plate (Fig. 8). Afterwards the paraffin is removed, and the shaving mounted upon a glass slide. These preparations are usually hardened by chemicals, and are frequently dyed with special solutions, which may, for example, color the nerves and not the other parts, thus bringing out the contrast, and assisting the work. Under some circumstances the object is frozen by means of liquid carbonic acid gas and then shaved in sections.

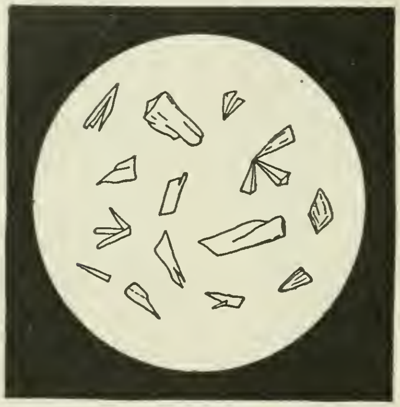
It should be evident that by a simple device a camera may be made to take the place of the eye in any of the above cases, and by that means photographs may be taken of the objects under investigation. For the early history of the microscope, the reader should consult Gerland and Traumüller, *Geschichte der Experimentierkunst* (Leipzig, 1899). Drude, *Lehrbuch der Optik* (Leipzig, 1900), translated into English as *The Theory of Optics* by Mann and Milikan (New York, 1902), should be read for the theoretical side. A practical and complete treatise is Carpenter, *The Microscope* (8th ed., edited by Dallmeyer, Philadelphia, 1901). See MICROSCOPY, CLINICAL.

MICROSCOPICAL SOCIETY, THE AMERICAN. An association organized in 1878 and incorporated in 1891, at Washington, D. C. It has a membership of three hundred, and an extensive collection of specimens and exhibits at Pittsburg, Pa. Its objects are the encouragement of microscopical research, and the diffusion of knowledge on the subject of microscopy.

MICROSCOPY, Clinical. With the rapid increase made in comparatively recent times in the perfection of instruments at our disposal and in our knowledge of the differences in normal and pathological appearances of body tissues and organs and their products, the microscope has come to be an indispensable adjunct to medical diagnosis. (See Microscope for description of the clinical and other microscopes.) For most diagnostic work two objectives are sufficient, a low power having a focal length of about two-thirds of an inch, and a high power having a focal length of about one-fifth of an inch. For work upon bacteria and upon the blood a higher magnification is often desirable. See Microscope for further description and illustrations.

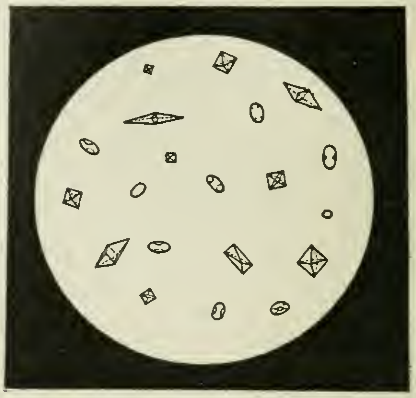
Before examining with the microscope most specimens require some special preparation. As these preparations differ for different specimens, they will be described under separate headings.

Urine. Microscopic examination of the urine is made for the purpose of determining disease of the kidney, ureter, bladder, urethra, etc. For microscopic examination the specimen of urine should be allowed to stand for from eight to twelve hours and the part examined taken by means of a pipette from the bottom of the fluid, or the urinary solids may be thrown down by means of a centrifugal machine called the centrifuge. A small drop of the urine is placed upon a glass slide and covered by a thin piece of glass known as a cover glass. The specimen may then be examined.

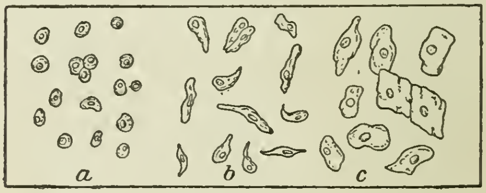


CRYSTALS OF CALCIUM PHOSPHATE X 150.

Crystalline Substances. (a) Uric acid occurs as 'whet-stone' shaped crystals. These lying across one another in groups form radiating masses or rosettes. Crystals somewhat dumb-bell in shape are less common, and after the addition of acid to urine large plate-like crystals of uric acid may be found. (b) The salts of uric acid or urates may also be seen under the microscope, usually as a granular deposit, 'amorphous urates.' In urine which is undergoing ammoniacal fermentation, ammonium urate crystals occur either as clumps of short thick needles or as rough spherical crystals. (c) Hippuric acid crystals are rather infrequently found in acid urine. (d) Phosphates, ammonium-magnesium or 'triple phosphate' crystals occur in slightly acid and in alkaline urine. They are large and are usually described as 'coffin-lid' in shape. In alkaline urine the phosphates sometimes come down as fine feathery 'snow-flake' crystals. Calcium phosphate occurs as clear, slender, needle-shaped crystals. Large colorless plate-like crystals of basic magnesium phosphate and granular deposits of the basic phosphates of lime and magnesium may also be found in alkaline urine. (e) Calcium oxalate crystals occur in acid urine. They are clear and diamond or 'envelope' shaped. Less common are crystals of a somewhat dumb-bell shape. (f) Calcium carbonate is found in alkaline urine which is undergoing fermentation. It occurs as coarse granules which dissolve with gas formation on the addition of acetic acid. (g) Less common crystals found in urinary sediments are those of bilirubin, hæmatoidin, leucin, tyrosin, and cystin.



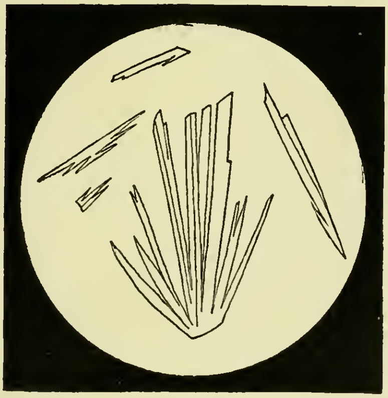
CRYSTALS OF CALCIUM OXALATE X 350.



EPITHELIAL CELLS.
(*a*) Round; (*b*) columnar; (*c*) squamous.

Organic Substances. (a) Epithelial cells mainly from the bladder and vagina occur in normal urine. In inflammatory conditions of the bladder and vagina their number is greatly increased. Epithelium from the kidney may also occur in the urine. It is cuboidal or columnar in shape and most abundant in degenerative conditions of the kidney, and in disease of the kidney pelvis. Pigmented columnar epithelium from the seminal vesicles may sometimes be found. (*b*) Casts are among the most important of the organic substances found in urine, indicating as they often do serious conditions in the kidneys. They are formed by the coagulation of albuminoid matter in the tubules of the kidney, thus

CLINICAL MICROSCOPY



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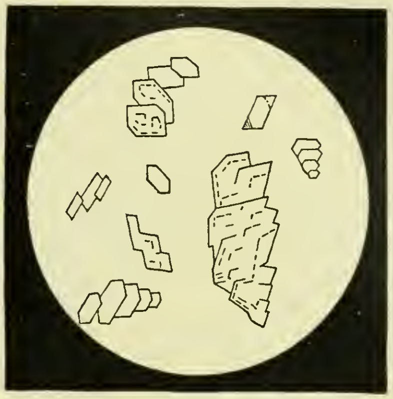

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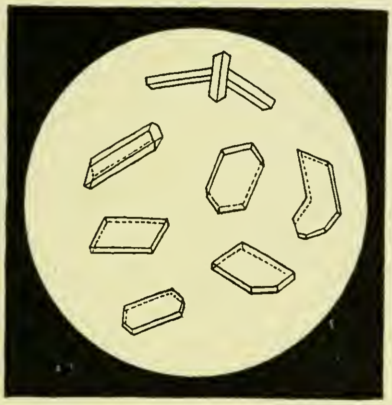

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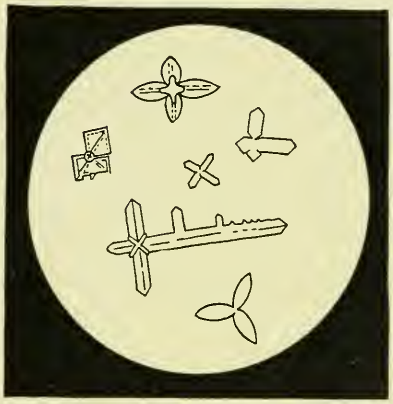

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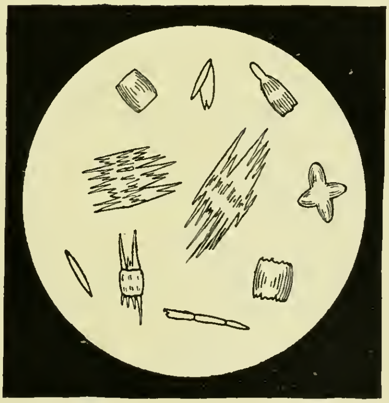

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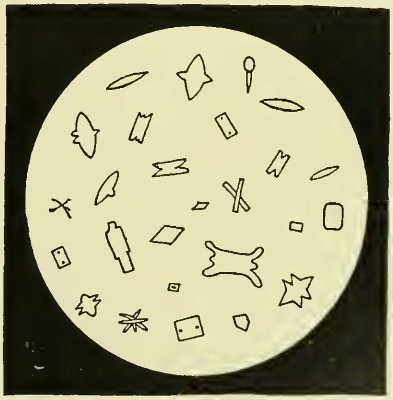

6

1. UREA FROM WATER SOLUTION, magnified 25 times.
2. UREA NITRATE, magnified 75 times.
3. UREA OXALATE, magnified 75 times.
4. UREA SODIUM CHLORIDE, magnified 75 times.
5. URIC ACID FROM ACID URINE, magnified 25 times.
6. URIC ACID FROM SNAKE'S EXCREMENT, magnified 200 times.

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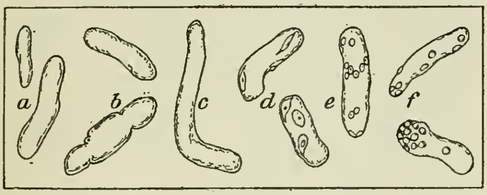
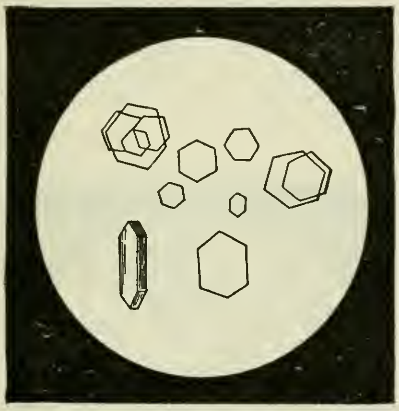
producing casts of the tubules. From here they are washed along the urinary tubules into the urine. Casts almost clear composed of albumin and a few fine granules are known as hyaline casts. Occurring in small numbers hyaline casts may be of little significance, being present in functional albuminuria in the urine of old persons and often in urine otherwise normal. In chronic inflammation of the kidney these casts occur in large numbers. So-called 'waxy' casts are less transparent than the hyaline and turn brown when subjected to the action of iodine. They are characteristic of the waxy degeneration of the kidney which sometimes accompanies chronic nephritis. Casts containing epithelial cells are known as epithelial casts. They are associated with acute disease of the kidney. Blood casts, or casts containing red blood cells, are found in urine in cases of acute exudative nephritis and in connection with the hemorrhages which sometimes occur. Pus casts, or casts containing pus cells, are found in suppurative nephritis and in some of the more severe cases of acute nephritis. Casts containing fine or coarse granules are of frequent occurrence.

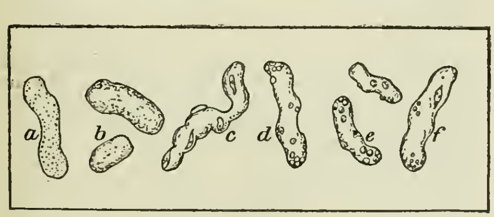


CASTS.

(*a*) Hyaline; (*b*) waxy; (*c*) hyaline and granular; (*d*) hyaline and epithelial; (*e*) hyaline and blood; (*f*) hyaline and pus.



CRYSTALS OF CYSTIN.

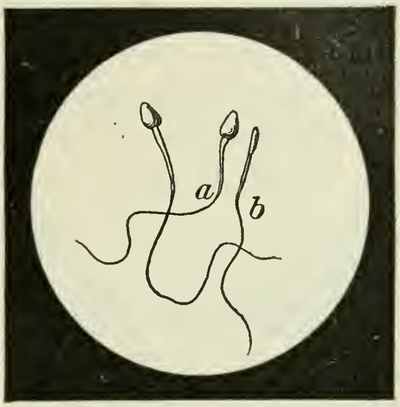


CASTS.

(*a*) Fine granular; (*b*) coarse granular; (*c*) epithelial; (*d*) blood; (*e*) pus; (*f*) fatty.

Pus cells are found in the urine in the more severe forms of acute nephritis and in suppurative inflammation of any part of the genito-urinary tract. Pus is most abundant in cystitis; less abundant and more thoroughly mixed with the urine in pyelitis; least abundant, and confined mainly to the first part of the specimen passed, in urethritis.

Red blood cells appear as round biconcave disks, about seven micromillimeters in diameter. They may be found in severe acute inflammations of the genito-urinary tract and in conditions determining hemorrhage along the tract.



HUMAN SPERMATOZOA GREATLY MAGNIFIED.

(*a*) View of broad surface; (*b*) view in profile.

Spermatozoa are frequently found in the urine of healthy individuals. Constant presence of spermatozoa in the urine may occur in certain diseases of the prostate and seminal vesicles. The condition is also frequently present in sexual neuroses.

Yeast and mold plants are frequently found in the urine of diabetics, more rarely in other conditions.

Bacteria. Normal urine in the normal bladder contains no bacteria. Non-pathogenic bacteria are, however, frequently added to the urine from the urethra or from the external genitals. Of these the Micrococcus ureæ is one of the most common. The smegma bacillus is also sometimes present in large numbers and is important from the similarity which it bears to the tubercle bacillus as regards its staining qualities. Of pathogenic bacteria found in urinary sediments may be mentioned the Staphylococcus pyogenes, Streptococcus pyogenes, the colon bacillus, tubercle bacillus, and gonococcus. In such infectious diseases as septicæmia, pyæmia, erysipelas, diphtheria, and tuberculosis the specific germ of the disease is sometimes found in the urine. For descriptions of the appearance which these different germs present under the microscope the reader is referred to the special articles on the diseases which they cause. For a description of the staphylococcus and streptococcus the reader is referred to the article on Bacteria. In examining urinary sediment for bacteria, a small amount of the sediment is taken up with a platinum loop and smeared on a cover glass in a thin layer. This is allowed to dry. To fix the specimen on the cover glass, the cover glass is passed through a blue flame of sufficient heat to bring the specimen just to the boiling point of water. The specimen may now be stained by placing upon it a few drops of a watery solution of fuchsin, gentian violet, or methylene blue. After staining it is washed in water and may then be examined.

For other organisms more rarely present in urine the reader is referred to special works upon microscopical urinalysis.

Blood. The main purposes for which blood is examined microscopically are as follows:

(1) To determine the number of red blood cells.

(2) To determine the richness of the red cells in hæmoglobin.

(3) To determine the size, shape, etc., of the red cells and the presence of forms of cells not found in normal blood, e.g. nucleated red blood cells.

(4) To determine the number of white blood cells.

(5) To determine the relative proportion of the different kinds of white blood cells—'differential count of leucocytes.'

(6) For the plasmodium malariæ.

(7) In suspected typhoid for Widal's reaction.

(8) For bacteria and other foreign substances.

For description of the normal histology of blood the reader is referred to the article on Blood.

Counting the Red Blood Cells. This is best accomplished by means of Thoma's hæmatocytometer or blood-counting apparatus. This consists of a pipette with bulb and graduated capillary tube. The graduation of the tube is 0.5 and 1, that of the bulb and tube together 100. By filling the tube to mark 1 with blood and then the bulb and tube to mark 100 with an inert diluting fluid such as normal saline, a dilution of 1 to 100 is obtained. The counting slide has in its centre a round chamber, in the centre of which is a raised flat glass surface which is marked off into 400 equal squares, each of which is one four-hundredth of a square millimeter. The surface of the marked-off area is just one-tenth of a millimeter lower than the surface of the rest of the slide. A drop of the diluted blood is placed upon the centre of the graduated area and a flat cover glass placed over it. As will be seen, the amount of fluid over one of the small squares is one-tenth times one four-hundredth or one four-thousandth of a cubic millimeter. The number of cells in one square is then counted. This multiplied by 4000 and then by the dilution, 100, gives the result desired, i.e. the number of red cells in one cubic millimeter of blood examined. In actual practice a large number of squares is counted and the average taken. The white blood cells may be counted in the same specimen if desired. Owing, however, to their smaller number, a larger number of squares should be counted to avoid error. For determining the richness of the individual corpuscles in hæmoglobin, the shape and size of the cells, the relative number of the different kinds of white cells, the presence of the malaria plasmodium, etc., the preparation of fixed and stained specimens is required as follows. Blood from a needle prick is taken up on the end of a glass slide and this is drawn across the surface of a second slide, thus making a thin 'smear' of blood. This is dried quickly in the air, after which it is 'fixed' by equal parts of alcohol and ether, the vapor of osmic acid or of formalin, or by subjecting to the action of dry heat. The specimen is now ready for staining. A combination of eosin and methylene blue, and Ehrlich's triacid stain, are the most satisfactory. After staining the specimen is washed in water. The eosin-methylene blue method is the most satisfactory for general purposes and stains the malaria plasmodium. Ehrlich's stain is most satisfactory for making a differential count of the leucocytes.

Persistent marked reduction in the number of red cells occurs in primary pernicious anæmia and in the severe secondary anæmias due to some of the infectious diseases. It may also be due to the action of certain mineral poisons (phosphorus, arsenic, etc.), to long-continued suppurative processes, cancer, malaria, conditions of malnutrition, etc.

Loss in the hæmoglobin content of the individual cells occurs especially in that form of anæmia known as chlorosis. Moderate diminution in number of cells may also occur. In leucocythæmia there may also be both a reduction in the number of cells and a reduction in hæmoglobin content. This loss on the part of the individual cell in hæmoglobin is shown in the eosin-stained specimen by an increase in the clear central area of the cell.

Irregular red cells (poikilocytes), small red cells (microcytes), and large red cells (megalocytes) are found in severe anæmias whether primary or secondary.

Nucleated red blood cells are found in all forms of anæmia. As they represent developmental types, their presence may be construed as an attempt on the part of nature to replace lost cells. Very large nucleated red cells (megaloblasts and gigantoblasts) are sometimes present in severe anæmias.

HUMAN RED BLOOD CORPUSCLES AND TWO LEUCOCYTES.

Moderate increase in the number of white blood cells occurs physiologically during the first few days after birth, in the later months of pregnancy, and after eating. Pathological increase in the number of white cells occurs in many of the infectious diseases, especially those accompanied by exudation or suppuration. It is notably absent in typhoid, typhus, tuberculosis, measles, and malaria. Lymphocytosis, or increase in the number of lymphocytes, is frequent in the later weeks of typhoid, in anæmia, in intestinal diseases of children, and in lymphatic leucocythæmia. Persistent increase in the number of white blood cells independent of other lesions is characteristic of leucocythæmia. This increase may be very great, and is usually irregular, i.e. the proportionate numerical relation of the different kinds of white blood cells is changed. In lymphatic leucocythæmia the greatest increase is in the lymphocytes. In myelogenous leucocythæmia the increase in leucocytes is often enormous, sometimes more than a million per cubic millimeter. Abnormal forms of leucocytes also appear.

In patients suffering from malaria the plasmodium malariæ may be found. The forms which the organism assumes are known as tertian, quartan, and æstivo-autumnal. They occur within the red blood cells, rarely in the plasma. The recognition of the malarial parasite requires extremely careful technique and experience. For more detailed description of the parasite and of the methods used in the detection of the same the reader is referred to Delafield and Prudden's *Handbook of Pathological Anatomy and Histology*, ed. 6, with references on page 259.

Free pigment is sometimes found in the blood. This condition is known as melanæmia.

Various foreign bodies such as fat, air, bacteria, animal parasites (distoma hæmatobium, filaria sanguinis hominis, and the eggs of the trichina and echinococcus), endothelial cells, pus cells, tumor cells, etc., are sometimes found in the blood.

Examination of the blood in typhoid for the so-called Widal reaction should be mentioned. The blood or serum to be examined is mixed with ten times its amount of a twenty-four-hour-old broth culture of the typhoid bacillus and examined under the oil immersion lens. A positive reaction consists in the rendering motionless of the bacilli and their collection into groups. If a reaction with the one to ten dilution occurs, a one to twenty should be tried. Positive reaction with the one to twenty dilution makes the diagnosis of typhoid extremely probable. A negative result is of less value.

Stains may be examined to determine the presence or absence of blood, as follows. A drop of normal saline solution to which a few scrapings from the stain have been added is evaporated on a glass slide. This is then covered and a drop of glacial acetic acid allowed to run under the cover. The preparation is next heated until it bubbles. More acid is added and the slide heated until a brownish color appears. The specimen is then slowly dried and mounted in glycerin. If any blood was present it is shown by the presence of small rhombic crystals which result from the conversion of hæmoglobin into hæmin.

Fæces may be examined by mixing a small amount with a drop of normal saline solution on a glass slide and covering with a cover glass. Detritus from incomplete digestion of food forms a large part of normal fæces. Thus it is common to find in a specimen of fæces vegetable cells of various kinds, starch granules, muscle fibres from meat, fat globules, coagulated albumins, etc. In addition to these there are usually found mucus and epithelial cells, and not infrequently crystals of calcium oxalate, calcium phosphate, calcium sulphate, the fatty acids, triple phosphates, cholesterin, etc.

Epithelial cells in large numbers are frequently associated with intestinal catarrh, especially in children.

Red blood cells may be found in conditions associated with hemorrhage.

Pus cells are frequent in catarrhal inflammations of the bowels. They are more abundant when the inflammation is suppurative in character. In typhoid fever and other ulcerative conditions, bits of an ulcer which has sloughed, or groups of epithelium with pus cells attached may be found in the fæces.

BACTERIA X 500.

A large variety of bacteria are present in normal fæces. Some of these gain entrance with the food; others are normal habitats of the gastro-intestinal canal. Among these may be mentioned the Bacillus coli communis, Proteus vulgaris, Leptothrix, and the Bacillus lactis aerogenes. Under certain as yet little understood conditions, it appears that some of these micro-organisms may assume pathological significance.

The typhoid bacillus occurs in the stools of persons suffering from typhoid fever. As its appearance under the microscope is identical with that of the Bacillus coli communis, the two must be differentiated by biological methods.

Tubercle bacilli may be found in the fæces. (For method of staining, see TUBERCULOSIS.) Occurring with pulmonary lesions and without intestinal symptoms, their source is usually in swallowed sputum. If, however, symptoms of enteritis are associated with tubercle bacilli in the stools, there is certainly a strong probability that the enteritis is tubercular.

The 'Comma' bacillus is present in the stools of persons suffering from Asiatic cholera.

The Amœba coli is found in the fæces in amœbic colitis. It is best to examine stools for amœba as soon as possible after their passage and in the warm stage, as their motility is a valuable aid in its detection.

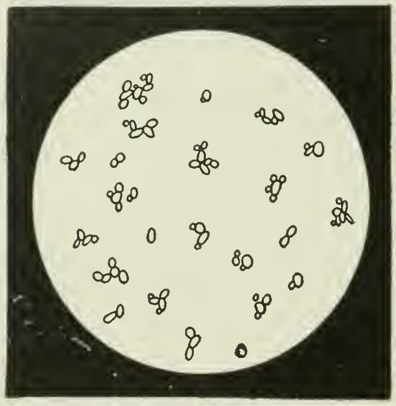
Sputum is examined microscopically to determine the character of the secretion of the respiratory tract. It may be examined by smearing on a cover glass or slide, fixing and staining with dilute aqueous solution of methylene blue. If there are little lumps of cheesy matter scattered through the sputum, it is well to select one of these from which to make the smear, especially if the tubercle bacillus is to be looked for. Photographs of typical bacteria as seen through the microscope are shown in the article Disease, Germ Theory of.

Epithelial cells from various parts of the respiratory tract are often present. Their origin can frequently be determined by their appearance.

Red blood cells occur in the sputum in acute bronchitis, pneumonia, tuberculosis, and in any condition which is associated by hemorrhage into the respiratory tract.

White blood cells are also readily recognized in methylene blue stained specimens by their irregular or multiple nuclei and their unstained cell bodies. They are found in acute and chronic bronchitis, in pneumonia, tuberculosis, abscess, and gangrene of the lung, in fact in any inflammatory condition of the respiratory tract which is marked by a catarrhal or suppurative exudation.

Mucus, fat droplets, fibrin, elastic fibres, crystals of calcium carbonate, of triple phosphates, of cholesterin, of the fatty acids, and the so-called Charcot-Leyden crystals may be found in sputum on microscopical examination.



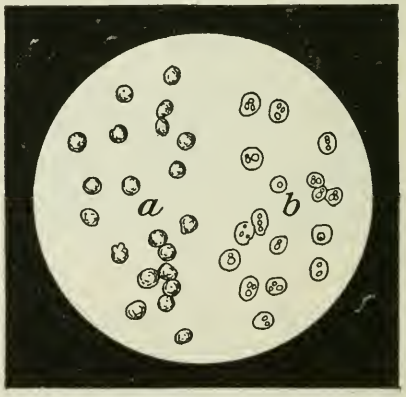
YEAST X 250.

A large number of harmless species of bacteria are found in sputum, most of these being derived from the mouth, nose, and upper respiratory tract. Of disease-producing species the most important are the tubercle bacillus, the bacillus of influenza, the pneumo-bacillus of Friedländer, the pneumococcus, the streptococcus, and the staphylococcus. (For the staining qualities and appearance of the tubercle bacillus, see article on Tuberculosis.) The bacillus of influenza is an extremely minute bacillus measuring only about half the length of the tubercle bacillus. It is apt to occur in clumps and does not stain very readily with methylene blue. A rather weak solution of carbol-fuchsin, however, gives good staining of the micro-organism. The bacillus of Friedländer is the less common of the pneumonic organisms. It is capsulated and decolorizes by Gram's method. (See Bacteria.) The more common cause of pneumonia, the pneumococcus or diplococcus lanceolatus, is also surrounded by a capsule, but is shorter than the Friedländer bacillus and does not decolorize by Gram's method. For the appearance of the streptococcus and the staphylococcus, see article on Bacteria.

The 'ray' fungus, or fungus of actinomycosis of the lung, is sometimes demonstrable in the sputum, as are also yeasts, molds, and leptothrix.

Microscopical examination of specimens from the stomach is often of value in determining the condition of that organ. Material is obtained as vomitus or by introducing the stomach tube. Incompletely digested food may be recognized as muscle fibres, fibrous and elastic fibres, fat, starch, and various kinds of vegetable cells. Epithelial cells from the mouth or œsophagus or from the stomach itself may be found. Red blood cells may come from the stomach or may have been swallowed. White blood cells are quite commonly found. When in large numbers they indicate suppurative inflammation. The condition of the stomach may sometimes be determined by the forms of micro-organism which are found growing there. Thus a long bacillus which occurs in chains, the so-called Boas-Oppler bacillus, is a common habitat of a stomach which is free from hydrochloric acid, and whose contents are undergoing lactic acid fermentation. The Sarcinæ, on the other hand, a species of cocci which

MOLD PLANTS X 100.



PUS CELLS.

(*a*) natural condition; (*b*) after the addition of acetic acid.

hang together in cubes of eight, sixteen, thirty-two, etc., occur in exactly opposite gastric conditions, i.e. where hydrochloric acid is present and lactic acid is absent. Yeasts, molds, and leptothrix are also found.

Serous exudates usually show little of diagnostic import. After standing or after centrifuging, the sediment may show some epithelial cells, red blood cells, leucocytes, fat globules, cholesterin crystals, etc. Bacteria, if present, are usually in such small numbers as to require culture for their recognition. Fairly frequently, however, the gonococcus may be found in the exudate of gonorrhœal arthritis, by simply staining the sediment by Gram's method. (See BACTERIA.) Less frequently the tubercle bacillus may be identified in a similar manner.

Purulent exudates when examined under the microscope show large numbers of pus cells which are mainly polynuclear leucocytes. Red blood cells and exfoliated epithelium are also often present. Of bacteria may be mentioned the tubercle bacillus, the bacillus of anthrax, the diphtheria bacillus, the streptococcus, staphylococcus, gonococcus, and pneumococcus. For methods of examining for tubercle bacillus, see article on TUBERCULOSIS; for streptococcus, staphylococcus, and gonococcus, see article on BACTERIA; for pneumococcus, see PNEUMONIA.

The diphtheria or Klebs-Loeffler bacillus may be found in sputum. For examination it is usually, however, obtained directly from the suspected membrane. See DIPHTHERIA.

Leptothrix and Oidium albicans are organisms sometimes found in exudates associated with diseases of the mouth and pharynx. The former is not infrequently the apparent cause of very obstinate pharyngitis, while the latter is found in connection with the disease known as thrush.

TISSUES AND ORGANS. The examination of pieces of tissue or of organs for the purpose of determining the nature of the disease affecting them is often of great importance.

Some tissues may be examined in the fresh state by simply teasing apart in such an inert fluid as normal saline solution (three-quarters per cent. aqueous solution of sodium chloride). The satisfactory examination of most tissues requires, however, a more or less elaborate preliminary preparation. This consists in (1) fixing, (2) hardening, (3) imbedding, (4) section cutting, (5) staining, and (6) mounting.

(1) *Fixing.*—This consists in placing the tissue, as soon as possible after its removal, in a solution which will kill the tissue elements rapidly so that they retain the same form and structure that they had during life. Of the most commonly used fixing agents may be mentioned alcohol; formalin, in aqueous solutions of from 2½ to 10 per cent.; and Müller's fluid (potassium dichromate, 2.5 grams; sodium sulphate, 1 gram; water, 100 c. c.).

(2) *Hardening and Preserving.*—After fixing, tissues are usually thoroughly washed in running water and then hardened in graded alcohols, i.e. first in 50 per cent., then in 60 per cent., then in 80 per cent. For permanent preservation they are usually left in 80 per cent. alcohol.

(3) *Imbedding.*—This is for the purpose of impregnating the tissues with some substance which will hold them together during the subsequent manipulations. The now most commonly employed imbedding mass is celloidin, although for special purposes paraffin is used.

(4) *Section Cutting.*—This is now accomplished by means of an instrument known as a microtome. While many of these instruments are quite complicated, the purpose of them all is to carry a knife through the specimen in such a way that sections of any desired thickness may be obtained.

(5) *Staining.*—Sections may be stained in a great variety of ways. For general purposes what is known as 'staining double' gives satisfactory pictures. This is accomplished by staining the specimen first in a watery solution of hæmotoxylin and then in an alcoholic solution of eosin. The specimens are next placed in oil of origanum, which removes the alcohol and renders the sections more transparent ('clearing').

(6) *Mounting.*—From the oil the section is transferred to a glass slide, the excess of oil removed by blotting with filter paper, a drop of Canada balsam placed on the specimen, and the whole covered by means of a cover glass. This makes a permanent mount.

For other methods of staining and mounting the reader is referred to special text-books on histology and histological technique.

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MI′CROSOME (from Gk. μικρός, *mikros*, small + σῶμα, *sōma*, body). A name given to minute granules which occur in protoplasm.

MI′CROSPORAN′GIUM (Neo-Lat., from Gk. μικρός, *mikros*, small + σπόρος, *sporos*, seed + ἀγγεῖον, *angeion*, vessel, from ἄγγος, *angos*, jar). The spore-case (sporangium) which produces the microspores. For example, the pollen sacs of flowering plants are microsporangia. See HETEROSPORY; SPORANGIUM.

MI′CROSPORE (from Gk. μικρός, *mikros*, small + σπόρος, *sporos*, seed). In the higher plants, the smaller of the two kinds of spores produced. They develop the small male plants (male gametophytes). Pollen grains are microspores of flowering plants. See HETEROSPORY; SPORE.

MI′CROSPOR′OPHYLL (from Gk. μικρός, *mikros*, small + σπόρος, *sporos*, seed + φύλλον, *phyllon*, leaf). In higher plants, the leaf structures (sporophylls), that bear the microspores, e.g. the stamen of flowering plants. See HETEROSPORY; SPOROPHYLL.

MI′CROTASIM′ETER (from Gk. μικρός, *mikros*, small + τάσις, *tasis*, extension + μέτρον, *metron*, measure). An instrument invented by Thomas A. Edison in 1877 for the purpose of measuring very minute variations of temperature or moisture. The action of the apparatus depends on the effect which the pressure of an expanding rod has upon the electrical resistance of a piece of carbon placed in the circuit of a galvanic battery. A rod of vulcanite is used as the expanding element when it is desired to employ the instrument to ascertain slight variations in the heat vibrations coming from any object, as the sun, or a gas or electric light. This rod is adjusted in a strong frame kept at an equable temperature, so that no expansions or contractions shall exert any influence except those which take place in the vulcanite rod itself. In the chamber which receives one end of this rod or plate there is placed under a follower or slide a piece of carbon, which becomes compressed with great force upon the expansion of the vulcanite rod. If radiant heat is to be measured, a large funnel is placed in front of the apparatus to gather the rays and throw them upon the rod or plate. When the rays increase in intensity the rod expands, compresses the button, and changes its resistance, the variation of which is indicated by a galvanometer. The instrument was used to ascertain the variations in the radiation from the sun during the solar eclipse of July 28, 1878. It may also be used to note the variations taking place on a day when clouds are passing across the sun's disk, or when the transmission of its rays is affected by increase or decrease of moisture. It may be used as a delicate hygrometer by substituting in place of the vulcanite rod a body containing gelatin, which expands under the influence of moisture. The chief disadvantage possessed by this instrument is that the carbon does not regain its original resistance after the pressure is removed. Modern micro-radiometers and bolometers are, in addition, far more sensitive and are usually employed for the measurement of radiation.

MI′CROTOME. See MICROSCOPE, and Plate of MICROSCOPE.

MI′DAS (Lat., from Gk. Μίδας). A common name of the more ancient Phrygian kings, of whom Midas, the son of Gordius and Cybele, is the most famous. According to one legend he captured Silenus by mixing wine with the water of the fountain at which the god drank, and thus secured for himself the wisdom of the god. Herodotus tells this story as Macedonian, but later writers transferred it to Phrygia. Another version, told by Ovid, relates that he restored Silenus to Dionysus, and when asked by the god to name his reward, prayed that whatever he touched might become gold, from which so great inconvenience ensued that he was glad to get himself relieved from the burden by washing, at the command of the god, in the Pactolus, the sands of which became thenceforth productive of gold. Another legend represents him as having offended Apollo by assigning the prize in the musical contest to Marsyas, or in later versions to Pan, and as having therefore been endowed by him with a pair of ass's ears. These, concealed under his Phrygian cap, were known only to his barber, who dared tell no man, but, unable to contain his secret, whispered it to the earth. His precaution, however, was vain, for the reeds which sprang up at this spot, as they rustled in the wind, proclaimed the news to the world. Midas seems an ancient Phrygian nature-god, probably conceived, like Silenus and other similar fructifying deities, in animal form, but transformed by Greek story-tellers. The story of the ass's ears is a common folk-tale.

MI′DAS. A genus of marmosets; but sometimes the special name of the marakina (*Midas rosalia*). See MARMOSET.

MIDDELBURG, mĭd′d'l-bo͞org. The capital of the Province of Zealand, Netherlands, situated on the island of Walcheren (Map: Netherlands, B 3). It is connected with the sea by a canal five miles long, which admits ships of heavy burden. The city is surrounded by a broad canal, and has handsome houses, ornamented with gardens; the canals and streets are shaded with trees. The town house, built in the sixteenth century, has a beautiful tower, and is decorated with twenty-five colossal statues of counts and countesses of Holland. At the beginning of the thirteenth century an abbey was founded here, which was later enriched by William II., Count of Holland and Zealand. The buildings are now occupied as the meeting place of the Provincial States. The new church contains the tomb of the naval heroes J. and C. Evertsen, and a monument to the German King William of Holland. The town possesses a provincial library, a gymnasium, a high school, and a normal school, and is the seat of several learned societies, with important collections of antiquities and objects of local interest. The city's commerce was formerly very large. It has some inland trade in grain, potatoes, and madder, and manufactures of cotton goods. Population, in 1892, 17,560; in 1900, 18,837. Middelburg was a Hanse town in the Middle Ages, having received its charter in 1225. In 1574, during the war for independence, it was captured by the Dutch from the Spaniards after a siege of two years. It suffered heavily during the wars between England and France in the beginning of the nineteenth century.

MIDDELBURG, PAUL OF (1445-1534). A Dutch mathematician, born at Middelburg, whence his name. He studied at the University of Louvain, took orders, became canon of Saint Barthélemy at Middelburg, and also taught mathematics, medicine, philosophy, and theology there. For having expressed himself regarding the faults of his fellow-citizens, he was banished from the town. He went to Louvain, where he lectured on mathematics so successfully that the Grand Council of Venice offered him the chair of mathematics at Padua. By 1484 he was at the Court of Francesco Maria della Rovera, Duke of Urbino, to whom he became physician and by whom he was appointed to the abbacy of Castel Durante. It was also at the instigation of the Duke that he was elected Bishop of Fossombrone in 1494. In 1513 he presided at the Fifth Lateran Council (1512-17), where he spoke on the necessity of a revision of the existing calendar, later undertaken by Gregory XIII. He was esteemed the first mathematician of his day. His publications include: *Practica de Parvis Constellationibus* (1484); *Epistola Apologetica Magistri Pauli de Middelburgo* (1487), in which he answers various objections raised by mathematicians against a revision of the Julian calendar; and *Paulina de Recta Paschæ Celebratione* (1513), in which he demonstrates with much learning that, owing to defective reckoning, the Easter festival was frequently celebrated at a period a month earlier than that determined by the Council of Nice. Consult: Baldi, *Cronica de' matematici* (Urbino, 1707); De Paquot, *Mémoires pour servir à l'histoire littéraire de dix-sept provinces des Pays-Bas* (Louvain, 1763-70).

MIDDENDORFF, mĭd'den-dôrf, ALEXANDER THEODOR VON (1815-94). A Russian traveler and naturalist. He was born in Saint Petersburg and studied medicine in Germany. With Baer, in 1840, he made an ornithological expedition into Lapland, and four years afterwards made an important trip in Northeast Siberia. His journeys were detailed in Government reports, and in his book, *Reise in den äussersten Norden und Osten Sibiriens* (1848-75). He was a member of the Saint Petersburg Academy (Zoölogical Section) and for some time its secretary; founder of the Russian Geographical Society; and in 1846 gold medalist of the London Geographical Society.

MIDDLE AGES. The designation applied to the historical period between the times of classical antiquity and modern times. The beginning and close of this period are not very definite. It is usual, however, to regard the Middle Ages as beginning with the overthrow of the Western Roman Empire by the barbarians in the fifth century, and ending at the close of the fifteenth century, or the beginning of the sixteenth century. Some scholars prefer to regard the Renaissance (q.v.) as the beginning of modern history. By some, who prefer to use precise landmarks, the Middle Ages are made to extend from the end of the Roman Empire in 476 to that of the Byzantine or Greek Empire in 1453, when Constantinople was taken by the Turks. Others again make the Middle Ages terminate with the discovery of America in 1492. The term Dark Ages is frequently used to cover the greater part of the Middle Ages, the designation being applied by some to the period from the fifth to the eleventh century, and by others made to embrace all but the last two centuries of the Middle Ages.

In the year A.D. 395 there was a single Roman Empire, embracing practically the whole Christian world, extending from the Atlantic to the Euphrates, from the Rhine and the Danube to the great Sahara. Throughout the whole expanse there was a single government, the same system of laws, an official language. Christianity was the recognized State religion. The Roman civilization was in its essential features uniform throughout the Empire; a great network of roads bound all the parts together. In the fifth century the Germanic barbarians overran the Western Empire and settled as conquerors in the various parts. Thus the three most important factors which were to influence the civilization of Western Europe during the early Middle Ages were the Roman, the Christian, and the German. The Roman civilization had absorbed to a considerable extent Greek art, Greek literature, Greek philosophy, and Greek science. It had developed to a marvelous degree a system of administration and law. It had so completely assimilated the various races in the Western Empire that they were proud to be called Romans. The Christian Church had brought in high ideals and had taught new duties. But at the same time it exalted asceticism, and had a tendency to oppose everything pagan which it was possible to eradicate. Much of the classical literature and art was under the ban of the Church, because these were so intimately associated with the pagan religions. Consequently the Church diminished the inheritance which the Middle Ages would otherwise have received. On the other hand, the Church adopted the magnificent Roman system of administration and thus became a great centralizing governmental force. The German barbarians contributed to the mediæval civilization certain ideas of freedom, and of the importance of the individual, as shown in their public assemblies, but the most important contribution was the Germans themselves, a strong race, capable of rapid advance, and always ready to assimilate itself to surrounding conditions. Furthermore, those who settled in the Empire were relatively few in number, and consequently were profoundly influenced by the more numerous population among which they dwelt.

The fifth and sixth centuries were marked by the migrations of the German nations. One tribe after another broke through the Roman frontier and carved out a territory for itself. By 600 almost the whole of the former Western Empire was in the power of the Germans. During the seventh and eighth centuries the Romanic population and the barbarians were going through a process of fusion. By 800 the two formed practically a homogeneous society of a composite nature. The civilization was far higher than that of the early Germans, far lower than that of the Romans. During this period the Church was converting and bringing under its authority the various peoples of the North and West. (See FRANKS.) Its monks were missionaries of culture and also political agents of great importance in binding the separate nations to Rome. From 800 there was again a Roman Empire in the West. (See CHARLES THE GREAT.) Although the Carolingian Empire soon disintegrated, its brief existence had been of great importance as a precedent, and had had a lasting effect upon the relations between the Germans and the Roman Catholic Church. In the States which arose with the disruption of the Frankish realm the absence of a strong central government threw each district upon its own resources. Local rulers arose, defended their territories against invaders, and maintained a semblance of order. These leaders were sometimes bishops or abbots, as well as lay nobles. The power fell into their hands. (See FEUDALISM.) The Church was the only bond of union and the only restraining force in the disturbed conditions of the times. It became a mighty engine of government, whose interests were by no means restricted to religious matters. From this time until the close of the thirteenth century the Church was the most important factor in mediæval history. Its authority, wealth, and influence increased constantly; its members were prominent in every sphere.

In the latter half of the tenth century Otho the Great (q.v.) connected the fortunes of Germany and Italy by restoring the empire of Charles the Great. His action was to result in the weakness and disunion of both countries, but for three centuries the German monarch was in appearance the leading power in Western Europe.

During this period the Normans (q.v.) conquered England, Southern Italy, and Sicily, and strong monarchies began to develop in England, France, and Spain. Ever since the early part of the eighth century Christendom had been waging a fierce warfare against the Mohammedan power in the West. At the close of the eleventh century began a great onslaught of Western Europe upon the Mohammedan power in the East, known as the Crusades. The broadening of the horizon, the resultant skepticism, and the enrichment of Europe, which resulted from the Crusades, caused the progress in many lines to be more rapid. The twelfth and thirteenth centuries were periods of great intellectual activity, marked by the foundation of universities, the prevalence of heresy, the development of vernacular literature, the rise of the cities, the growth of national feeling. The following centuries are generally designated the period of the Renaissance (q.v.).

It is difficult to describe the Middle Ages as a whole, because there was a constant evolution for over 1000 years. The characteristics which contrast most sharply with those of the classical world are these: In the Middle Ages the civilization as a whole was much ruder and mixed with barbaric elements; the individual was of greater importance than the State; men were dominated by a militant, vital religion. If contrasted with the modern period which followed: In the Middle Ages the human intellect was restricted by a deference to the authority of tradition in every phase of life, which was wholly at variance with the critical and skeptical attitude of thought. Again, the physical world, the world of investigation, the world of action, were very limited for the mediæval man. The discoveries at the close of the fifteenth century which disclosed new continents were coincident with the development of the printing press, the revolution in warfare due to the introduction of gunpowder, and the discoveries in the various sciences which opened new worlds of thought and activity. The important artistic activity of the Middle Ages falls into three distinct epochs, the Early Christian (see CHRISTIAN ART), Romanesque, and Gothic, under which titles the art of the period is treated.

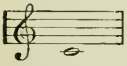
Of general works dealing with the Middle Ages the following may be noted: Lavisse and Rambaud, *Histoire générale*, vols. i.-ii., with helpful bibliographies (Paris, 1893-94); Gibbon, *Decline and Fall*, ed. Bury (London, 1896-1900); Bryce, *Holy Roman Empire* (ib., 1873); Poole, *Illustrations of the History of Mediæval Thought* (ib., 1884); Milman, *Latin Christianity* (ib., 1883); Assman, *Geschichte des Mittelalters* (Brunswick, 1853-62); Hodgkin, *Italy and Her Invaders* (Oxford, 1880); Bury, *Later Roman Empire* (London, 1889); Gregorovius, *History of the City of Rome in the Middle Ages* (ib., 1894-1900); Lacroix, *The Arts in the Middle Ages* (ib., 1880); id., *Science and Literature in the Middle Ages* (ib., 1880); Lecky, *History of European Morals* (ib., 1875); Adams, *Civilization During the Middle Ages* (New York, 1883); Emerton, *Introduction to the Middle Ages* (Boston, 1896); id., *Mediæval Europe* (ib., 1896); Oman, *European History, 476-918* (London, 1893); Tout, *The Empire and the Papacy, 918-1273* (ib., 1898); Cunningham, *Western Civilization* (Mediæval and Modern Times) (Cambridge, England, 1900). See articles on the various nations and the separate biographies of rulers and important men.

MID'DLEBORO. A town, including several villages, in Plymouth County, Mass., 35 miles south by east of Boston; on the Nemasket River, and on four branches of the New York, New Haven and Hartford Railroad (Map: Massachusetts, F 4). It has a public library, is an attractive summer resort on account of the picturesqueness of its scenery, and is noted as an industrial centre. Its manufacturing interests, which are promoted by the valuable water-power derived from three falls, are represented by several large shoe factories, woolen mills, parlor-grate works, iron foundries, saw and planing mills, marble works, and varnish and stove polish factories. The government is administered by town meetings. Population, in 1890, 6065; in 1900, 6885. Settled about 1662 on the site of an old Indian village, Nemasket, Middleboro was incorporated in 1669. Consult Barber, *Historical Collections of Massachusetts* (Worcester, 1840).

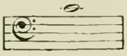
MID'DLEBURY. A village and the county-seat of Addison County, Vt.; 50 miles southwest of the State capital, Montpelier, on the Rutland Railroad (Map: Vermont, B 5). The village is situated in the Otter Creek Valley, near the Green Mountains, in a region of picturesque scenery. It is the seat of Middlebury College (q.v.), and has the Sheldon Art Museum and Library, a ladies' library, and a fine courthouse and opera house; also attractive fair grounds. The industries are represented by agricultural interests and by several marble quarries, marble mills, iron foundry, lime kilns, and flour, saw, door, sash, and pulp mills. The village possesses valuable water power. Under a revised charter of 1877, Middlebury is governed by a board of trustees, chosen annually, who elect subordinate administrative officers. Population, in 1890, 1762; in 1900, 1897. Middlebury was founded in 1773, but, owing to threatened attacks from the English and the Indians, was almost completely deserted during the Revolutionary War. In 1813 it was incorporated as the borough, and in 1832 as the village of Middlebury. Consult Swift, *History of the Town of Middlebury* (Middlebury, 1859).

MIDDLEBURY COLLEGE. A college established at Middlebury, Vt., in 1800, under no denominational control, although its affiliations are Congregational. It is a purely collegiate institution, with a curriculum, partially elective, leading to the degrees of B.A. and B.S. The departments of instruction are mental and moral science, Greek, Latin, English, modern languages, history and political science, physics and mathematics, chemistry and natural history. In 1902 it had 11 instructors, 118 students, a library of 26,154 volumes, an endowment of $400,000, and an income of $24,000. The campus, presented to the corporation by Col. Seth Storrs in 1810, is a beautiful park of 30 acres. It contains five buildings: Painter Hall (1814), Starr Hall (1860), the Chapel (1886), the Egbert Starr Library (1900), and the Warner Science Hall (1901). Middlebury has been coeducational since 1883, but in 1902 a charter was granted by the Legislature, authorizing the establishment by the corporation of a separate college for women. The centennial of the college was celebrated in 1900. Its grounds and buildings were valued at $200,000, and the whole college property at $651,000. The library contains 26,154 volumes.

MIDDLE C. In music, the note c¹, which is on the first leger line below the treble staff,



, or above the base staff



The C clef always represents the note termed middle C, and the lines and spaces above or below are designated accordingly.

MIDDLE ENGLISH. See ENGLISH LANGUAGE; ENGLISH LITERATURE.

MIDDLE KINGDOM. A native name of China, believed by its inhabitants to be the middle point of the earth.

MIDDLE LATITUDE SAILING. See SAILINGS.

MIDDLEMARCH. A novel by George Eliot (1872). It appeared serially in *Blackwood's Magazine* in 1871. The author considered this story of a provincial town her greatest work. It consists of two stories, that of the Vincy family and that of Dorothea Brooke, who is the chief character. She marries a stiff clergyman, Mr. Casauban, and is soon disillusionized. Rosamond Vincy, a beautiful girl, marries Dr. Lydgate, and proves a hindrance to him. The general teaching of the novel is that people even of high ideals are changed and hampered by circumstances.

MIDDLESBROUGH, mĭd'd'lz-b'rŭh. A manufacturing town, port, and Parliamentary borough in the North Riding of Yorkshire, England, at the mouth of the Tees, 48 miles north of York (Map: England, E 2). The town is well built, with handsome specimens of architecture, ecclesiastical, municipal, and commercial. In the royal exchange, a fine building, the weekly iron market is held on Tuesdays, attended by persons connected with the iron trade from all parts of the kingdom, as well as foreigners. Albert Park, containing 72 acres, is tastefully laid out. The town owns its water, gas, abattoirs, markets, and cemeteries, and maintains baths, wash-houses, and free libraries. Middlesbrough was founded in 1830, and the following year had 154 inhabitants. The opening of the docks in 1842 gave additional importance, and the population rose to 6000. From the year 1852, when iron ore was discovered in the Eston Hills, the town increased rapidly, and has acquired an important position as an iron manufacturing centre, turning out over 2,000,000 tons per year of pig iron alone, and having smelting furnaces on an extensive scale, iron foundries, manufactures of rails, locomotive engines, tubes, boilers, etc. There are also chemical works and potteries, and shipbuilding is extensively carried on. There are spacious docks, and a breakwater nearly 2½ miles long. The average annual value of the export trade is $32,500,000, and the town has also a considerable import trade. Middlesbrough was incorporated in 1853. Population, in 1891, 75,500; in 1901, 91,300. Consult Reid, *Middlesbrough and Its Jubilee* (Middlesbrough, 1881).

MID'DLESEX. The metropolitan county of England, in the southeast of the country, bounded north by Hertford and south by Surrey (Map: England, F 5). Next to Rutland it is the smallest of the English counties, its area being only 181,301 statute acres, or 283 square miles, a considerable portion of which comprises a large area of metropolitan London. Outside of London the land is chiefly devoted to grass and hay farms and to market-gardens, the produce of which is sent to supply the metropolis. Capital, Brentford. Population, in 1891, 3,251,700; in 1901, 3,585,100.

MIDDLE TEMPLE. One of the four Inns of Court. The Inns of the Middle Temple are so called from the group of ancient buildings occupied by them, which were the seat of the knights templars and passed into the hands of the lawyers after the dissolution of that famous order of chivalry. See INNS OF COURT.

MID'DLETON. A municipal borough in Lancashire, England, five miles north-northeast of Manchester (Map: England, D 3). Its chief industries are the manufactures of cotton and silk; coal is mined, and it has also chemical works. It has a grammar school dating from 1572. The municipality is progressive, owns gas works, electric lighting plant, markets, and public baths, and maintains free library, park, recreation grounds, and a sewage farm. Population, in 1891, 22,150; in 1901, 25,180.

MIDDLETON. A town of Annapolis County, Nova Scotia, Canada, the northwest terminus of the Nova Scotia Central Railway, 102 miles west-northwest of Halifax (Map: Nova Scotia, D 5). It also has a station on the Windsor and Annapolis Railway. Lucrative iron and copper mining is carried on in the neighborhood. Population, in 1901, 2000.

MIDDLETON, ARTHUR (1681-1737). An American colonist, born in South Carolina. He held high offices under the proprietary government, and in 1719 was president of the convention which placed South Carolina directly under the Crown. After the establishment of the Royal Government, he became president of His Majesty's Council, and as such was Acting Governor from 1725 until the arrival of the first regularly appointed royal Governor in 1731.

MIDDLETON, ARTHUR (1742-87). A signer of the Declaration of Independence, born in South Carolina. In 1754 he went with an uncle to England, where he was educated at Harrow, Westminster School, and Saint John's College, Cambridge. He returned to South Carolina in 1763, settled at Middleton Place, became a justice of the peace, and from 1765 to 1766 served in the Commons for Saint Helena. He then again went abroad, and spent three years in England and Southern Europe. On his return in 1772 he was again elected to the Commons, and in 1774 became a member of the Upper House of the Provincial Congress. He was one of the ablest and boldest opponents of the royal authority, and early in 1775 became a member of the Secret Service Committee, and in June of the same year of the Council of Safety. Early in 1776 he helped frame a constitution for the State, and later in the same year he was sent as a delegate to the Continental Congress, and signed the Declaration of Independence. In 1778 he was elected a member of the State Legislature, and was also chosen President and Commander-in-Chief of South Carolina, but declined. He assisted in the defense of Charleston, and upon the capture of that place was imprisoned in Saint

Augustine, and later in the prison ship *Jersey*. Being exchanged in July, 1781, he was again elected to the Continental Congress, where he served until peace was declared. Later he became a member of the State Legislature and a trustee of Charleston College. Middleton was a man of much energy and judgment, an able debater, and a forceful writer. Under the pseudonym of "Andrew Marvel" he wrote a number of effective political essays; he also left stenographic reports of many of the debates in which he participated.

MIDDLETON, Conyers (1683-1750). A divine of the Church of England. He was born December 27, 1683, at York or Richmond, in Yorkshire. He studied at Cambridge, where he took the degree of B.A. in 1702, was elected a Fellow in 1706, and shortly after married a lady of fortune. The views he expressed and defended were generally such as to draw down upon him the imputation of being an "infidel in disguise," though some of them—such as that the Jews borrowed some of their customs from Egypt, that the primitive writers in vindicating Scripture found it necessary sometimes to recur to allegory—are now commonly held. Middleton died at Hildersham, in Cambridgeshire, July 28, 1750. His principal writings are: *A Letter from Rome, showing an exact Conformity between Popery and Paganism; or the Religion of the present Romans derived from that of their Heathen Ancestors* (1729), which provoked the most violent indignation among Roman Catholics; and *The History of the Life of M. Tullius Cicero* (2 vols., 1741), a work both interesting and valuable. All his pamphlets, treatises, etc., were collected and published under the title of *Miscellaneous Works* (4 vols., London, 1752).

MIDDLETON, Sir Frederick Dobson (1825-98). A British soldier. He was born in Belfast, Ireland, and graduating at the Royal Military College at Sandhurst in 1842, saw active service in New South Wales, New Zealand, Burma, and India. In the Indian Mutiny (1857-58) he was decorated with the Victoria Cross for gallant conduct. In 1868 he accompanied his regiment to Canada, but returned to England in 1870. In 1884 he returned to Canada as commander-in-chief of Canadian militia, and in 1885 he energetically suppressed the Riel rebellion in the Northwest, for which he received from the Canadian Parliament a grant of $20,000, and the honor of knighthood from the Queen. In 1890 he returned to England, and in 1896 was appointed keeper of the crown jewels.

MIDDLETON, Henry (1771-1846). An American politician and diplomat, the son of Arthur Middleton (q.v.). He was born in Charleston, S. C., was carefully educated by private tutors and at South Carolina College, and in 1801 was elected to the South Carolina Legislature, where his brilliant powers as an orator attracted wide attention and led, in 1810, to his election as Governor of the State. He held this office until 1812, was a strong supporter of the war policy of the Madison Administration, and in 1815, after a brief retirement from politics, was elected to Congress, serving until 1820. In that year he was appointed by President Monroe Minister of the United States to Russia, where in a service of ten years he did much to strengthen the commercial relations between the two nations, negotiating in 1824 the first treaty which provided for the regulation of trade and fisheries in the Pacific. On his return to America in 1830, he retired from public life.

MIDDLETON, Thomas (1570?-1627). An English dramatist, born probably in London. Hardly a detail of his life is known. He seems to have studied law, and may thus be one of the two Thomas Middletons entered at Gray's Inn in 1593 and 1596. It is thought that he began writing for the stage as early as 1599. But the first mention of him is in Henslowe's *Diary*, on May 22, 1602. He was then collaborating with Munday, Drayton, Webster, and others on a lost play called *Cæsar's Fall*. In this year he published a comedy entitled *Blurt, Master-Constable*, and in 1603-04 two prose tracts, *The Black Book* and *Father Hubburd's Tales*, lively and highly colored satirical sketches of London life. Between this time and his death he wrote more than twenty plays, and twelve masques and pageants. In 1620 he was made chronologer to the city of London. He died in London near July 1, 1627. He was successful in both comedy and tragedy. His humor is seen at its best in *A Trick to Catch the Old-One* (1608); *The Roaring Girl* (1611); *The Spanish Gypsy*, a tragicomedy (acted as early as 1623, but not printed till 1653); *A Chaste Maid in Cheapside* (not printed till 1630). All except the third in this list depict contemporary London life. The second has as heroine the notorious Mary Frith, known as Moll Cutpurse. Middleton's dramatic power is at is height in *Women Beware Women* (first printed in 1657). It is a romantic tragedy founded in part on the history of Bianca Capello. Almost equal to this play are *The Spanish Gypsy*, cited above, and *The Changeling* (printed 1653). *A Game at Chess*, a political drama, attacking Spain, aroused such enthusiastic hatred that the Spanish Ambassador protested, and the piece was taken off the stage after scoring a great success (1624). A play called *The Witch* (printed 1778) is of considerable interest because it has the same motive as Shakespeare's *Macbeth*. Consult *Works*, ed. by Bullen (8 vols., London, 1886); and selections from the plays, ed. by Havelock Ellis, with an introduction by Swinburne, for the Mermaid Series (London, 1887).

MIDDLETON, Thomas Fanshaw (1769-1822). Bishop of Calcutta. He was born in Kedleston, Derbyshire, England; was educated at Christ's Hospital, and graduated at Pembroke College, Cambridge, in 1792; was ordained to a curacy in Gainsborough in 1792, and was afterwards incumbent at Tansor, Northamptonshire; Bytham, Lincolnshire; Saint Pancras, London; and other parishes. In 1814 he was consecrated first Bishop of Calcutta, where he did much to promote the advancement of Christianity and education, founded the Bishop's Mission College in 1820, and established a consistory court. He was editor for short periods of the journals *The Country Spectator* at Gainsborough, and *The British Critic* (new series) in London. The work by which he was best known was that on *The Doctrine of the Greek Article Applied to the Criticism and Illustration of the New Testament* (1808). A *Life of Bishop Middleton*, by C. W. Le Bas, was published in London in 1831.

MID'DLETOWN. A city and the county-seat of Middlesex County, Conn., 14 miles south of

Hartford; on the Connecticut River, and on the New York, New Haven and Hartford Railroad (Map: Connecticut, E 3). It is connected with the opposite town of Portland, known for its brownstone quarries, by an unusually long drawbridge. Middletown is the seat of Wesleyan University (q.v.); the Berkeley Divinity School (Protestant Episcopal), opened in 1854; the State Hospital for the Insane; and the State Industrial School for Girls. Other features are the municipal building, and the Russell Free Library of about 14,000 volumes. The city has considerable trade, as the river is navigable as far as Hartford for light-draught steamers, thus increasing the transportation facilities. Middletown is also an important industrial centre, with manufactures of cotton webbing, hammocks, pumps, marine hardware, locks, harness trimmings, silver-plated ware, and rubber, bone, and silk goods. There are valuable mineral deposits in the vicinity. Middletown is governed, under a charter of 1882, by a mayor, elected biennially, and a city council, chosen on a general ticket. The water-works are owned and operated by the municipality. Population, in 1890, 9013; in 1900, 9589.

Founded in 1650, and incorporated as a town under the name Mattabeseck in 1651, Middletown received its present name in 1653, and was incorporated as a city in 1784. Previous to the Revolution and for some time thereafter it was a very important commercial port, a large number of its citizens being engaged in the West Indian trade. For many years prior to 1886, when the Custom House was moved to Hartford, it was a port of entry. Consult an article on "Middletown" in *The Connecticut Quarterly* (Hartford, 1898); also Whittemore, *History of Middlesex County, Connecticut* (New York, 1884).

MIDDLETOWN. A town in Newcastle County, Del., 25 miles south-southwest of Wilmington; on the Philadelphia, Wilmington and Baltimore Railroad (Map: Delaware, P 3). It has considerable fruit-canning interests, owing to its location in the noted fruit-growing belt of the State, and manufactures farming implements, carriages, etc. Population, in 1890, 1454; in 1900, 1567.

MIDDLETOWN. A city in Orange County, N. Y., 67 miles northwest of New York City, near the Wallkill River, and on the Erie, the New York, Ontario and Western, and the New York, Susquehanna and Western railroads (Map: New York, F 4). It is the seat of a State Hospital for the Insane (homœopathic), and has a public library and a fine high school building. The centre of an agricultural and dairying district, Middletown enjoys a considerable trade in the products of the region; and among its industrial establishments are woolen and straw hat factories, car shops (N. Y., O. and W.) saw and file works, cigar factories, a tannery, a milk-condensery, and manufactories of shirts and cut glass. The city is governed, under a revised charter of 1902, by a mayor, elected every two years, and a common council which elects the city clerk, corporation counsel, and engineer, and confirms the executive's nominations to the board of health, other municipal officials being chosen by popular vote. The city owns and operates the water-works. Population, in 1890, 11,977; in 1900, 14,522. Settled before the Revolution and named from its central location between Montgomery and Mount Hope, Middletown was incorporated as a village in 1848, and was chartered as a city in 1888. Its situation as the half-way station between the Hudson and the Delaware rivers, on the old Minisink road leading to the 'far West' of New York State, made it of considerable importance in the later years of the eighteenth and the early years of the nineteenth century; while its position as a terminal of the Erie Railroad, and the consequent establishment of a foundry about 1845, gave it a start as an industrial centre.

MIDDLETOWN. A city in Butler County, Ohio, 35 miles north of Cincinnati; on the Miami River, and the Miami and Erie Canal, and on the Cleveland, Cincinnati, Chicago and Saint Louis, the Cincinnati, Hamilton and Dayton, and the Cincinnati Northern railroads (Map: Ohio, B 7). It has a Masonic Temple and a fine opera house; and there are extensive manufactures of tobacco, paper, bicycles, and agricultural implements. Middletown, settled as early as 1794, is governed by a mayor, elected biennially, and a unicameral council which controls important elective and confirming powers. The water-works are owned and operated by the municipality. Population, in 1890, 7681; in 1900, 9215.

MIDDLETOWN. A borough in Dauphin County, Pa., 9 miles southeast of Harrisburg; on the Susquehanna River, and on the Pennsylvania and the Philadelphia and Reading railroads (Map: Pennsylvania, E 3). It is in a farming section, and has flouring and planing mills, iron furnaces, stove works, tube and iron works, car shops, a furniture factory, tannery, and stone quarries, the principal products of which constitute a considerable export trade. The electric light plant is owned by the municipality. Middletown was founded in 1756 and was incorporated as a borough in 1828. Population, in 1890, 5080; in 1900, 5608.

MIDGE (AS. *mycg*, OHG. *muccā*, Ger. *Mücke*, Icel. *my*, midge, fly; connected with Gk. μυῖα, *myia*, fly). The popular name of the little flies of the family Chironomidæ, applied also in Europe to the Simuliidæ, which in this country are called 'black flies' and 'buffalo gnats.' There is nothing very specific in the use of the name, and it is generally applied to almost any minute flying insect, most of which are true flies.

MIDHAT PASHA, mē̂'d'hät′ på-shä′ (1822-84). A Turkish statesman, born in Bulgaria or Constantinople. His origin was humble, but his marked ability secured him rapid promotion in the Ottoman civil service. He visited England and France; was made a pasha; governed with energy and wisdom Bulgaria and other provinces; and in 1872 was named Grand Vizier. He had already identified himself with the progressive party known as Young Turkey, and was disliked and feared by the reactionaries. He took a leading part in the conspiracy which led to the dethronement of Abd-ul Aziz (May 30, 1876), and was made Grand Vizier December 20, 1876, by Abd-ul Hamid II., but was dismissed in February, 1877, and had to flee. A constitution which he had promulgated failed. Later, he was permitted to return, and became Governor of Syria and then of Smyrna. In 1881 he was tried, with others, upon the charge of murdering Abd-ul Aziz, and was condemned to death, but the sentence was commuted. He died in Arabia, May 8, 1884. He was the author of *La Turquie, son passé, son avenir* (Paris, 1878). Consult: Leouzon Le Duc, *Midhat Pasha* (ib., 1879); Brunswik, *La vérité sur Midhat Pasha* (ib., 1877).

MID′IANITES. A name applied somewhat indefinitely in the Old Testament to groups of Bedouins. According to Gen. xxv. 2, Midian, the eponymous ancestor, is a son of Abraham through his 'Arabic' wife Keturah. That the Midianites are to be reckoned with the Arabs is clear, but we find them now at Mount Sinai (Ex. iii. 1), again to the east of Israel (Gen. xxv. 4), while in the days of Gideon they advance from the Syrian desert (Judges vi.), and again (Num. xxv. 6-9) they occupy the northern portion of Moab. This shifting about is to be accounted for not merely by the natural movements of nomadic tribes, but through the generic meaning that Midian seems to have acquired, much as in the Talmud, Tai, which originally designated a particular Arabic clan, becomes the designation for Arabs in general. The Midianites as described in Judges (vi.-viii.) are thorough Bedouins, whereas the Midianites around Sinai are a pastoral people. The latter seem to have been the original Midianites, and the fact that Jethro, Moses' father-in-law, is described as a 'Midianite' (Ex. iii. 1), whereas in Judges i. 16 he is called the 'Kenite,' is due to the more comprehensive character of the former term, which led to its gradual extension until it became synonymous with Bedouin. The land of Midian extended northward from Horeb, or Sinai, close to the eastern shore of the Gulf of Akabah. A place called Modiana is mentioned by Ptolemy close to the Red Sea, and about opposite the extremity of the Sinaitic peninsula, and no doubt this stands in some relationship in the original application of Midian in the Old Testament. Consult Burton, *Gold Mines of Midian* (London, 1878); *Land of Midian Revisited* (ib., 1879).

MIDLOTHIAN, mĭd-lō′thĭ-*an*. A county of Scotland. See Edinburghshire.

MIDNAPUR, mĭd′nȧ-po͞or′. The capital of a district of Bardwan, Bengal, British India, 68 miles by rail west of Calcutta, with which it is also connected by a canal. It is an educational centre with a municipal college, high school, public library, and printing establishments, and is also the seat of an active American missionary settlement. It has manufactures of copper, brass, silk, and indigo, and an important trade. Population, in 1891, 32,264; in 1901, 33,140.

MIDNIGHT APPOINTMENTS. In American history, a term applied to the appointments made by John Adams on the last night of his administration as President.

MID′RASH (Heb., from *dārash*, to seek, search). The general name given to the exposition of the Old Testament which, for about 1500 years after the Exile, formed the centre of all mental activity both in and out of the schools, among the Jews. The prohibitions and ordinances contained in the Pentateuchal codes were specified and particularized according to certain hermeneutical rules, and further surrounded by traditional ordinances and inhibitions. This division of Midrash is represented by the Halacha (q.v.), the binding authoritative, civil, and religous law as laid down in the Talmud. Another branch of the Midrash, however, is the Haggada (q.v.), a kind of free poetical homiletics, on the whole body of the Old Testament, and the term Midrash without further specification generally refers to this branch of rabbinical literature. The chief collections of this part of the Midrash are *Midrash Rabba* or *Midrash haggadol* (on the Pentateuch and the five scrolls), and *Pesikta* to various sections of the Bible. A complete German translation of the Midrash Rabba was begun by August Wünsche in 1880. Besides this there are Midrashim to the separate books of the Pentateuch, Exodus, Leviticus, Numbers, and Deuteronomy. Consult: Steinschneider, *Jewish Literature* (London, 1857); Chenery, "Legends from the Midrash," in Löwy, *Miscellanies of Hebrew Literature* (ib., 1877); Abrahams, *Jewish Literature*, c. iv. (Philadelphia, 1899).

MIDRIFF (AS. *midhrif*, *midrif*, diaphragm, from *mid*, middle + *hrif*, belly). A transverse muscle to be found in mammalia generally, separating the thoracic organs from the abdominal organs. It is also called the diaphragm (q.v.).

MIDSHIPMAN. A title in the United States Navy abolished by the act of Congress of August, 1882; but revived in 1902, and substituted for the title of naval cadet, which it displaced. The term is derived from the fact that the 'young gentlemen' under instruction on British men-of-war to fit them to become officers were given quarters *amidships* abreast the mainmast on the lower deck. In the American navy midshipmen rank next below ensigns. Formerly, those who were not yet graduated from the naval academy were styled cadet midshipmen.

MIDSHIPMAN. See Singing Fish.

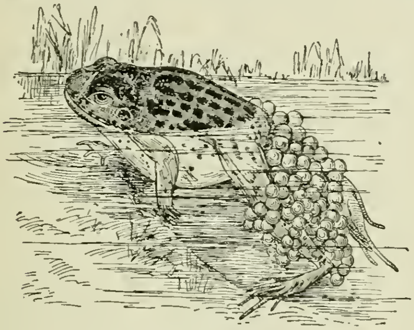
MIDSHIPMAN EASY, Mr. A nautical story by Captain Marryat (1836). It sets forth the perilous and amusing adventures of Jack Easy, a young scapegrace, who enlists in the British Navy, and after a long course of discipline renounces his early theories of the equality of men.

MIDSUMMER EVE. See Saint John's, Eve of.

MIDSUMMER NIGHT'S DREAM, A. A comedy by Shakespeare, written about 1595, printed in 1600, when two editions appeared, by Thomas Fisher and by James Roberts, the latter being used for the folio reprint. Evidently a masque or festival play, it may have celebrated the marriage of the Earl of Derby. The comedy is a jumble of classic, mediæval, and fairy lore. The parts of Theseus and Hippolyta may have been taken from Chaucer's *Knight's Tale*, but more probably from North's translations of Plutarch's "Theseus," 1579. Pyramus and Thisbe, drawn from Ovid's "Metamorphoses," may have come through Chaucer's "Legend of Good Women," or was based on Robinson's "Handfull of Pleasant Delights." Oberon, originating in the French "Huon of Bordeaux" in the Charlemagne cycle, is found in Greene's "James IV.," 1590. Titania, without the name, can be traced to Chaucer's "Wife of Bath's Tale." Puck is the Robin Goodfellow of old English folk-lore. The rest of the fairy scenery is Shakespeare's own, except for a slight debt to John Lyly.

MIDWIFE, and **MIDWIFERY**. See Obstetrics.

MIDWIFE FROG, or Obstetrical Toad. A smooth toad-like terrestrial frog (*Alytes obstetricans*) of the family Discoglossidæ, found along the Mediterranean coast, and numerous and ubiquitous. From March to August the double call-note of the male, sounding like a small bell, is heard, but it is difficult to see the performer. The remarkable feature of this frog's life, however, is its egg-nurture. When the female is ready to extrude her eggs, which are of large size and attached to one another, in two rosary-like strings, to the number of several dozen, the accepted male mounts upon her back. During the expulsion of the eggs they are fecundated by the male, who then pushes his hind limbs through the tangled mass, after which he releases the female, and retires to his hole dragging with him the burden wrapped about his legs. He comes out each night to feed and to moisten the eggs in the dew or the nearest puddle, and after about three weeks, when the eggs are nearly ready to hatch, he takes them into the water, where he remains until the tadpoles escape through the softened envelopes. Broods born in early summer mature the same autumn, but later broods remain as tadpoles until the following May. A second species (*Alytes cisternasi*), of similar habits, occurs in Central Spain and Portugal. Consult Boulenger, *Catalogue of Batrachia in the British Museum* (London, 1882); Gadow, *Amphibia and Reptiles* (London, 1901).



MIDWIFE FROG.

MIER, mė-âr′. A frontier town of Mexico, situated on the Rio Grande, 110 miles in a straight line from its mouth (Map: Mexico, J 4). A United States consular agent is stationed here. It is noted in connection with an attempted invasion of Mexico by a body of Texans in 1842. Population, 4000.

MIERES, mė-ā′rås. A mining town of Northern Spain in the Province of Oviedo. It is situated 9 miles southeast of the City of Oviedo, among forest-covered mountains, and is surrounded by gardens and orchards. It has a score of mines and extensive factories for iron and chemical products. In the neighborhood are important mines of coal, iron, and cinnabar. Population, in 1900, 17,867.

MIEREVELT, mē′re-vĕlt. Michiel Jansze (1567-1651). A Dutch painter, born at Delft. He was a pupil of A. van Montfoort, called Blocklandt, of Utrecht. He received a pension from the Archduke Albert of Austria, at whose Court he lived in Delft. Mierevelt's portraits are in many of the museums. They are of varying importance, as he was often assisted by his pupils, particularly by his son, Pieter van Mierevelt (1596-1623), who imitated the manner of his father with much success. Among the best portraits by the elder Mierevelt are those of William of Orange, and others of the Princes of Orange, John Barneveldt, and several of the Prince of Nassau.

MIERIS, mē′rĭs. A family of Dutch painters. Frans van Mieris, the elder (1635-81), a genre painter, was born in Leyden, April 12, 1635. He was a pupil of Torenvliet, of Gerard Dou, and of Adriæn van den Tempel. His pictures are characterized by elegance of drawing, and his coloring is clear, delicate, and rich, especially in painting velvets, satin, and other rich stuffs. They are treated too superficially and smoothly, however, to be strong. His principal works include the "Lady in the Crimson Jacket," National Gallery, London; "Lady at Her Toilet," "Two Ladies Drinking Tea," "Interior of a Household," and a "Male Portrait," in the Louvre; "Boy Blowing Soap-Bubbles" and "Artist and His Wife" (1663), in the Hague Museum; a "Lady Writing a Letter" (1680); a "Lady Playing Guitar," Amsterdam Museum; the "Soldier" (1662); "Woman Fainting," Munich Gallery; and the "Tinker," Dresden Gallery.—Jan van Mieris (1660-90), a genre and portrait painter, son and pupil of Frans the elder; he studied also under Lairesse. Examples of his work are an "Assembly of Ladies and Gentlemen with Lute-Player," Gotha Museum; "Surgeon Dressing a Wound," Hermitage, Saint Petersburg.—Willem van Mieris (1662-1747), a genre and mythological painter and sculptor, was born in Leyden, the son and pupil of Frans the elder. His work represents the school in its decline, and is inferior to his father's in drawing and impasto. He also modeled statuettes and vases adorned with bas-reliefs. Among his works are the "Trumpeter," the "Poultry Dealer," and the "Merry Toper," all in the Dresden Gallery.—Frans van Mieris, the younger (1689-1763). A genre painter and writer. He was the son and pupil of Willem, and a distinguished antiquary, and published works of merit on numismatics and history. His books include the *Historie der nederlandsche vorsten* (1732-35) and *Groot charterboek der graven van Holland, van Zeeland en heren van Vriesland* (1753-56). Among his paintings are the "Pharmacy" (1714), Amsterdam Museum; portrait of his father (1737), Copenhagen Gallery; and the "Fishmonger" (1747), Rotterdam Museum.

MIEROSLAWSKI, myĕ′rô-släv′skė, Ludwik (1814-78). A Polish revolutionary leader, born at Nemours, France. He was the son of a Polish officer in the service of France, received his education at the military school in Kalisz, and joined the Polish insurgents in 1830. Mieroslawski distinguished himself greatly, and was made an officer, serving until the fall of Warsaw, when he settled in Paris. Here he published a number of books in Polish and French, particularly a military history of the Revolution in Poland. In 1846 he was at the head of another revolutionary movement in Poland, which resulted in his being captured and sentenced to death. From this fate he was rescued by the outbreak of the general revolutionary movement of 1848. After fighting in Posen, Mieroslawski resigned his command in the face of ultimate defeat. In 1849 he participated in the revolutionary movement in Sicily, and after resigning his command placed himself at the head of the revolutionary army in Baden, but eventually retired to Paris. His last appearance as a revolutionist was in Poland in 1863, and, after the failure of that attempt, he spent the last years of his life writing political pamphlets. He died in Paris, November 23, 1878.

MIFFLIN, FORT. See FORT MIFFLIN.

MIFFLIN, LLOYD (1846—). An American poet, born in Columbia, Pa. His father was J. Houston Mifflin, a portrait painter and writer of verse. Some of his highly polished sonnets celebrate the beauties of his birthplace. These sonnets have gradually won their author recognition as a genuine poet. The following are his principal volumes of verse: *The Hills* (1895); *At the Gates of Song* (1897); *The Slopes of Helicon, and Other Poems* (1898); *Echoes of Greek Idyls* (1899); paraphrases in sonnets from Bion, Moschus, and Bachylides; and *The Fields of Dawn and Later Sonnets* (1900).

MIF'FLIN, THOMAS (1744-1800). An American soldier and statesman. He was born at Philadelphia, of Quaker parentage. He graduated at Philadelphia College in 1760, was a member of the Pennsylvania Legislature in 1772 and 1773, and in 1774 was sent as a delegate to the Continental Congress. Entering the army as a major in 1775, he became Washington's first aide-de-camp with the rank of colonel; was made quartermaster-general in August, 1775; and finally (February 19, 1777) was promoted to the rank of major-general and appointed a member of the Board of War. During the retreat from Long Island, he commanded the covering party, and afterwards rendered valuable service by rousing the people to enlist, bringing essential aid to General Washington before the battles of Trenton and Princeton. Becoming dissatisfied with Washington's management of the war, he intrigued for his removal, forming with Conway and others the so-called 'Conway Cabal' (q.v.), on the failure of which he was replaced (March, 1778) by Nathanael Greene as quartermaster-general, and in October, 1778, was removed from the Board of War. He was elected to Congress in 1782, and became its president the following year. He was a member and Speaker of the Pennsylvania State Legislature in 1785, and a delegate to the Constitutional Convention of 1787. From 1788 to 1790 he was president of the Executive Council of Pennsylvania, and from 1790 to 1799 was Governor of the State. Consult Simpson, *Eminent Philadelphians* (1859).

MIFFLIN, WARNER (1745-98). An American reformer, cousin of General Mifflin. He was born of Quaker parentage in Accomac County, Va. While a mere boy, he became impressed with the wrong of slavery, and about 1774 freed all his slaves and gave them compensation for past services. From that time forward he traveled about frequently to the various meetings of his sect, and did much to create a sentiment against slavery among his fellow Quakers. His religious principles led him to oppose the Revolutionary War, and at the request of the Yearly Meeting at Philadelphia he visited both Howe and Washington in order to point out the wickedness of the struggle. Mifflin is perhaps best remembered for having in November, 1792, presented to Congress a memorial against slavery which resulted in a spirited debate over the question of the right of petition.

MIG'DOL. A place in Egypt mentioned in Exodus xiv. 2, Ezekiel xxix. 10 (Authorized Version, margin), Jeremiah xliv. 1. The name is identical with the Hebrew *midgaal*, 'tower,' 'castle.' As an appellation it occurs in Egyptian inscriptions as early as the fourteenth century B.C. The exact location of the Migdol referred to in the story of the Exodus is uncertain, and it is impossible to determine whether the same place is meant in Ezekiel and Jeremiah. A *Maktal* is spoken of in Papyrus Anastasi v. 20 as the 'watchtower of Seti,' and this appears to have been somewhat south of Taku, which may be the Succoth of Exodus. But neither of these places can be identified. From Ezekiel xxix. 10 it is evident that a locality in the extreme north of Egypt is intended, as it is contrasted with Syene in the extreme south. In Jeremiah xliv. 1 it is mentioned in connection with Tahpanhes (Daphnæ) and Noph (Memphis), and in Jeremiah xlvi. 9 as a place inhabited by exiled Jews.

MIGNARD, mē'nyär', NICOLAS (1606-68). A French painter and engraver, born at Troyes. He went to Rome in the suite of the Archbishop of Lyons, and there engraved a number of the pictures of Annibale Carracci. On his return to France he settled at Avignon where he lived until 1660. Thus he is often called Mignard of Avignon to distinguish him from his famous brother, Mignard the 'Roman.' Through Cardinal Mazarin, the painter was presented to Louis XIV. and painted the portrait of that King, and of many of his courtiers. In 1663 he became professor in the Academy of Painting. He decorated the lower floor of the Tuileries, and also made two religious pictures for the Chartreuse of Grenoble and a few etchings.

MIGNARD, PIERRE (1612-95). A French portrait and historical painter, a brother of Nicholas Mignard. He was born at Troyes, studied under Jean Boucher in Bourges and Simon Vouet in Paris, and resided for twenty-two years in Italy, where he was much influenced by the works of Annibale Carracci. At Rome he painted the portraits of Pope Alexander VII. and many of the Roman nobility, and at Venice many Venetian nobles. In 1657 he was summoned by Louis XIV. to Paris, where he painted the King's portrait and that of Cardinal Mazarin. In 1664 he decorated the cupola of the Church of Val-de-Grâce, Paris, where he represented a colossal Paradise with two hundred figures, some of which are three times the size of life. This is the most ambitious fresco decoration in France, but the color has suffered much from time. He also painted decorations in the palace of Versailles. He was famous in Paris as the leader of the opposition against Le Brun and the Academy, but upon the latter's death in 1690 he fell heir to all his positions. He was made director of the Gobelins, and was elected director of the Academy. He died in Paris, May 30, 1695.

Mignard was the leading French portrait painter of the seventeenth century. His other pictures are rather cold and conventional, but his coloring, derived from the Venetians, is good. The

Louvre contains a number of his works, including the portrait of Madame de Maintenon, "Saint Cecilia," and "Saint Luke Painting the Virgin." Others are in the galleries of Versailles, Madrid, Saint Petersburg, Vienna, Berlin, London, and Florence. Consult Lebrun-Dalbanne, *Etude sur Pierre Mignard* (Paris, 1878).

MIGNE, mē'ny', JACQUES PAUL (1800-75). A Roman Catholic editor. He was born in Saint Flour, France, October 25, 1800, and was educated at Orléans. In 1824 he became a priest and performed the functions of his office till 1833, when a pamphlet published by him, entitled *De la liberté, par un prêtre*, brought upon him the censure of the Bishop of Orléans, who forbade its publication. Migne went to Paris, and the same year established *L'univers religieux* (later called merely *L'univers*), designed to harmonize the Church with the free spirit of civil government. Later he commenced the publication of a collection of works called *Cours complets de théologie et d'écriture sainte*, and founded a publishing house on a large scale called *L'imprimerie catholique*, designed to furnish standard religious works at a low price. He established the daily *Vérité*, which in 1856 became the *Courrier de Paris*. The *Cours complets* finally grew into a very long series of volumes of standard authors under the general head of *Bibliothèque universelle du clergé et des laïques instruits*. The parts which are best known are *Patrologia Latina*, in 221 volumes (Paris, 1844-64); *Patrologia Græca* (Greek and Latin) in 165 volumes (Paris, 1857-86); and *Patrologia græce latine tantum edita*, in 85 volumes (Paris, 1856-67). They are reprints of the famous Benedictine editions and many others, and bring together very conveniently well nigh the whole library of the ecclesiastical writers to Innocent III. (d. 1216). Migne died in Paris, October 25, 1875.

MIGNET, mē'nyā', FRANÇOIS AUGUSTE MARIE (1796-1884). A French historian. He was born May 8, 1796, at Aix, in Provence, studied law in his native city with his life-long friend, Adolphe Thiers, and in 1822 went to Paris in order to devote himself to a literary career. He found employment in writing for the public journals, and after giving lectures on modern history, which were received with great approbation, he wrote his *Histoire de la révolution française* (1824). In 1830 Mignet and Thiers in conjunction founded the liberal journal *Le National*. After the Revolution of July he became a Counselor of State, and Keeper of the Archives of the Ministry of Foreign Affairs, but he lost these offices in 1848. In 1836 he was received into the French Academy. He edited *Négociations relatives à la succession d'Espagne sous Louis XIV.* (1836-42). Other of his works are: *Notices et mémoires historiques* (1843-1853, 1854); *Vie de Franklin* (1848); *Histoire de Marie Stuart* (1851); *Charles Quint, son abdication, son séjour et sa mort au monastère de Yuste* (10th ed. 1882); *Eloges historiques* (5th ed. 1884); and *Rivalité de François I. et de Charles V.* (1872-75); also a drama entitled *Antonio Perez et Philippe II.* (1845-46). Mignet died in Paris, March 24, 1884. Consult: Trefort, *Mignet und seine Werke* (Budapest, 1885); Simon, *Mignet, Michelet, Henri Martin* (Paris, 1889).

MIGNON, mē'nyôɴ' (Fr., darling). (1) An Italian girl in love with Wilhelm, in Goethe's *Wilhelm Meisters Lehrjahre* (q.v.). Her love is not returned, and she dies broken-hearted. (2) An opera founded on *Wilhelm Meister*, with music by Ambroise Thomas and libretto by Carré and Barbier. (3) A derisive name applied to the effeminate favorites of Henry III. of France, and to the King himself.

MIGNON, ABRAHAM (c.1640-79). A German painter, born in Frankfort-on-the-Main. He studied under Jacob Marrel, who took him to Haarlem, where he became the pupil of Jan David de Heem, the celebrated fruit and flower painter. He selected subjects similar to those his master painted, but never equaled him. His composition is more formal, his color less agreeable, and there is too much detail, although his better works are rich, warm, and harmonious. Among his more notable works are a study of flowers, fruit, and other objects, and some "Flowers in a Vase," in the Amsterdam Museum. The Van der Hoop Collection in Amsterdam also has a dish with fruit, oysters, and bread, that is more broadly painted than is usual with him. Of his six pictures in the Louvre, two are very fine—a "Bouquet of Wild Flowers," and "Flowers and Fruit." He is also well represented by similar pieces in Dresden, Munich, Brussels, The Hague, Vienna, and other European galleries.

MIGNONETTE, mĭn'yŭn-ĕt' (Fr. *mignonette*, diminutive of OF., Fr. *mignon*, favorite, dainty, from OHG. *minna*, Ger. *Minne*, love, Icel. *minna*, recollection; connected with Goth *gamunan*, AS. *munan*, Icel. *muna*, to be mindful, Lat. *mens*, Gk. *μένος*, *menos*, mind, Skt. *man*, to think), *Reseda odorata.* An annual or perennial plant of the natural order Resedaceæ, a native of the north of Africa, widely cultivated in gardens during summer and in greenhouses and windows during winter for its fragrant flowers. It has lanceolate entire or trifid leaves, and erect terminal racemes of small yellowish-white flowers, which have a six-parted calyx as long as the corolla, and three-toothed capsules. What is called tree mignonette is not even a distinct variety, but merely the common kind trained in an erect form, and prevented from early flowering by pinching off the ends of the shoots. White or upright mignonette (*Reseda alba*), a native of Southern Europe, another very popular species, which grows from two to three feet high and bears its white flowers with brownish anthers in dense erect spikes, makes a fine border plant and grows well on ordinary garden soils. The seeds are sown in the open in April or May and later on the plants are thinned to a foot or 18 inches apart. Dyer's weed, or weld (*Reseda Luteola*), is a tall species with long spikes of yellowish flowers. All species are generally propagated from seeds, but cuttings are sometimes used.

MIGNOT, mēn-yō', LOUIS RÉMY (1831-70). An American landscape painter, born in Charleston, S. C. He studied under Schelfhout at The Hague, and was elected a National Academician in 1859, but during the Civil War and afterwards he lived in London, and traveled much abroad. His landscapes treat a variety of subjects, and are painted with considerable skill. They include: "Lagoon of Guayaquil, South America" (1863); "Evening in the Tropics" (1865);

"Snow in Hyde Park;" "Sunset off Hastings" (1870); and "Mount Chimborazo" (1871).

MIGRAINE, mĭ-grān′ (OF., Fr. *migraine*, from Lat. *hemicranion*, from Gk. ἡμικρανία, *hēmikrania*, pain in one side of the head, from ἡμι-, *hēmi-*, half + κρανίον, *kranion*, head), MEGRIM, HEMICRANIA, SICK HEADACHE. A paroxysmal affection characterized by severe headache, usually one-sided and often associated with disorders of vision. It is sometimes hereditary. Women are the chief sufferers. Migraine is often associated with gout, rheumatism, decayed teeth, eye strain, and uterine disorders. It is often due to reflex causes, such as powerful emotions, mental and bodily fatigue, disorders of digestion, and the like. There are often premonitory signs of an attack. There may be spasms of the pupil of the eye on the affected side; or the sight may be blurred or there seem to be balls of light or zigzag lines, or gorgeous colors. The tongue, face, and hand may experience numbness or tingling. There is sometimes dizziness. The headache is generally located on the temple, or in the forehead or in the eyeball; it is penetrating, sharp, and boring in character. It spreads gradually over the side of the head, sometimes extending to the neck and even to the arm. The face may then be pale and there may be a marked difference between the two sides. Nausea or vomiting appears very early in the attack. Few affections are more prostrating than migraine. The attack endures for a variable time; the sufferer is usually incapacitated for about three days. Those subject to migraine should avoid excitement; there should be regular meals and the diet should be moderate. Hydrotherapy and out-of-door life are important adjuvants. The physician will direct the treatment toward the removal of the conditions upon which the attacks depend. The eyes should be examined for possible errors of refraction or heterophoria, either of which may be the underlying cause of migraine. Among drugs the bromides, iron, arsenic, nitroglycerin, cannabis indica, quinine, chloroform, antipyrine, caffein, nux vomica, and ergot may be employed according to the cause which produces the migraine. None of these drugs should be used except upon a physician's advice. Dangerous symptoms of collapse have been known to follow the use of phenacetin. Electricity has been found helpful. During the paroxysm the sufferer should remain quiet in bed in a dark room. See HEMICRANIA.

MIGRATION (Lat. *migratio*, from *migrare*, to migrate). The movement of peoples, with all their household, from one place to another, usually, though not necessarily, for the purpose of settlement. General movements of population were no doubt common in prehistoric times, and in the historic period there have been several notable migrations that have largely affected the history of civilization. Students of African ethnology have traced migrations among the negro tribes of that continent that are of importance to the ethnographer; and a more complete knowledge of the ethnology and prehistoric archæology of America will probably make it possible to trace such migrations among the American tribes, and perhaps will throw some light upon their origin. But the historically important migrations are those that have taken place in the Eurasian continent.

THE ARYANS. The accepted hypothesis until very recently has been that the so-called Aryan or Indo-European family—embracing the Celts, Teutons, Greeks, Latins, Slavs, Letts, and Indo-Iranians—originated in the Pamir region of Central Asia, whence the last-named group moved into India and the Iranian Plateau, while the remaining groups migrated westward into Europe, the Celts leading the way and advancing to the western confines of the continent, the Teutons settling about the Baltic, the Greeks and Latins finding their way to the Mediterranean, the Letts to the Baltic Provinces and Lithuania, and the Slavs making their home in the great region of steppes and rivers southeast of the Letts. Later investigation of the remains of primitive man in Europe, together with a close comparative study of the Aryan tongues, has cast grave doubt upon this theory, and made it seem altogether possible that there never was an undivided Aryan family, and that the European Aryan groups originated very near their present habitats; that perhaps the Baltic was the original centre of diffusion of European races, and that the Græco-Latins migrated southward to the Mediterranean and the Indo-Iranians southeast into Asia. Another hypothesis locates the original Aryan home in the steppes of Southeastern Europe, whence it is supposed that at a very early period the Indo-Iranians moved southeastward and the European groups northwest and southwestward. See ARYANS; INDO-GERMANIC LANGUAGES.

THE GERMANS AND HUNS. The migrations of the Teutonic or Germanic tribes, during the years of decline of the Roman Empire, had a profound influence upon the social and political development of Europe, and are known preëminently as 'the migrations' (Völkerwanderung). The Germans, in the centuries following the period when Tacitus gave his lucid and generally correct account of them in the *Germania*, were engaged in intertribal strife, which resulted in the loss of identity of several of the weaker tribes, the remnants of which were merged in the new confederacies—Goths, Vandals, Alemanni, Burgundians, and Franks (qq.v.). In the fourth century A.D. the Goths were spread over the country north of the Danube. There came upon them from Asia a great migratory wave of the nomadic Huns (q.v.), an aggregation of Turko-Tatar tribes, whose ancestors had held the Chinese Empire in temporary subjection. The Goths were unable to resist this inroad of overwhelming numbers, and a part of them, the Visigoths, who were nearest the Danube, threw themselves on the mercy of the Emperor Valens and crossed the river in 376. Soon after, owing to ill-treatment at the hands of Roman officials, they revolted against the Empire, defeated the Roman army in a battle under the walls of Adrianople (A.D. 378), in which Valens was killed, and then moved westward under their King, Alaric (q.v.), into the valley of the Po. The forces of the Western Empire under the Vandal Stilicho checked their progress temporarily and drove them back into Pannonia; but after the murder of Stilicho in 408 they returned to Italy and captured Rome (410), soon after which Alaric died. His followers, at first in the service of the Empire, afterwards on their own account, went into Southern Gaul and Spain, and there founded the Visigothic kingdom, the Gallic part of which continued until it was conquered by the Franks (507-10). The part south of the Pyrenees was conquered in the great Mohammedan invasion of 711. The Vandals left their homes, which lay between the Goths and the Baltic, and moved southeast and then westward to Pannonia, where they were when the battle of Adrianople showed conclusively the weakness of the Roman Empire. After a restless period of several years they were again in motion in 406, united with the Suevi and Alani. They swept forward through the north of Gaul and southward into Spain, where they preceded the Visigoths, who appeared in the Peninsula and overthrew them in the name of Rome. In 429 they crossed the straits, conquered the North African provinces, set up a Vandal kingdom, and entered upon a career of piracy on the Mediterranean. In 455 they raided and sacked Rome. The Vandal kingdom was overthrown in 534 by the armies of the Emperor Justinian (q.v.). The Burgundians, living on the Vistula near the Goths and the Vandals, migrated southward to the Rhine frontier of the Roman Empire in the latter part of the third century, were given some land by the Emperor Honorius, and spread over the Rhone and Sâone valleys soon after the founding of the Visigothic kingdom. The Burgundian kingdom there established was conquered by the Franks in 534.

The Ostrogoths, who had as a whole been subdued by the Huns when their cousins the Visigoths escaped across the Danube, settled in Pannonia about 453. In 476 Theodoric, the ablest of all the barbarian chieftains of the period of the migrations, became King of the Ostrogoths. He offered the services of his people to put down the independent kingdom which had been set up in Italy, in defiance of the Empire, by Odoacer, a German adventurer. With the expectation of conquering for themselves new and pleasanter homes in Italy, the Ostrogothic people set out with their whole impedimenta. The forces of Odoacer were successfully encountered in Lombardy and he was driven back into his capital, Ravenna, where he endured a long siege. The city was finally taken and the defeated King was treacherously killed. Theodoric then set up a kingdom, acknowledging nominal subjection to the Emperor, but in reality acting as an independent sovereign. He developed the most equitable and enlightened government then existing in the Roman world; but his own strong head and hand were necessary to maintain it, and after his death the Ostrogothic kingdom in Italy gradually lost its power, and was finally overthrown under Justinian in 553, when Narses (q.v.) completed the reconquest of Italy for the Eastern Empire. The Ostrogothic occupation left a permanent influence upon the laws, customs, and language of Italy, although these remained at bottom thoroughly Italian, the German leaven being a comparatively small one.

There was one more German migration into Italy, that of the Lombards, who entered the country from Pannonia, in 567. They settled in the valley of the Po, in the region which has been named for them, Lombardy. Their rule extended at one time throughout the Peninsula, except over the Exarchate of Ravenna (q.v.) and Rome. Their influence upon Italian life was lasting because, although their kingdom was overthrown as a political power by Pepin and Charles the Great, they remained in their Italian home, a permanent factor in the population. See ITALY; LOMBARDS.

These were all true migrations, not simply military invasions, the whole people in each case moving over the country with all their goods, and transferring their abodes. Each one of these Germanic kingdoms left a permanent impression upon the life and institutions of the country in which it was established, although as a formal political institution each gave way to others. With the Huns, whose movement westward had set the Visigoths in motion, it was different. They had no affinities with the Aryan groups and were regarded with horror and detestation by all of the European peoples alike. They were not home-seekers, but natural nomads, who lived by fighting and by plunder. They threatened the Danube frontier of the Empire for many years, and in 449 their King, Attila (q.v.), led his own tribes, with a miscellaneous contingent of German adventurers, across to Northern Gaul, where a heavy blow was aimed at the weakened remnant of Roman power. The invasion was checked by a union of Visigothic and Imperial forces under Aëtius and Theodoric (qq.v.) in a great battle near Châlons-sur-Marne (451). Attila never founded a State that was more than an armed camp, and his power went to pieces at his death, in 455. From that time the Huns disappeared as an organized power, leaving no influence behind, as did the abler and more stable Germans.

The conquest of Gaul by the Franks (q.v.) beginning in 486 differed from the other German folk-wanderings in that it was effected primarily by true military campaigns from a strategic base. The Franks had their original homes along the Gallic border, and they made a regular military invasion of Gaul, effecting a thorough conquest before making a settlement in the country. This gave the Frankish kingdom a more lasting foundation than those which were established by the migration of comparatively small bodies into the midst of alien populations, with a higher degree of civilization. There remains but to mention the migrations of the Teutonic tribes living on the North Sea coast about the mouths of the Elbe and the Weser, and northward, whose pirate forces in the fifth and sixth centuries invaded Britain and made the beginning of England. See ANGLES; ANGLO-SAXONS; JUTES.

SLAVS; AVARS; BULGARS; MAGYARS. The migration of the Germans was followed by a great movement of Slavic peoples westward and southward from the plains of what is now Russia. At the same time the non-Aryan Avars and Bulgars pressed into the regions of the middle and lower Danube. At the close of the ninth century occurred the migration of the Maygars into what is now Hungary.

ASIATIC TRIBES. The nomadic habits of the interior tribes of Asia of the Mongol-Tatar stock have made great migratory movements of these warlike peoples numerous, likely to occur, in fact, whenever a leader of large capacity and ambition has arisen among them. It is difficult to classify many of these movements as migrations or as military invasions, since they partake so much of both characters. Most notable of these was the great Mongolian movement set on foot by Genghis Khan (q.v.), which established Mongol dynasties in China and Persia, threatened even Central Europe, and placed Russia under the Tatar yoke for several centuries. In these cases the tribes transferred themselves to the conquered countries to a considerable extent and maintained a restless life until their unstable military States were broken up by new conquerors or by their own dissensions and lack of capable leadership. See MONGOL DYNASTIES; TIMUR; TURKS.

For the effect of the Germanic migrations on the history of European civilization, see EUROPE, section on *History*. For bibliography, see the articles on the various barbarian nations, as FRANKS, GOTHS, etc.

MIGRATION, WAGNER'S LAW OF. In evolution, one of the main agencies leading to the isolation of animals, and consequently to the formation of local races, varieties, and species. This was first pointed out by Wagner in 1868. He stated his views in three general propositions: (1) The greater the change in the conditions to which individuals are subjected on emigrating to another territory, the more intense must be the inherent individual variability of each organism; (2) the less the even tenor of this increased individual variability of organisms is interrupted by frequent crosses with emigrants of the old stock, the more frequently will nature be successful in forming a new variety or incipient species by the accumulation and inheritance of fresh characteristics; (3) the more advantageous to the variety the change in each single organ, the better it will be able to adapt itself to surrounding circumstances; and the longer the selection of an incipient variety of colonists remains undisturbed by the old stock, the more frequently will a new species arise out of the variety. These laws are fully illustrated by Wagner in his works, and by later observers. Wagner claimed that evolution by natural selection is impossible, unless it be assisted by geographical isolation, in order to prevent the swamping effects of intercrossing. The numerous facts observed by Wagner and others show that some of the barriers isolating incipient species are broad rapid rivers, oceans, and mountains. He speaks of the extraordinary phenomena of so many species of plants and animals peculiar to the volcanoes and isolated mountains of Quito. "Without the distribution of organisms by migration in connection with local selection it would be inexplicable. The gigantic isolated mountains of this highland act a similar part in the formation of varieties and species as the islands of the archipelago, for instance, of the Galapagos." Wagner also claimed that adaptation to changed conditions of life and transformation appear to be tantamount to a renovation. Species, he said, which did not migrate, and consequently did not alter in form, became extinct. Consult Wagner, *The Darwinian Theory and the Law of the Migration of Organisms* (Munich, 1868; trans. by Laird, London, 1873).

MIGRATION OF ANIMALS. The word migration is used in two senses: either to refer to those periodical changes of location such as are made by many species of birds and fishes, by some mammals, and by a few insects; or to those irregular dispersions caused by overcrowding and lack of food or water.

MAMMALS. Among mammals migrations in the first sense are mainly confined to certain Cetacea, which regularly move from and to the polar seas, with the alternating seasons. Regular seasonal movements, truly migratory but short, are practiced by many land animals, especially the herbivores. All deer, goats, sheep, antelopes, and the like, which dwell in mountainous regions, regularly ascend the heights in early summer to get the new grass, find safer solitudes, escape the lowland flies, and otherwise better themselves. In the fall they come down as the snow and cold increase upon the heights, and seek the valleys or the neighboring plains. The American bison formerly was wont to retreat from the mountains to the plains during severe winters, while those on the northerly plains tended to move south. Before the time of railroads the great body of the pronghorns of the plains used to migrate from the northern area of their range to the milder regions south of the Platte River, and returned north in the spring. Still more striking is the regular and prolonged annual migration of the caribou from the Arctic shores of America to the southerly interior, especially in the region north and east of Hudson Bay; they cannot live so far north during the winter, but go back as soon as the snow melts in spring. In all these cases there is an accompanying migration of certain large predaceous animals, such as wolves, which depend upon the grazers for food. Similar facts may be cited from the plain regions of Asia, Australia, Patagonia, the Sahara, and South Africa, where seasonal changes, either of cold or drought or the parching of pasturage, compel annual migrations to and from other regions not far distant. It will be seen that these movements are under compulsion of the lack of food (or frequently in desert regions of water), and are continued only when and so far as is necessary. Mammals are too slow and hampered in their movements on land to make long, rapid journeys, such as a bird or fish is able to accomplish through the unobstructed air or water; and most mammals either can find food all the year round, or have acquired the power, by storage of provisions or by sinking into dormancy, of tiding over the seasons of scarcity.

OVERFLOWS OF MAMMALIAN LIFE. Mammals, including man, take part in certain much more rare but more universal and permanent removals. The most conspicuous instance is afforded by the lemmings of Central Norway and Sweden, which at uncertain intervals come down in vast hordes into the lowlands, as is fully described under LEMMING. They travel by night, feed and multiply excessively, and in from one to three years the few which escape the hordes of enemies following them reach the Atlantic or the Gulf of Bothnia. It is believed that these sudden incursions are the dispersal of an overpopulation in the ordinary habitat of the species, due to a combination of favoring circumstances causing an increase of a naturally fecund race until the country cannot longer support the numbers. The animals are started abroad by famine, and continue the flight in aimless restlessness until an equilibrium is restored. The same thing happens occasionally with various other small rodents. 'Plagues' of mice have broken out frequently in the grain-growing regions of Southern Russia and in other parts of the world. In the western part of the United States, until hunting kept down the stock, there used to be irregular but prodigious movements of squirrels (normally extremely numerous there), which would appear in droves over a wide range of country, all traveling steadily in one direction, until they gradually vanished. The writings of Audubon, Godman, and other early naturalists contain many records of these movements, which did not cease until about 1840. The theoretic and historic incursions of human hosts from Asia into Europe, the spread of the Bantu races which overran Africa, and similar 'waves' or 'migrations' of conquering men, fall into the same category, but their superior adaptability has enabled them, or some of them, to remain and possess the land.

INSECTS. The insects afford many cases of mass movements, similar to those of mammals, and also a rare approach to true migrations. The swarms of 'grasshoppers,' or locusts, which occasionally visit parts of Africa and Asia, are among one of the most familiar phenomena of those regions; and they are accompanied by a rapacious following of birds and mammals feeding upon the traveling hosts of insects, which disperse, dwindle, and finally disappear. In the United States the most disastrous incursions of these insects have been from the Rocky Mountains eastward. They are of irregular occurrence and the returning swarm the succeeding year is composed only of the descendants of the original emigrants—a fact which contains a hint as to the possible origin of the true migratory habit in others. Irregular movements, without, so far as we know, any attempt to return to the original home, are illustrated by the army worm, cotton worm, and chinch bug (qq.v.). These migrations are clearly induced by overcrowding and lack of food. There are still slower migrations among insects, which may be termed 'spreading.' Thus the Colorado potato beetle, a native of the Rocky Mountain Plateau, spread eastward, when suitable food was offered it by the cultivation of potatoes, until it now occurs all over the potato region of Eastern North America, and, like the brown rat, it permanently occupies all the new territory it enters. A few insects (butterflies) are known to migrate in the sense that fish and birds do.

REPTILES AND FISHES. Such phenomena are entirely unknown among reptiles, for obvious reasons, with the possible exception of sea-going turtles, which may withdraw into deeper water or more southerly latitudes in winter than in summer. Many fishes perform long and complex wanderings, but how they are guided in some cases across and up and down the ocean will be a very difficult problem to solve. Salmon and other anadromes come from the sea each spring, and ascend hundreds of miles up rivers so as to spawn in places suited to the needs of the young. The fish so bred return to spawn in the water of their birth, as has been demonstrated by marking smelt that have been transplanted and hatched in rivers previously unoccupied by them; the marked smelt returned from the sea to spawn in the river of their adoption. Experiments upon herring along the Massachusetts coast confirm this conclusion. Sea fishes generally retire to comparatively deep water, and probably many species go southward in winter, while in summer they spread northward and approach the shores, river-mouths, or other spawning places. These migrations are induced by reproductive desires and necessities, and the slight variation in the time of the coming of each species, which fishermen expect with fair regularity, seems due to variations in the temperature of the water. It is probable that even these ocean wanderers return to the same part of the coast where they were bred, and that in some cases, as of the Atlantic salmon, exaggerated notions have prevailed as to the distance to which they go in winter. See SALMON.

THE MIGRATION OF BIRDS. More conspicuous and interesting, and quite as difficult to explain, are the migrations of the birds, which have been the theme of poetry, homily, and fable, as well as a baffling subject of inquiry, ever since men began to notice the ways of animals.

Most persons have a vague idea that the habit of yearly migration among birds is uniform and universal; but this is not so. Most birds do not migrate at all, and among those that do great diversity exists, so great that the custom seems almost an individual rather than a racial one. The whole body of ratite birds—ostriches, rheas, cassowaries, and the like—are non-migratory. The fish-eating sea-fowl make no more of an annual migration than is necessary to escape from the ice and darkness of their most polar haunts to where there may be open sea. These are wanderers rather than migrants. Gulls and terns, geese, ducks, and the wading marsh and beach birds are in the main migratory, and include some of the most remarkable examples. Of the game-birds fewer are real migrants, but here again a few notable exceptions exist, of which one of the most familiar is that of the common European quail, which has been taken so numerously for centuries on both sides of the Mediterranean, and whose migratory flocks still feed Israelites wandering in the wilderness of Sinai. The pigeon tribe is sedentary as a rule, also, yet one of its species—the passenger pigeon of North America—has become the very type and exemplar of a migratory bird. Many, but not all, birds of prey regularly migrate, but it is a question whether they do not, in most cases, accompany the movements of the smaller birds rather than travel of their own impulse. Parrots are almost wholly non-migratory. It is not, then, until we have passed twenty-one of the twenty-three classified orders of birds (with the exceptions above noted) that we come to those groups—the picarian and passerine birds—in which the custom of seasonal migration is a prominent characteristic. These are, to be sure, the most numerous as well as the most highly organized orders; yet a large number even here do not migrate at all from temperate regions, but form a 'resident' or 'partially migrant' population in all moderate latitudes, where they remain all the year round. On the whole, the large majority of the total list of the birds of the world are non-migratory to any considerable degree.

When we examine the minority which does annually alternate between southerly winter and northerly summer residences, many curious facts are discernible. First, it is noticeable that all migratory birds belong to the colder latitudes of the globe; and, on the other hand, that those groups which are wholly non-migratory represent the primitive types—birds whose ancestry goes back to times when a comparatively warm climate prevailed over the now unbearably cold and sterile polar regions. In general, two-thirds of the birds of the middle temperate zones, both north and south, are migrants, and the total is a very small part of the entire avifauna of the world. Taking up the character of the migratory birds as a class, it appears, first, that they are such as either subsist wholly or mainly on soft-bodied insects, larvæ, worms, and the like, or give their young such fare; second, such as gain their living from fresh or brackish waters or mud, which is likely to freeze; and third, such as follow small birds in order to prey upon them. It is also significantly true that they represent families whose mass and affiliations are found in the tropics, in many cases only one or two species being known elsewhere. Europe's single cuckoo, our single (Eastern) humming-bird, our few tanagers, orioles, and the like, are familiar and striking examples of this fact. On the other hand, the non-migratory or 'resident' birds of the temperate zones belong to families mainly distributed outside the tropics, and separable, broadly speaking, on other grounds. This state of things points to the explanation that the extratropical parts of the world, depopulated of birds by the cold, ice, and excessive rains of the Pleistocene or 'Glacial' period, were restocked from the crowded intertropical preserves as fast as the amelioration of the climate permitted plants and animals to occupy the temperate and sub-arctic regions; and that the reactive effect of the new country steadily checked colonization by selecting only those species adapted or adaptive to the new conditions. In this light, the seasonal migration of birds must be viewed as an annual excursion, constantly repeated by certain species that have the habit (and not by others), outward from equatorial regions to a greater or less distance poleward.

Beginning of the Seasonal Movement. As the close of the rainy season approaches in the tropics migratory strangers gradually separate themselves from the resident birds, now beginning domestic cares, and disappear. What starts them off, just as the rains are bringing an increase of both plant and insect food, we do not know. Their ovaries show little preparatory enlargement, and few or none are mated. As they slowly proceed, keeping pace with the lifting sun and the opening spring, they will gradually concentrate upon certain highways, or 'migration routes.' The old males take the lead, probably merely through superior strength of wing; and it is not until the bulk of these have passed by that the females appear, followed, after an interval, by yearling birds.

The weather encountered, always uncertain, influences this progress decidedly, warm southerly winds encouraging the birds to go forward, while cold spells or northerly storms check them, sometimes for a fortnight or more, and occasionally destroy large numbers. When sunshine and southerly breezes again prevail the accumulated host goes forward in what observers call a 'wave' of migration. Such checks are local; and larger influences have an effect, so that the movement is uniformly earlier in some parts of the continent than in others.

Migration Routes. It is also true that the movement is not uniformly distributed. On the contrary, there are certain definite routes or paths which birds follow in especially great numbers. The greater of these routes or 'fly lines' are generally recognized and seem to be determined partly by topography, but to a greater degree by considerations of security and subsistence. The most thickly frequented routes are along ocean coasts, river-valleys, or mountain ranges. European specialists, like Palmen and Middendorf, have outlived several such 'fly lines' with great particularity, and when sketched upon a map they are seen to coincide in a general way with the valley system of that continent. Similar highways are traceable in North America. One runs along the Pacific coast, and another up the valley of the Rio Grande and along the connected valleys and parks between the parallel ranges of the Rocky Mountains. East of the plains a horde of spring birds enters the United States along the eastern lowlands of Mexico, and by way of the West Indies, and soon divides into definite streams of travel. Parted first by the southern extremity of the Alleghanies into two main currents, one goes to the right up the Atlantic coast and through the Hudson Valley and New England, while a second, to the left, ascends the Mississippi, Missouri, and Ohio, diverging more and more up tributary valleys, until all the central and northern parts of the continent are supplied. A little reflection will show how likely, from the nature of the case, are these routes. They are natural bird-roads, without obstacles, and they afford easy guidance, plentiful vegetation, and consequent protection against enemies and storms, and the abundance of insect food belonging to watercourses.

Nocturnal and High-Flying Migrants. A large part of the migration of many birds is made at night, especially the natural night-fliers, like owls and goat-suckers, and the great body of small, timid birds, that in their daily life seek concealment and obtain their food in shady, secluded places. It is only the day-goers that we ordinarily see migrating, and these more commonly in spring than fall; but every observer has noted how after a favorable night the woods will be full of birds at dawn where none were to be seen the evening before. English and American ornithologists, led by Baird, about 1875, have collected at light-houses and other watching places systematic data in respect to night migration.

Guidance. What guides these travelers on their annual journeys across continents and over seas? This has been an eager question ever since men began to watch the ways of the birds. If anything approaching a rule has been disclosed, it is that diversity prevails rather than uniformity. Birds closely allied in structure, diet, nesting habits, and so forth, vary immensely in the extent and manner of their migrations. While some travel twice a year from the equator to near the poles, others of the same family, or genus even, never leave warm latitudes at all. The increasing perception of this individuality in animals inclines one more and more to believe that migratory birds are guided by the teaching of their elders, and by their own observation and memory, rather than by any extraordinary faculties or process. Brewster declares that the manner of migration of our birds is determined by one, two, or three of the following considerations, viz.: (1) Habitual manner of procuring food; (2) disposition; (3) wing-power. Much evidence exists in favor of this simple and practical explanation, but unfortunately contrary and unexplained facts still con-front us. European ornithologists assert that there the young of many species precede the adults on their journey southward in the autumn. Cooke and Widman, in their elaborate *Report on Bird Migration in the Mississippi Valley,* say the same for the interior of North America. On the other hand, William Brewster, who has observed this matter with the highest zeal and intelligence, maintains the opposite view as the result of long experience in New England and Eastern Canada, and declares that the young never precede older birds in the fall, explaining that the first southward flights of adult birds have been overlooked because they were unexpectedly early. He has elucidated this with much detail in the *Memoirs* (No. 1) *of the Nuttall Ornithological Club.*

That this is the true history of migration in respect to many and various kinds of birds cannot be gainsaid; that it is an all-sufficient explanation is not universally admitted. The powers of recognition and recollection involved are doubted by some; yet all animals are strong in this direction—perhaps no mental faculties are so distinctly manifested by brutes as observation and memory. Examples might be drawn from every class, but homing pigeons are most closely to the point. There can be no reason to suppose other birds are less able in this respect until we have taken pains to exploit their abilities. No mysterious 'homing faculty' need be summoned. The great height at which pigeons usually fly enables them to survey a wide extent of country, and find some points with which they have been previously familiarized; from this a second is visible and so on, leading the pigeon straight home as the pioneer follows a blazed trail through a forest. Wild birds may be supposed to do the same, and their wish to get a very wide view of the landscape explains the height to which they rise in these journeys and their descent and confusion in murky weather. From a height of 10,000 feet both shores of the Mediterranean, for example, would probably be visible to a bird's eye, at any rate in the narrower places where they mostly cross. It must be confessed, however, that this explanation does not cover the case of those birds which migrate across ocean spaces of one or two thousand miles. Here it seems necessary to believe that they are guided by an intuitive sense of direction—a *feeling* for the points of the compass, so to speak. Something so closely akin to this instinctive power of orientation is observable among other animals, including the human savage, that it may be very well conceded to the birds.

Bibliography. For references to early essays, and to many essays and books on European languages, consult Newton, article "Migration," in *Dictionary of Birds* (London and New York, (1893-96), and Giebel, *Thesaurus Ornithologiæ* (Leipzig, 1872-77); Baird, "Distribution and Migrations of North American Birds" (three articles), in *American Journal of Science and Arts*, ser. 2, vol. xli. (New Haven, 1866); Allen, "Birds and Weather," in *Scribner's Magazine*, vol. xxii. (New York, October, 1881); Brewster, "Bird Migration," in *Memoirs* (No. 1) *of the Nuttall Ornithological Club* (Cambridge, 1886); Cooke, *Report on Bird Migration in the Mississippi Valley* (United States Department of Agriculture, Washington, 1888); Palmen, translation by Shoemaker of a report to the International Ornithological Congress at Budapest, 1891, in *Report of the Smithsonian Institution for 1892* (Washington, 1893); Gätke, *Die Vogelwarte Heligoland* (Brunswick, 1891), translated by Rosenstock as *Heligoland as an Ornithological Observatory* (Edinburgh, 1895); Whitlock, *The Migration of Birds: A Consideration of Herr Gätke's Views* (London, 1897). This combats many of Gätke's statements and theories. Dixon, *The Migration of Birds: An Attempt to Reduce Avian Season Flight to Law* (amended edition, London, 1897), an ambitious book of theory, not well sustained; Beddard, *Book of Whales;* Scudder, *The Butterflies of New England* (Boston, 1886).

MIGRATION OF PLANTS. The natural movement of plants from one area to another. This term is thus somewhat in contrast to naturalization (q.v.). Migration of species is possible by reason of variations in the structural adaptations which are found in most plants. Among these perhaps the most important are the structures which are concerned in the dispersal of seeds and spores, which may be scattered by means of birds, wind, or water to very great distances. Besides this type of dispersal, certain plants may be scattered in a vegetative way for great distances and become established far from the original home. Thus the common water weed Elodea is believed to have spread all over Europe vegetatively from a single plant introduced in the early part of the nineteenth century. It seems likely that after a time a certain equilibrium between the various species of the world will have been reached, and that each particular species will be found in the conditions best suited to it. When this time comes, further migration would seem to be without result, whether the scattering of seeds takes place or not. It must be remembered, however, that various factors enter in to disturb any equilibrium which may be formed. In the first place, there are changes in the organic world itself; that is, new species of both plants and animals are developed from time to time through evolution and new disturbances in the so-called equilibrium must arise. In the second place, the external world suffers tremendous changes. It is probably this last cause which has been most responsible for the migration of plants. Through the geological ages continents have arisen and passed away, and all these changes must have been accompanied by changes in the mutual relations of the species then living. Changes in climate have taken place many times in the world's history, and all of these changes must have been attended with great plant migrations. To illustrate: the oncoming of the ice epoch caused a southern movement of the climatic zones, and the species which had become adapted to a particular climate moved south to a greater or less degree *pari passu* with the climatic movement. Post-glacial times have witnessed northern migrations which are necessarily much slower than the northern migrations of the southern zones. Plants must not be regarded as less active migrants than animals, though they make no seasonal migrations.

MIGUEL, mē-gāl′, Dom Maria Evaristo (1802-66). An aspirant for the Portuguese throne, the third son of John VI. of Portugal.

He was brought up in Brazil, and came to Portugal in 1821 without the least education, a debauchee, and a superstitious bigot. He put himself at the head of the reactionary party, and plotted the overthrow of his father and of constitutional government. In 1824 he caused his father to be closely guarded, arrested the ministers, and sought to overthrow the Government, but failed, and was sent into banishment. In 1826 his brother Dom Pedro, Emperor of Brazil, succeeded to the throne. He relinquished the crown of Portugal to his young daughter, Dona Maria da Gloria, and betrothed her to her uncle Miguel, who was made regent. Dom Miguel in 1828 usurped the throne, abolished the Constitution, and introduced a reign of terror. Dom Pedro, who had been forced to abdicate the throne of Brazil in 1831, placed himself in 1832 at the head of an expeditionary force, which had been collected by the opponents of Dom Miguel, and proceeded to dethrone the usurper. He entered Oporto in July, and a year later, after the defeat of Dom Miguel's fleet, was in possession of Lisbon. England and France intervened, and Dom Miguel was forced to give up all claims to the crown (1834). He died at Brombach, in Baden. To the common estimate of Dom Miguel's character exception is taken by Cardinal Hergenröther, in the *Handbuch der allgemeinen Kirchengeschichte* (1886), vol. iii., p. 847 ff., where he is spoken of as a noble prince who possessed the affection of his subjects.

MIHRAB, mê-räb′. See Kiblah.

MIKADO, mê-kä′dô (Jap., Exalted Gate). Formerly the popular and official title of the Emperor of Japan, occurring in poetry and history throughout the whole range of Japanese literature. Though comparatively obsolete in the Japan of the twentieth century, the word has found a fixed and honored place in the English language and literature. The dynasty of the mikados is probably the oldest in the world, the present ruler, Mutsuhito (q.v.), being reckoned by some authors the 123d of the Imperial line, the first being Jimmu-Tenno, who in the official chronology began to reign B.C. 660. Descent is claimed from the gods that created heaven and earth. The origin of the line is lost in mythology, and there is little or no historical foundation for it before the fourth century. The first seventeen mikados, B.C. 660 to A.D. 399, are said to have died at ages ranging from 100 to 141 years. The average reign in the whole line is twenty years. Each mikado has a personal name, but no family name, nor is the name of a mikado ever repeated. Each has also a posthumous title, by which he is known in history. Seven of the mikados were women. The mikado's person is sacred and inviolable, and he is the fountain of all authority and the centre of all government and history.

MIKA′NIA (Neo-Lat., named in honor of J. C. Mikan, a Bohemian botanist of the nineteenth century). A genus of plants of the natural order Compositæ, nearly allied to Eupatorium (q.v.). The heads are four-flowered, and have four involucral scales. *Mikania offieinalis* is a Brazilian species, with erect stem, and heart-shaped leaves, abounding in a bitter principle and an aromatic oil, reputed useful in medicine. *Mikania amara* and *Mikania cordifolia* (twining herbs), also natives of the warm parts of South America, are among the plants which have acquired a high reputation—deserved or undeserved—for the cure of snake bites. The former is remarkable for the large indigo-blue spots on the under side of its ovate leaves. *Mikania scandens*, sometimes called climbing hempweed, is a native of the United States, growing in moist soils from New England to Texas.

MIKHAILOFF - SHELLER, mē′ᴋȧ-yĭl′ȯf′-shĕl′lẽr, Alexander. See Sheller, Alexander Mikhailovitch.

MIKHAÏLOVSKI, mē′ᴋȧ-yĭl-ȯf′skė, Nikolaiovitch (1826-65). A Russian journalist and novelist, born in the Ural Mountains. He was educated in Saint Petersburg, and began his literary work with translations, chiefly from Heine. These were collected in one volume (1858), and his articles for the *Sovremmenik* (*Contemporary*) and other journals, as well as his stories, notably *Adam Adamovitch* (1851), were published in two volumes in 1859. He shared the dreams of the revolutionists of his own country, and in 1865 was exiled to Siberia, where he died.

MIKHAÏLOVSKI, mē′ᴋȧ-yĭl-ȯf′skė, Nikolai Konstantinovitch (1842—). A Russian critic. He translated Byron into Russian, but it was his critical work on the famous *Annals of the Fatherland*, with which he was connected from 1868 to its suppression in 1884, that made him famous. For it he wrote literary notes regularly, beginning in 1872, and many scientific papers, on Darwinism, socialism, positivism, and the systems of Spencer and Mill. Best known is the monograph on *The True Nature of Progress* (translated into French by Louis, *Qu'est-ce que le progrès?* 1879). His style is brilliant.

MIKHAÏLOVSKII-DANÏLEVSKÏI, mē′ᴋȧ-yĭl-ȯf′skė dä′nė-lyĕf′skė, Alexander Ivanovitch (1790-1848). A Russian soldier and historian. He took part in the war with France (1812-13) as Kutusoff's aide-de-camp, and was head Chancellor of Wolkonski in 1813-14. In the war with Turkey (1829) he served as major-general, was promoted to be lieutenant-general in 1835, and was a member of the war council and Senator in 1839. He wrote a *History of the Turkish War of 1806-12* (1843), besides accounts of his experiences in the campaigns of 1812-13 (1834), and of 1814-15 (1849-50). His collected works were published (1849-50) in seven volumes. They are marked by a freedom of style and a patriotic sentiment that sometimes verged into inaccuracies.

MIKLOSICH, mĭk′lô-shĭch, Franz von (1813-91). A Slavic philologist. He was born in Luttenberg, Styria, studied law at Gratz, and settled to practice in Vienna in 1838. He became interested in Slavic philology, and first attracted attention by his review of Bopp's *Comparative Grammar* in 1844. Henceforth he devoted himself to philology, and until his death his productivity was enormous. In 1844 he obtained a position in the Imperial Library, and in 1850 was made professor of Slavic philology in the University of Vienna, retaining his post until 1886. His scientific career is remarkable for profundity of research. He is the founder of modern Slavic philology. Aside from numerous articles on special points of phonetics, syntax, archæology, etc., the most important of his works are: *Verglei-*

chende Grammatik der slawischen Sprachen (1874-79); *Lexicon Palæoslovenico Græco-Latinum* (2d ed. 1865), the best of its kind for completeness and the abundance of material; *Etymologisches Wörterbuch der slawischen Sprachen* (1886); *Formenlehre der altslowenischen Sprache* (2d ed. 1854); *Altslowenische Lautlehre* (3d ed. 1878); and *Altslowenische Formenlehre in Paradigmen* (1874).

MIKLUCHO-MACLAY, mė-klōō′kȯ-mȧ-klī′, Nikolai (1846-88). A Russian traveler and ethnographer, born in the Ukraine of a noble family. He studied medicine and zoölogy at Saint Petersburg and in Germany. In 1866 he went with Haeckel to Madeira; visited the Canary Islands in 1867, and after a trip to Morocco in 1870 undertook a great anthropological tour in Oceanica. At Sydney he founded a museum and zoölogical station, and in 1885 returned to Saint Petersburg, where he died before he had classified his collections. He wrote on his travels in New Guinea in Petermann's *Mitteilungen* (1874 and 1878), and on the temperature of oceanic depths for the *Bulletin* of the Saint Petersburg Academy (1871), besides many other contributions to technical journals in Europe, Asia, and Australia.

MIKNAS, mĭk′nȧs. A town of Morocco. See Mekinez.

MIKOVEC, mė-kō′vĕch, Ferdinand Bretislav (1826-62). A Bohemian dramatist and archæologist, born at Bürgstein, and educated at Česká Lípa and Prague. He founded the literary journal *Lumir* (1850), and edited two volumes of Bohemian antiquities under the title *Starožitnosti a památky země české* (1858-64). He wrote the tragedies, *Záhuba rodu Premyslovského* ("The Fall of the Přemyslids," 1851); *Dimitri Ivanovič* (1856), and other dramatic works.

MILAN, mĭl′an *or* mĭ-lăn′ (It. *Milano*, Lat. *Mediolanum*). The second largest city in Italy, the chief city in Lombardy, and the capital of the Province of Milan. It is situated in the great plain of Lombardy, 360 feet above the sea, on the little river Olona, an affluent of the Po, 93 miles northeast of Turin and 166 miles west of Venice; latitude 45° 28′ N., longitude 9° 11′ E. (Map: Italy, D 2). The climate is rather changeable and trying. It is extremely hot in summer and quite cold in winter, the winds from the frozen Alps sweeping across the Lombardy plain. The thermometer at times drops below zero. The mean annual temperature is 55.4° F.; rainfall, 39.37 inches.

Milan is a fairly symmetrical polygon in shape, the circuit of its customs district being now nearly twenty miles. Its focus is the splendid Piazzo del Duomo (Cathedral Square), from which broad avenues and electric railways radiate in all directions. These radials are connected by an inner circle of modernized streets just outside the canal that marks the location of the ancient moat and of the inner and most ancient city. An additional connection is furnished by a splendid boulevard, and by a belt electric railway seven miles long beyond the sixteenth century walls that are pierced by a dozen gates, and are now planted with trees and used as a promenade, commanding the view of the suburbs. The most magnificent of the radials is the modern Via Dante, leading from the handsome Piazza de' Mercanti to the spacious Foro Bonaparte, and thence to the New Park, which was formerly a part of a national drill-ground. This park is paved with wooden blocks on a concrete foundation, and on each side, next to the front foundation walls of the houses, has large subways containing water and gas pipes, electric wires, etc. It is beautified by a large pond and spacious promenades, and is faced by the Castello, and also by the Anfiteatro dell' Arena, which was constructed by Napoleon I. for races and is capable of seating 30,000 persons. The park is lighted by electricity at night. Adorning the northeastern section of the city are the splendid Giardini Pubblici, surpassed by few gardens on the Continent. The Corso Vittorio Emanuele is one of the most elegant shopping streets in Italy, and the centre of traffic in Milan. The Galleria Vittorio Emanuele, connecting the Piazza del Duomo with the Piazza della Scala, is a splendid glass-covered arcade, with shops, designed by one of Milan's distinguished architects, Mengoni. It is in the form of a Latin cross, with a cupola 180 feet in height.

Architecture is superbly represented in Milan, nearly all styles being displayed in rare examples. Bramante dwelt here many years, and left his genius impressed on more than one fine monument. The city is particularly famous for fine churches. Of these the principal is the world-renowned Gothic cathedral, one of the finest of ecclesiastical structures, ranking with Saint Peter's at Rome and the Cathedral of Santa Maria del Fiore at Florence. The vast church has an exterior of white Carrara marble, which is adorned by 98 pinnacles and with more than 2000 statues, besides a variety of carvings of unsurpassable beauty. In form it is a Latin cross, with a length of 486 and a breadth of 287 feet. The height of the tower is 356 feet. Its foundation was laid in 1386 by Gian Galeazzo Visconti, and during its erection many of the greatest European architects contributed designs for its embellishment. Within it Napoleon was crowned King of Italy in 1805. The view of the Alps, Lombardy, and the city from the top of the cathedral is celebrated. The quaint mediæval Church of Sant' Ambrogio, erected on the site of a church founded by Saint Ambrose in the fourth century, possesses inscriptions, sarcophagi, and monuments full of antiquarian interest, and is historic as the place where the German emperors were crowned kings of Italy. There are also the Dominican Church of Santa Maria delle Grazie, which contains in its refectory the now almost obliterated picture of the "Last Supper," by Leonardo da Vinci; the Church of San Carlo Borromeo (1847); and San Nazaro, which possesses a masterful fresco by Lanino, and also San Sebastano, once a Roman temple. The Church of San Satiro has a beautiful sacristy—a creation of Bramante. The mural paintings of Luini in the Church of San Giorgio al Palazzo are visited by all art lovers. San Lorenzo is an important church, and is in addition the oldest one in the city, tracing its history back to Roman times.

Of the secular buildings of Milan, the most noteworthy is the magnificent Brera Palace, formerly a Jesuit college, and now used for the fine arts, with the official name of Palace of Arts and Sciences. (For illustration, see Lombardy, Renaissance Architecture.) Within its vast precincts this unique institution includes an academy of art, a choice gallery of paintings of the Bolognese and Lombard schools, a fine collection of casts for modeling purposes, a splendid national library containing about 350,000 volumes and pamphlets, and a rare collection of manuscripts, medals, and antiquities. It has also attached to it an observatory and a botanical garden. The masterpieces of painting here include Raphael's far-famed "Sposalizio," Mantegna's "Pietà," and Bellini's "Saint Mark." The Brera has been greatly enlarged latterly, and many pictures of high rank have been added to its collection. One of the features of the national library is a room devoted to the editions and autograph writings of Manzoni. Another large library is the Ambrosian (q.v.). The Borromeo Palace also has a meritorious collection of paintings. The Museo Poldi-Pezzoli offers a fine collection of paintings, weapons, furniture, porcelain, etc. The Museo Civico is worthy of mention for its superb ornithological collection. There is also a permanent art exposition, and Milan now has good scientific collections.

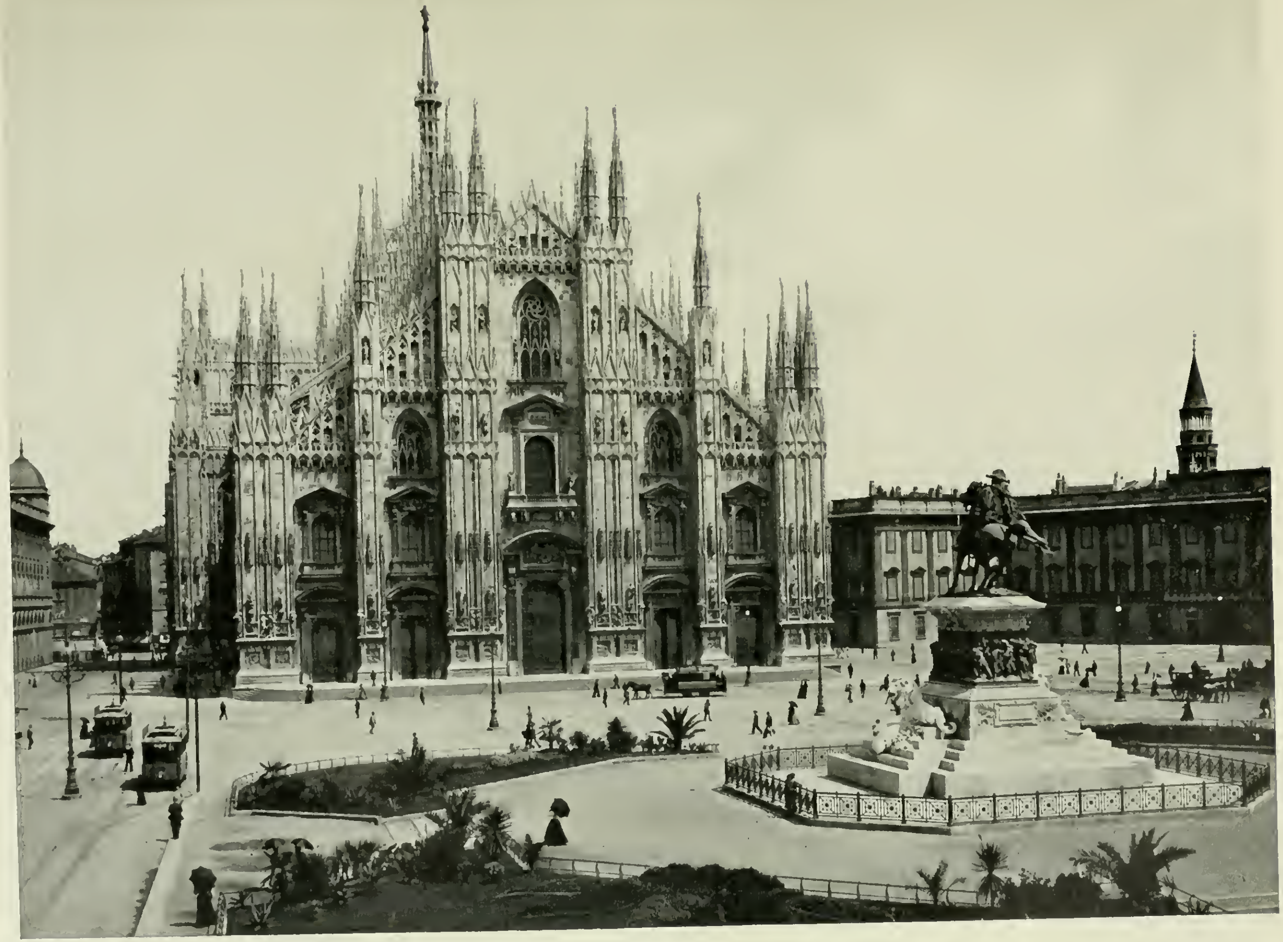
The Palazzo Reale and the archiepiscopal palace are old, and have some attractive features. The fine and elaborate Castello di Porta Giovia dates from 1368, and is the castle of Milan, being associated with the city's governmental and historic career. Among the noteworthy new and attractive secular buildings are the Exchange, finished in 1901, the prefecture, and Palace of Justice. Notable features in the city also are the Court of the Marino Palace, the Corinthian Colonnade. the finest relic of Roman times in Milan, and the well-known triumphal arch begun by Napoleon I. Other conspicuous public monuments are the statues of Victor Emmanuel II. and of Cavour, Canova's notable statue of Napoleon I., the huge equestrian statue of Garibaldi, an equestrian statue of Napoleon III. in commemoration of Magenta, the monument to Leonardo by Magni, the statues of Cardinal Borromeo and Parini, and the monument to Manzoni. The Cimitero Monumentale, with its decorative tombs and its elaborate cremation temple. is visited by all tourists. Milan is famous for its vast Scala Theatre, which was built in 1178 for operas and ballets. It accommodates 3600 persons. Milan is the centre for music in Italy. The famous Conservatory of Music is established in the buildings of an ancient monastery.

In recent years many new schools have been built, and the number of day and evening scholars has increased rapidly. Milan has an Academy of Science and Literature. a college for girls, and medical. high, and normal schools. The fine polytechnic, dating from 1865, a commercial academy, an agricultural school, a royal astronomical observatory, an Accademia di Belle Arti are other educational institutions. There are also a municipal zoölogical collection, and botanical gardens. and theatres. The government of the city is highly efficient, and enormous sums have been expended on public improvements. The *giunta* is composed of men of wealth and family connections, and also of a number of successful business and professional men. The new system of sewers empties into the swift covered-over Seveso, whence the sewage passes to the Adriatic by way of the Po. The city water for domestic purposes comes principally from large artesian wells, and for industrial purposes from the canals. The different philanthropic organizations under the control of the Board of Charities have property valued at over $53,000,000, and a yearly income of $1,600,000. The Maggiore hospital is one of the largest in the world, accommodating 4000 patients. It dates from 1456. It is a splendid brick edifice, part Gothic, part Renaissance. There are deaf and dumb institutions, and institutions for surgical operations and for ailments of the eyes. Milan has also public dormitories, soup-kitchens, etc.

Milan is the leading financial city of Italy and possesses vast wealth. It has a chamber of commerce and a stock exchange. It markets large quantities of grain, cheese, butter, eggs, and poultry, and manufactures silk, leather, and woolen goods, stationary engines, locomotives, railway machinery, carriages, furniture, glass and earthenware, and chemical products. A royal mint and a royal tobacco factory are situated here, and there is a corn exchange. It is the centre also of the Italian book trade, deserving to be called the Leipzig of Italy. In modern sculpture likewise it holds a leading rank. Not only are its industries by far the most important in Italy, but its commerce is very extensive. The Grand Canal connects the navigable Olona with Lake Maggiore and the Ticino. The city is also in canal communication with the Po, and with Lake Como through the Adda. It is an important centre of the national railway system. When the new Simplon Tunnel is opened the already immense traffic with mid-Europe, through the Saint Gotthard, will be heavily increased. Milan is connected by street railways with the neighboring towns of Lombardy. The local system of electric street railways is excellent. The city owns the lines of this system and shares in its profits; the Edison Company operates the plant. In the last twenty years of the nineteenth century Milan grew more rapidly than any other Italian city. Population, in 1810, 124,000; in 1860, 191,000; in 1881, 321,839; in 1901, 491,460.

History. Milan, the ancient Mediolanum, appears first definitely in history in B.C. 222, when it was taken by the consuls Scipio and Marcus Marcellus from the Gauls. It rose to great prominence at the close of the third century A.D., when Diocletian made it the capital of Italy. Thereafter Milan was frequently a favorite Imperial residence. It was from Milan that Constantine issued in 313 the famous edict by which Christianity was recognized. Milan became the seat of a bishop, and from 374 to 397 this office was held by the celebrated Ambrose (q.v.). He established a ritual, which in some points varied considerably from the Roman, and for a time Milan was the religious metropolis of Northern Italy, and almost entirely independent of Rome. This first era of prosperity was destroyed by the barbarian invasions; in 539 the city was laid waste by the Goths, and only in the tenth century did it begin to recover.

During the greater part of the Middle Ages the population of Milan was divided into great nobles (*capitanei*), petty knights (*valvassores*), and the general populace. For a long time the history of the city turns upon conflicts between these various classes. In 1036 the Archbishop Aribert sought to make himself independent of all ecclesiastical and temporal control, and for this purpose united with the *capitanei*. He was however, opposed by the Emperor Conrad II., who



MILAN
THE CATHEDRAL

was aided by the *valvassores.* The Emperor in 1037 gave his allies the full inheritance of their feudal holdings, for which they had been struggling; Aribert was overthrown, but the sudden death of Conrad in 1039 put an end for a time to the conflict. Henry III. (1039-56) ruled the whole Empire (Italy included) with a firm hand, but during his reign the forces developed which resulted in the great conflict of the *Pataria* after his death. According to the Ambrosian rules priests were permitted to marry, but Hildebrand (later Pope Gregory VII.), whose influence at Rome began about 1045, urged the suppression of this, and also sought to connect the Church of Milan more closely with that of Rome. He was aided in this attempt by the lower classes of the populace, who were known as *patarini,* i.e. ragamuffins, and were in reality infected with the Manichean heresy. Opposed to this whole movement was the Archbishop and his party, supported by the Empire, which, under Henry IV. (1056-1106), was also at war with the Papacy. The conflict was violent, and in 1066 the Archbishop Guido himself was assassinated. The struggle terminated with a compromise, by which marriage of priests was forbidden for the future, but those who were married might retain their wives. The independent position of the archbishops, however, was gone forever, and the way was clear for the establishment of a republican commune, especially as a very powerful artisan class had gradually developed.

The city was ruled by consuls elected by the three orders, and it rapidly acquired a hegemony over the other Lombard cities. When, however, Frederick Barbarossa became Emperor, he proceeded to reëstablish the old Imperial power in Italy, and in 1153 began active warfare against Milan. Twice the city was compelled to submit, in 1158 and 1162, and the last time it was razed to the ground. The cities of Northern Italy, which at first had been glad to witness the destruction of a rival, now, however, saw their own danger, and hastened to the assistance of Milan under the leadership of Pope Alexander III. (1159-81). The Lombard League was formed against the Emperor, and in 1176 Frederick was defeated at Legnano, and in 1183 by the Peace of Constance recognized the independence of Milan and the other cities of Lombardy. After these foreign dangers were averted, intestine strife again broke out between the three parties: between the *credenza dei consoli,* a council of 400 members, named by the great nobility; the *motta,* a council of 100, named by the *valvassores;* and the *credenza di Sant' Ambrogio,* a council of 300, named by the populace. Wearied by these continuous quarrels, the citizens began to call in foreigners to rule and mediate, thus giving rise to the office of the *podestà.* The first one was Uberto Visconti, who was chosen in 1186, and ruled for a year. He had several successors. In 1226 the Lombard League was renewed to prevent the aggressions of Frederick II., who was finally defeated in 1237 at the battle of Cortenuova.

In the thirteenth century Milan gradually lost its republican liberties. In 1259 the Guelph leader Martino della Torre headed the citizens in a struggle against the Ghibelline nobles, and assumed the lordship of the city. But in 1277 a revolution was effected by the Ghibellines under the Archbishop Ottone Visconti, who in turn became the ruler of the city, and in 1295 the power descended to his nephew Matteo Visconti. From that time the Visconti (q.v.) ruled Milan almost continuously until 1447. Under their supremacy was not only Milan, but the whole of Lombardy; the arts were fostered and prosperity was general. In 1395 the Emperor Wenceslas granted Gian Galeazzo Visconti the title of Duke of Milan. The last of the Visconti, Filippo Maria (1412-47), was succeeded in 1450 by his son-in-law, the celebrated *condottiere* Francesco Sforza (q.v.). The Sforzas were the typical princes of the Renaissance, patrons of art and learning, but at the same time guilty of the greatest cruelties. Milan became involved in the many Italian wars of the period, and finally, in 1494, Ludovico Sforza called in the French. From this time on the history of Milan as such has little interest. Louis XII. of France, as a descendant of the Visconti, claimed Milan, and the city and duchy for a while changed hands repeatedly between the French and the Sforzas, the latter being supported by Spain. In 1535 the last of the male line of the Sforzas died, and Milan became a Spanish possession. In 1713 the Peace of Utrecht, which ended the War of the Spanish Succession, gave Lombardy to Austria. In 1797 Milan became the capital of the Cisalpine Republic, founded by Napoleon, and in 1805 the capital of the Napoleonic Kingdom of Italy. The Congress of Vienna in 1815 gave Lombardy back to Austria, and Milan shared with the rest of the Hapsburg possessions the oppressions of the Metternich régime. On March 18, 1848, the inhabitants rose in insurrection, and on March 23d General Radetzky was compelled to evacuate the city, which was occupied by the Sardinian forces. On August 6th, however, Radetzky reëntered Milan. The riots of March, 1849, and February 6, 1853, were vigorously suppressed by the Austrian commanders. In 1859, after the battle of Magenta, the Austrians evacuated the city, which was handed over to Napoleon, who surrendered it to Sardinia with the rest of Lombardy. In May, 1898, it was the scene of serious bread riots.

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MILAN. A town and the county-seat of Sullivan County, Mo., 105 miles west by north of Quincy, Ill.; at the junction of the Chicago, Burlington and Kansas City and the Quincy, Omaha and Kansas City railroads (Map: Missouri, C 1). It is in a farming and stock-raising region, which has some mineral deposits, particularly of coal. The principal industrial establishments are flour and lumber mills, and shops of the Quincy, Omaha and Kansas City Railroad, Milan being a division point on that road. Population, in 1890, 1234; in 1900, 1757.

MILAN I., Obrenovitch, ȯ′brȧ-nō′vĭch (1854-1901). Prince of Servia from 1868 to 1882, and

King from 1882 to 1889. He was born August 22, 1854, at Manassee, Rumania, and was educated at Paris. The assassination of Prince Michael III., in 1868, caused his recall to Servia, where he was proclaimed Prince. A council of regency administered the government till he was eighteen. The revolt of Servia against the Ottoman power, its alliance with Russia in the Russo-Turkish War (q.v.), and its resulting independence and recognition as a kingdom (1882), made his reign memorable. In 1875 he married Natalie, the daughter of a Russian colonel, and his quarrels with her and his personal vices deprived him of all prestige. In 1888 he was illegally divorced, and on March 6, 1889, he abdicated in favor of his son Alexander. He became reconciled to Natalie in 1893, and died at Vienna, February 11, 1901. See SERVIA.

MILAN DECREES. See CONTINENTAL SYSTEM.

MILANÉS Y FUENTES, mē̍'lȧ-nās' ē̇ fwān'tȧ̊s, JOSÉ JACINTO (1814-63). A Cuban poet, born at Matanzas. His first verses appeared in the *Aguinaldo Habanero* (1837), and were favorably received. From this time his work was well known. His early life had been one of poverty and hardship, but afterwards he obtained a satisfactory position, and was able to travel abroad in 1848. He had been the victim of a mental disease for some time, and during the last years of his life was quite insane. The poetry of Milanés is contemplative and melancholy, and, like that of his fellow poets Heredia and Plácida, saddened by the thought of his country's wrongs. Editions of his poems were published at Havana (1846) and New York (1864).

MILÁ Y FONTANALS, mē̇-lä' ē̇ fōn'tȧ-näls', MANUEL (1818-84). A Spanish historian of literature, born at Villafranca del Panadés. He was appointed professor in the University of Barcelona in 1845. The influence of his philosophical studies is apparent even in so early a work as his *Arte poética* (1884). This was followed by the *Romancerillo catalán* (1848), a collection of the lyrics of his native region, and by the *Elementos de literatura* and the *Teoría literaria*, which apply philosophical methods to the study of literature. His *Observaciones sobre la poesía popular* appeared in 1853. His noblest productions are *Los trovadores en España* (1861) and *La poesía heroico-popular* (1874). Consult Rubio y Ors, *Noticia de la vida y escritos de D. Manuel Milá y Fontanals* (Barcelona, 1887), and the edition of his *Obras completas*, prepared by M. Menéndez y Pelayo (Barcelona, 1885).

MILAZZO, mē̇-lät'sō̇, or **MELAZZO.** A city in the Province of Messina, Sicily, 16 miles by rail west of the city of Messina, at the base of a narrow peninsula, four miles long (Map: Italy, K 9). It has a very large and safe harbor which in bad weather serves as a refuge for vessels that have just left or are trying to make the northern entrance of, the Strait of Messina. It has a city hospital, a technical school, a city library, a municipal theatre. It markets wine, fish, cattle, fruit, and sulphur, and has a considerable foreign trade. Population (commune), in 1881, 13,699; in 1901, 16,422. Milazzo is on the site of the ancient Mylæ, founded prior to the eighth century B.C. by colonists from Messina. A great naval victory was won here over the Carthaginians in B.C. 260 by G. Duilius. The crowning point of Garibaldi's victorious Sicilian campaign was his defeat of the Neapolitans here, July 20, 1860.

MIL'BURN, WILLIAM HENRY (1823-1903). An American clergyman. He was born in Philadelphia, and studied at Illinois College. He entirely lost the sight of one eye and partially that of the other while he was a boy, and finally became wholly blind. He became a traveling preacher in the Methodist Episcopal Church in 1843, and was appointed to circuits in Illinois and the South, with several appointments at Montgomery, Ala., in 1848, and Mobile in 1850, and for two years after 1852 preached in an independent church. He was ordained a deacon in the Protestant Episcopal Church in 1865, and priest in 1866, but returned to the Methodist Church in 1871. He was elected chaplain of Congress in 1845 and 1853, chaplain of the House of Representatives in 1885 and in succeeding terms, and was chaplain of the Senate from 1893 to 1902. He published *Rifle, Axe, and Saddle-bags, Symbols of Western Character and Civilization* (1856); *Ten Years of Preacher Life, Chapters from an Autobiography* (1858); *Pioneers, Preachers, and People of the Mississippi Valley* (1860, comprising lectures given at the Lowell Institute in 1854); *The Lance, Cross, and Canoe in the Valley of the Mississippi* (1893).

MILDER-HAUPTMANN, mē̇l'dẽr-houpt'-män, ANNA PAULINE (1785-1838). A German opera singer, born at Constantinople, the daughter of an Austrian attaché. She studied under Tomascelli and Salien in Vienna; made her first appearance in that city in 1803, but was at the height of her power in Berlin (1815-29). She toured Russia, Sweden, and Denmark at the close of her stage career.

MILDEW (AS. *meledēaw*, honeydew, from **mele*, Goth. *miliþ*, Lat. *mel*, Gk. μέλι, *meli*, honey + *dēaw*, dew). A somewhat indefinite term used to designate a number of plant diseases that are caused by fungous parasites, as well as spots caused by microscopic fungi on cloth, paper, leather, glassware, etc. In England the term as applied to plant diseases has a much wider significance than in the United States. It is there made to include what are known in America as cereal rusts and smuts, as well as many other diseases not recognized as due to the mildews proper. In the United States the mildews are divided into two classes, the true or powdery mildews, due to fungi belonging to the order Erysiphaceæ, and the false or downy mildews caused by fungi of the order Peronosporaceæ. The powdery mildews attack the leaves, stems, flowers, and fruits of many of our most valued plants. For the most part they form superficial flour-like patches of white upon their host plants. The fungus most commonly develops over the surface of the leaves and sends minute suckers through the epidermis, by which they absorb nourishment from the host. They cause distorted and stunted growth, and often the death of the part of the plant affected. During the summer the fungus sends up numerous branches, which bear myriads of one-celled spores called conidia, by which the mildew is rapidly spread to other plants. Later in the season thick-walled resting spores are produced, by which the fungus is carried through the winter. These spores have appendages of various kinds, by which they retain their attachment to the leaves, and in the spring they develop a new generation of thin-walled spores for the spread of the disease. There are about 150 described species of powdery mildews, and there are few of our plants that are not subject to attack from some of them. Among the common ones injurious to economic plants are the apple, pear, and cherry mildew (*Podosphæra oxycanthæ*), rose mildew (*Sphærotheca pannosa*), hop mildew (*Sphærotheca castagnei*), grape mildew (*Uncinula spiralis*), mildew of wheat and other grasses (*Erysiphe graminis*), gooseberry mildew (*Sphærotheca mors-uvæ*), cucumber mildew (*Erysiphe cichoracearum*), which also attacks verbenas, sunflowers, asters, and other plants, pea mildew (*Erysiphe martii*), etc. Downy mildews are internal parasites which grow through the tissues of the plants that bear them, and only appearing outside to shed their microscopic spores. The branches of the fungus bearing these spores are often so abundant as to give a peculiar downy or frosty appearance to the leaf or other part of the plant infested. The spores (conidia) are one-celled, thin-walled, and are readily blown about by the wind. Falling upon a new leaf or plant, if the moisture conditions are favorable, they quickly germinate and set up a new infection. In this way they spread with great rapidity, and often produce epidemic outbreaks of disease. The resting spores are formed within the tissues of the host, and are thus carried over from season to season. They are liberated by the decay of the tissues surrounding them, and from these a new generation is derived. Among the downy mildews are some of the most serious plant parasites. The more common ones are the potato rot or mildew (*Phytophthora infestans*), the grape downy mildew (*Plasmopara viticola*), lima-bean mildew (*Phytophthora phaseoli*), lettuce mildew (*Bremia lactucæ*), onion mildew (*Peronospora schleideniana*), cucumber and melon downy mildew (*Plasmopara cubensis*), downy mildew of radishes and other cruciferous plants (*Cystopus candidus*), etc. Most of these mildews are more fully described under the diseases of their respective host plants. The problem of combating them has been a subject of much experimentation in America and in Europe. It has been found that many of the powdery mildews can be held in check and often serious loss prevented by dusting the plants with sulphur, or, if in a house or frame where it can be done, exposing them for a few moments to the fumes of boiling, but not burning, sulphur. Spraying thoroughly and repeatedly with Bordeaux mixture, ammoniacal copper carbonate solution, or other standard fungicide (q.v.) will prevent the serious attack of both classes of mildews. Success in these preventive treatments depends upon thoroughness. See Diseases of Plants; Fungi, Economic.

MILE. A measure of length in common use in Great Britain and the United States and their colonies. The name is also in use on the Continent of Europe to designate generally a much larger measure of length, although the official measure is now generally the kilometer. It is derived from the Roman *milliare*, which contained 1000 paces (*mille passuum*) of 5 Roman feet each, the pace being the length of the step made by one foot. The Roman foot being between 11.62 and 11.65 English inches, the Roman mile was thus less than the present English mile by from 142 to 144 yards. On the Continent of Europe previous to the general adoption of the metric system, the length of the modern mile in different countries exhibited a remarkable diversity not satisfactorily accounted for. Before the time of Elizabeth scientific writers made use of a mile of 5000 English feet, from the notion that this was the Roman mile, forgetting the difference in value between the English and Roman foot. The present English statute mile was incidentally defined by an act passed in the thirty-fifth year of the reign of Elizabeth to be "8 furlongs of 40 perches of 16½ feet each"—i.e. 1760 yards of 3 feet each—and it has since retained this value. The *geographic, nautical*, or *sea* mile is variously defined as (a) the length of a minute of latitude at any point, (b) the mean length of a minute of latitude (6082.66 feet), and (c) the length of a minute of longitude on the equator (6087.15 feet). The United States Coast Survey has adopted as the standard geographic mile the length of a minute of latitude of a sphere having the same surface as the earth. This gives a length of 6080.27 feet. The British Admiralty mile is 6080 feet. As the United States statute mile is 5280 feet, a nautical mile is 1.15155 statute miles, or 1853.24 meters. For ordinary purposes of navigation the nautical mile is assumed to be equal to a minute of latitude in the region navigated, the error being inappreciable in the calculations.

The following table gives the length, in English statute miles, of the various miles that have been or are commonly used:

	Eng. miles
English geographical mile	=1.153
German geographical mile	= 4.611
Tuscan mile	= 1.027
Ancient Scotch mile	= 1.127
" Irish mile	= 1.273
German short mile	= 3.897
Prussian mile	= 4.680
Danish mile	= 4.684
Hungarian mile	= 5.178
Swiss mile	= 5.201
German long mile	= 5.753
Hanoverian mile	= 6.568
Swedish mile	= 6.648
Kilometer	= 0.621

and 29 kil. = 18 English statute miles nearly.

See Weights and Measures and Metric System.

MILEAGE. Compensation reckoned at so much per mile in lieu of traveling expenses usually allowed public officers, who are compelled to journey to the seat of government in order to discharge their official duties. It is usually reckoned according to the shortest route by which the officer is able to travel, although there are sometimes cases of constructive mileage where compensation is allowed for distances which are not actually traveled. The mileage system of compensation is in very general use in the United States. It had its origin in the desire to make legislators entirely independent of the transportation companies which carried them to and from their respective capitals. Railroad companies, however, have always freely granted passes to Senators and Representatives, and this has led to the enactment by several State legislatures of laws forbidding any public official from accepting gratuitous passage from public carriers.

MILELLI, mē̇-lĕl′lē̇, Domenico (1841—). An Italian poet, born at Catanzaro, in Calabria. He was educated for the priesthood, but did not take orders, and afterwards taught for several years. His publications include several volumes of poetry, which show much imagination, but little sustained force. His volume, *Odi pagane* (1879) was much criticised, not only for its pagan spirit, but on account of the attacks on Manzoni. Other works are: *In giovinezza* (1879); *Gioconda* (1874); *Hiemalia* (1874); *Povertà* (1879); *Discerpta* (1881); *Il rapimento di Elena* (1882); *Canzoniere* (1884); *Verde antico* (1885); and *Miscellanea* (1886), a volume of essays.

MILES, Nelson Appleton (1839—). An American soldier, born at Westminster, Mass. He was engaged in mercantile pursuits in Boston between 1856 and 1861. In September, 1861, he was commissioned captain of the Twenty-second Massachusetts Infantry; in May, 1862, he became lieutenant-colonel of the Sixty-first New York Volunteers, and participated in the Peninsular campaign and the battle of Antietam. In September, 1862, he was promoted to be colonel of volunteers. He served in the battle of Fredericksburg, was wounded at Chancellorsville, and took part in the campaign before Richmond in 1864. He was commissioned brigadier-general of volunteers May 12, 1864, and was brevetted major-general of volunteers in August, 1864, for gallantry at the battle of Ream's Station. On October 21, 1865, he was commissioned major-general of volunteers; in July, 1866, he was appointed colonel, Fortieth Infantry, Regular Army; and on March 2, 1867, he was brevetted brigadier and major-general, U. S. A., for bravery at Chancellorsville and Spottsylvania. During the succeeding years General Miles's chief service was against the Indians in the West. In 1875 he defeated the Cheyenne, Kiowa, and Comanche tribes, and in 1876 the Sioux and Nez Percés in Montana; and in 1886 he made a campaign against the Apaches and compelled their chiefs, Geronimo and Natchez, to surrender. For this service he received the thanks of the legislatures of Kansas, Montana, New Mexico, and Arizona. In 1890-91 he suppressed some Indian outbreaks in South Dakota. In 1880 he was commissioned a brigadier-general. In 1890 he became a major-general, and on the retirement of General Schofield, in 1895, he became the commanding general of the army. During the strike riots of 1894 in Chicago he commanded the United States troops, and later visited the scene of the Græco-Turkish War, and in 1897 he represented the United States Army at Queen Victoria's Jubilee. During the war of 1898 against Spain he directed in person the occupation of Porto Rico. Within a period of two weeks the entire western part of the island was cleared and the Spanish forces defeated. The total loss of the Americans was only four killed and forty wounded. He was raised to the rank of lieutenant-general in February, 1901, in pursuance of an act of Congress of June 6, 1900. In 1902-03 he made a tour of inspection in the Philippine Islands. He published *Personal Recollections, or from New England to the Golden Gate* (1897), in addition to military reports and magazine articles.

MILES GLORIOSUS, mī'lez glō'rĭ-ō'sŭs (Lat., braggart soldier). An entertaining comedy by Plautus. It is a broad farce, with a very slight plot resting entirely on the exaggerated representation of the leading character.

MILE'SIANS. The original Gaelic colonists of Ireland, so called, according to the bardic accounts, from the three sons of Mil (Latinized Milesius), who, coming in force from the opposite coast of Spain or Gaul, landed on the southern end of the island and defeated the preceding colonists and conquerors, the Tuatha-de-Danaan, in two great battles, thus making themselves masters of the country. The date is indefinitely placed some centuries before the Christian Era. This was the last of the traditional prehistoric colonizations of Ireland, the dominant Milesians fusing with the Tuatha-de-Danaan (q.v.) and Firbolg (q.v.) to form the Irish race as we find it at the dawn of history. The native kings, chieftains, and prominent families up to the period of the Norman Conquest all claimed direct descent from Milesian ancestry.

MILESIAN TALES (Μιλησιακά). The name given to a class of short, indecent anecdotes in vogue at Miletus and through Asia Minor in the first century B.C. The compilation of six books of these stories was ascribed to a certain Aristides of Miletus. Specimens of these works can be seen in the translation of Sisenna, printed in Bücheler's small edition of Petronius (Boston, 1882).

MILES O'REILLY, mīlz ō̇-rī'lĭ. The pseudonym of the American soldier and poet Charles Graham Halpine (q.v.).

MILET DE MUREAU, mē̇'lā̊' de mụ'rō̇', Louis Marie Antoine Destouff, Baron (1756-1825). A French soldier and politician, born at Toulon. He entered the army and was made a captain. As a member of the States-General, in 1789, he voted with the Right; afterwards he commanded the artillery in the army of occupation in Italy. In 1793 he was banished as a suspect, but was permitted to return to France two years later, and was made a brigadier-general in 1796. He was War Minister for a few months in 1799, was created a baron by Napoleon in 1809, was a prefect of Corrèze in 1802-10, and director of the general War Department in 1814, but retired two years afterwards. He edited the Pérouse journals, which were published under the title *Voyage de La Pérouse autour du monde 1785-88* (1797, 2d ed. 1798), and translated into German, Swedish, and English.

MILE'TUS (Lat., from Gk. Μίλητος). Anciently the greatest and most flourishing city of Ionia, in Asia Minor. It was situated on the Latmic Gulf, at the mouth of the Mæander, and was famous for its woolen manufactures and for its extensive trade with the north. The site is said to have been occupied by a Carian town, when the Ionian colonists, under Neleus, seized the place, massacred the men, and took possession of their wives. Though the inhabitants prided themselves on their Ionian descent, the names of their tribes show the presence of a foreign element. The city early came to occupy a commanding position in the Greek commercial world, and established many colonies in the north, as Abydos and Lampsacus, on the Hellespont; Cyzicus, on the Propontis; Sinope, Olbia, Istria, Tomi, and Panticapæum, on the Black Sea. Under the tyrant Thrasybulus it offered so resolute a resistance to the Lydian kings that it was at last received into an alliance on equal terms. It took a prominent part in the Ionian revolt (B.C. 500), and after the battle of Lade was besieged by the Persians, and after a long resistance captured and destroyed in B.C. 494. It seems to have revived after the formation of the Athenian League, and near the close of the Peloponnesian War ventured to revolt and join the Spartans. It also offered some resistance to Alexander, but seems to have declined from that time, though it continued to exist for several centuries. Saint Paul spent two or three days there on his last journey to Jerusalem before his imprisonment at Rome, and delivered his farewell address to the elders from Ephesus, who visited him at his request (Acts xx. 15-xxi. 1). Another visit, referred to in I. Timothy iv. 20, is best placed in a period later than that covered by the Book of Acts. Miletus has a distinguished place in the history of Greek literature, having been the birthplace of the philosophers Thales, Anaximander, and Anaximenes, and of the historians Cadmus and Hecatæus. Its harbor is now filled up, and the site is a swampy plain, occupied by the little Turkish village of Palatia. Excavations were begun by the Berlin Museum in 1899, and in spite of great difficulties have determined the course of the ancient walls, some streets, the Bouleuterion and part of the Agora, and other points important for the topography of the city. Preliminary reports are published in the *Sitzungsberichte der Akademie der Wissenschaft zu Berlin* for 1900 et seq. See also the unfinished work of Rayet and Thomas, *Milet et le Golf Latmique* (Paris, 1877 et seg.).

MI'LEY, JOHN (1813-95). An American theologian of the Methodist Episcopal Church. He was born near Hamilton, Butler County, Ohio; graduated at Augusta College, Kentucky, in 1838; entered the ministry of the Methodist Episcopal Church in the same year, and served churches in Ohio and Eastern New York from 1838 to 1873, except during 1848-50, when he was teacher in Wesley Female College in Cincinnati. In 1873 he became professor of systematic theology in Drew Theological Seminary, Madison, N. J., which chair he filled till his death. He was the author of a *Treatise on Class Meetings* (1851); *The Atonement in Christ* (1879), which advocates the governmental theory; and *Systematic Theology* (1892-94). He was a progressive conservative, holding to the substance of the traditional Methodist theology, but introducing important and some even radical changes of view.

MILFOIL. An herb. See ACHILLÆA.

MIL'FORD. A seaport in Pembrokeshire, Wales, on the famous Milford Haven, six miles from its entrance, and 273 miles west of London by rail (Map: England, A 5). The haven is formed by an estuary running inland for 17 miles to Langwin (easily reached by vessels of 2000 tons), and varies from one to two miles in breadth. It is protected from winds by a girdle of hills; its lower reaches are well fortified. The distance of Milford, however, from the Channel, the highway of British commerce, is a serious disadvantage, and its trade is not commensurate with its natural advantages. The town has passenger and cattle traffic with Irish ports, and an average of 2700 vessels of 575,000 tons burden enter and clear annually. Area of docks, 60 acres; depth of water over sill (high tide), 34 feet. The proposition to make Milford the eastern terminus of the English transatlantic steamers has been long discussed, as it would shorten by several hours the time now necessary for reaching London. The United States is represented by an agent. The town owns its water and gas supplies. The haven is frequently mentioned in Shakespeare's *Cymbeline*. Henry VII., when Earl of Richmond, landed here in 1485, on his way to claim the crown. Population, in 1891, 4000; in 1901, 5000.

MILFORD. A town in New Haven County, Conn., nine miles southwest of New Haven; on Long Island Sound, at the mouth of the Wepowaug River, and on the New York, New Haven and Hartford Railroad (Map: Connecticut. C 5). It is an attractive summer resort, with fine boating and bathing facilities. Its noteworthy features include the Taylor Library of 9000 volumes, an interesting Memorial Bridge, erected (1889) on the two hundred and fiftieth anniversary of the town's settlement, a soldiers' monument, and the Broad Street Park of four acres. The leading industries are farming, seed-growing, oyster cultivation, and the manufacture of straw hats, electrical supplies, silverware, telephone apparatus, and shoes. Population, in 1890, 3811; in 1900, 3783.

Milford, called Wepowage by the Indians, was settled in 1639 by a company from New Haven and Wethersfield. In 1644 Milford became one of the six towns which constituted the confederate 'Colony of New Haven,' and in 1664 it came under the jurisdiction of Connecticut. Robert Treat, an early colonial Governor, lived in Milford, and here, from 1661 to 1663, the regicides Goffe and Whalley were secreted. Consult "Early Milford," an article in the *Connecticut Magazine*, vol. v. (Hartford, 1899).

MILFORD. A town in Kent and Sussex counties, Del., about 60 miles south of Wilmington; on Mispillion River, and on a branch of the Philadelphia, Baltimore and Washington Railroad (Map: Delaware, Q 5). A steamship line also connects the town with Philadelphia. It is the shipping point for the surrounding agricultural and fruit-growing district, and has various industrial interests. There is a subscription library of about 1500 volumes. Milford was founded in 1680, and was incorporated in 1787. Population, in 1890, 2565; in 1900, 2500.

MILFORD. A town in Worcester County, Mass., 18 miles southeast of Worcester; on the Charles River, and on the Boston and Albany and the New York, New Haven and Hartford railroads (Map: Massachusetts, D 3). It has a fine high-school building, and a memorial hall which contains the public library, and is noted as a manufacturing centre, its products including boots and shoes, straw goods, silk, machinery, foundry and machine-shop products, etc. There are also extensive quarries of granite, which is used in the construction of many buildings in the town, and which is shipped in large quantities. The government is administered by town meetings, which are convened at least twice a year. Population, in 1890, 8780; in 1900, 11,376. Settled as early as 1669, Milford, with a population of 750, was incorporated as a separate town in 1780, having previously been the East Precinct of Mendon. Consult Ballou, *History of the Town of Milford* (Boston, 1882).

MILHAU, mē'lō'. A town of France. See MILLAU.

MIL'IA'RIA (Lat. fem. sg. of *miliarius*, relating to millet, from *milium*, millet). A structural affection of the sweat glands, caused by an obstruction to the sweat secretion, and generally accompanied by inflammation. It is classed with the skin diseases.

In *miliaria crystallina*, or *sudamina*, the non-inflammatory form, the lesion consists of minute, pearly vesicles set closely together, but always discrete, generally appearing on the neck, chest, and abdomen, but sometimes in other parts of the body. The vesicles appear rapidly, and depart in a few days. Invasions of fresh crops may occur, thus continuing the eruption for weeks.

In *miliaria vesiculosa*, or *rubra*, inflammation occurs in the gland, and the vesicles appear as if raised on a red base. This is the *strophulus*, or *red gum*, of the ancients, and is seen principally in children during hot weather and when excessively heavy clothing is worn.

Miliaria papulosa, or *lichen tropicus*, is commonly known as prickly heat. In this variety red, pointed papules are crowded together, with here and there a vesicle or pustule. It is accompanied by excessive sweating and annoying prickling and tingling. It is a tropical disease, of which a milder form is seen in this country.

The treatment of miliaria consists in removing heavy clothing, administering cool baths and saline diuretics, and applying locally soothing and astringent lotions, such as lead water, black wash, dilute vinegar, or powdered camphor mixed with starch or oxide of zinc.

MIL'IA'RIUM AU'REUM (Lat., golden mile-stone). A gilded column of bronze connected with the rostra in the Roman Forum. On it were engraved the distances of the postal stations from the city gates on the great roads leading out of Rome. It was set up in B.C. 29 by Augustus, and portions of the marble base on which it stood were discovered on the spot in 1849.

MILIARY FEVER. See MILIARIA.

MILICZ (mē'lĭch) OF KREMSIER (1325-74). A predecessor of John Huss. He was born at Kremsier, Moravia; entered holy orders, and was attached to the Court of the Emperor Charles IV.; became a canon and later archdeacon. In 1363 he resigned his appointments, giving himself up to preaching, and was very successful. He went to Rome in 1367 to expound his views as to eccleciastical abuses, but was thrown into prison by the Inquisition, from which he was released by Pope Urban V., on his arrival from Avignon in the autumn of that year. He returned to Prague, where he preached daily with greater success than ever till in 1374 he was summoned before the Papal Court at Avignon, upon complaint as to his orthodoxy, preferred by the clergy of Prague. He obeyed, and the complaint, after investigation, was dismissed. He died in Avignon, on June 29, 1374. Consult: Palacky, *Die Vorläufer des Hussitenthums* (Prague, 1869); Lechler, *Johann von Wiclif und die Vorgeschichte der Reformation*, vol. ii. (Leipzig, 1873).

MILIN'DA. The Pali form of the name of the Græco-Bactrian King Menander (q.v.). In the literature of the Buddhists his name is important through a book entitled *Milindapañha*, or "Questions of Milinda," a work which professes to give an account of a discussion between him and the Buddhist sage Nagasena. It has been translated into English by Davids, *The Questions of King Milinda* (Oxford, 1890-94).

MILITARY ACADEMY, ROYAL. An establishment at Woolwich, England, through which must pass all candidates for the Royal Artillery and the Royal Engineers. See MILITARY EDUCATION.

MILITARY ACADEMY, UNITED STATES. The national institution for the theoretical and practical training of cadets for commissions in the United States Army. It is situated at West Point, N. Y., on the west bank of the Hudson, 50 miles from its mouth, amid the picturesque peaks of the highlands. This place has been occupied as a military post continuously since January 20, 1778. (See WEST POINT for Revolutionary history of the locality and description of the modern post buildings, surroundings, etc.) The Academy itself had its origin in a resolution passed by Congress on October 1, 1776, which appointed a committee to prepare a plan for "a military academy for the army." On June 20, 1777, it was ordered that a Corps of Invalids organized as "a military school for young gentlemen previous to their being appointed to marching regiments" be instituted; which order was carried into effect almost immediately. General Washington was untiring in his efforts to establish the academy, and it was at his request in 1781 that the Corps of Invalids was marched from Philadelphia to join the garrison at West Point. Two years later Washington again brought the idea of a military academy before his officers at Newburgh, and made a special reference to it in his message of December 3, 1793. On May 9, 1794, his ideas and aspirations were crystallized in a law approved on that date, whereby was authorized the organization of a corps of engineers and artillerists with two 'cadets' to each company, and a school of instruction for them was established at West Point in the same year.

Prior to 1781 there were at West Point three separate buildings, used as an engineer school, laboratory, and library respectively. In 1796 the buildings occupied by the corps were burned down, and thus for a time the work of the Academy was suspended. Instruction was resumed on September 1, 1801, by order of the Secretary of War, who, on July 20th of that year, issued an order directing that all the cadets of the Corps of Artillerists should report at West Point for instruction. The faculty of the Academy at this time was made up of four army officers and a civilian, who acted as administrators and instructors. The actual creation of the Military Academy as it is known to-day occurred in 1802, under the authorization of an act of Congress approved on March 16th. West Point was selected for its location, and with a class of ten cadets present it was formally opened on July 4, 1802. The bill authorized the establishment of a corps of engineers to consist of five persons, a major, two first lieutenants, two second lieutenants, and ten cadets, with the pay of $16 per month. Provision was also made for promotions in the corps, not to exceed one colonel, one lieutenant, two majors, four captains, four first lieutenants, and four second lieutenants; but it was also distinctly ordained that the entire corps should not exceed twenty officers and cadets.

The following year an increase of forty cadets was authorized, and in 1808 156 became eligible, but, owing to the lack of provision for them at the Academy, very few of them were enabled to report for instruction.

The Academy passed through many vicissitudes about this time, and in March, 1812, was without a single instructor. Students entered without any mental or physical examination and without any regard to age. The War of 1812, however, called the attention of the Government to the pressing needs of the Academy. Only 71 students had been graduated in its first ten years, and President Madison called the attention of Congress to the necessity of making the Academy a scientific as well as a military college, in consequence of which, on April 29, 1812, the Academy was reorganized upon the principles which underlie its present organization. In 1818 the rules approved by President Monroe went into effect and provided that the assignment of cadets to the different corps in the army and their relative rank must depend upon their general merits, to be determined by a competent board of examiners, and that cadets should not be promoted until after they had received a diploma. Colonel Sylvanus Thayer was appointed Superintendent of West Point in 1817, and succeeded in making the institution famous among the military schools of the world. In 1815 he was sent by the Government to Europe, to study military schools, and during the sixteen years of his superintendency (1817 to 1833) completely reorganized the curriculum of the United States school. He organized the system of divisions of classes into sections; organized the corps of cadets into a batallion; and created the position of commandant of cadets. In 1833 he took issue with President Andrew Jackson regarding details of management and resigned his post. In 1838 it was again offered him, together with concessions that gave him almost absolute control, but he declined to accept. From this time on little change has been made in the organization of the Academy other than those natural to the progress of time.

The Civil War (1861-65) brought West Point into worldwide fame throughout the civilized world; so much so, that since then its methods have been carefully studied by the experts of nearly every great European country. Every one of the commanding generals on both sides in the great War of the Rebellion who earned high military honors was a graduate of West Point.

The authorized number of cadets in 1903 was 481, and the number of instructors 81. The course of instruction is to a large extent mathematical and professional. The curriculum includes: Mathematics, drawing, natural and experimental philosophy, chemistry, chemical physics, mineralogy, geology, electricity, history; international, constitutional, and military law; the French and Spanish languages, drill regulations of all arms of the service, civil and military engineering, the art and science of war, and ordnance and gunnery. The superintendent is assisted by a military staff, and the instruction is given by an academic staff, consisting entirely of army officers, with the additional rank of professors, assistant professors, and instructors of the several departments in which they serve.

In 1902 the requirements for candidates seeking admission were raised, which, while it made the entrance examination more difficult, greatly assisted the student during his period of instruction at the Academy, by reducing the amount of work he is called upon to do during his course. The system of training officers at West Point is regarded as more complete than that of any other country; but perhaps the greatest difference is the West Point method of holding the student firmly to his studies during his four years' course. He mingles little with the outside world, except in his furlough at the close of two years, so that the four most impressionable years of his life are spent in a training and environment well calculated to produce a thorough soldier. The Academy has been described as a model institution by many distinguished European military authorities, and in the reorganization of the methods of military instruction in England many of the West Point ideas were suggested. The West Point cadet uniform (see UNIFORMS, MILITARY) is the famous cadet gray.

BIBLIOGRAPHY. Consult: Mansfield, *The United States Academy at West Point* (Hartford, Conn., 1863); Farley, *West Point in the Early Sixties* (Troy, N. Y., 1902); Boynton, *History of West Point and Its Military Importance During the American Revolution* (New York, 1864); Hancock, *Life at West Point* (New York, 1902); Cullum, *Biographical Register of the Officers and Graduates of the United States Military Academy* (3 vols., New York, 1868-79); and the Annual Reports of the Superintendent of the Academy (United States Government Printing Office, Washington).

MILITARY ARCHITECTURE. The various branches of architecture and engineering used by military science in defensive works of different kinds. The reader is referred to the article FORTIFICATION for the military discussion of this subject. The more important details of military architecture will be found described under their own titles.

EGYPT. The fortified cities and forts of Egypt are the earliest yet explored, though doubtless earlier ones were erected in Babylonia. The earliest completely fortified city in good preservation is El-Kab, which formed a parallelogram of about 1500 by 2000 feet. The walls were of brick, over thirty feet thick, and less than thirty feet high, with gates only on two sides. There were no towers, no projections, no curved lines, no moats, simply a plain sharp-angled parallelogram, and the gates were merely openings. Such walls have been found at Thebes, Heliopolis, and in many other cities. Egyptian engineers, however, were sufficiently skillful in the Middle Empire to take advantage of the natural defensive features of rocky situations, and to abandon the defective rectangular groundplan; this is evident at Kummeh and Semneh at the Second Cataract, built to protect Egypt from Nubian invasions. Crude brick was the material, projecting buttresses strengthened the walls at intervals, and there were stations where archers could protect the approaches; the wide moat which encircled the fort was defended by a low stone wall; the interior of the fort was filled up solid to the level of a *chemin-de-ronde*. The Hittite wars made the Egyptians acquainted with the far more advanced systems of Western Asia. Towers, bastions, elaborately fortified gates, and the use of stone for brick were some of the results.

WESTERN ASIA. The use of crude brick has made impossible any detailed knowledge of the methods of fortification used in Babylonian cities, though they are known to have been protected by walls of immense thickness and height. The plan of placing the royal palace on one side and using it as a citadel, of rectangular shape, was followed by the Assyrians, as shown in the city of Sargon, near Nineveh. But it was in the more mountainous countries of Western Asia, especially in Syria and Armenia, that the earliest really scientific types of military engineering were thought out. The rectangular type was abandoned in favor of the circular or ovoidal, by which the weak angles were entirely avoided. In place of a single wall with an advance-wall or scarp. there were usually three concentric lines of increasing heights, each with towers and battlements and *chemins-de-ronde*. The Hittite cities were the most famous of such fortifications, from which both the Egyptians and Assyrians learned much of the art of building, of attacking, and of defending fortresses. The mountainous races of Northwestern Asia thus created a type that was to remain the highest known to military architecture, and to be perpetuated by the successors of Alexander, by the Byzantine Emperors, and by the Crusaders.

ÆGEAN PEOPLES. The Pelasgians and other Ægean peoples built also in stone, often with Cyclopean and polygonal masonry. There were many types: first, the groups of defensive forts on the outskirts, or constituting a citadel; then later, the walls encircling the entire city. This wall sometimes rises sixty or seventy feet; the citadel as much more.

GREEK. The great majority of fortifications found in Greece belong to the prehistoric period just described, for instance, those in Acarnania, at Orchomenus and Phigalia. The advances made in later historic times are shown, for example, at Mantinea, with two round towers protecting its double gate, and especially at Messene, with gates within large towers having a circular inner court. The towers are battlemented and are sometimes rectangular.

ROMAN. The walls of Pompeii, of Aosta, and of Rome are a few among many examples, showing the use of a simple encircling wall. The walls of Aurelian show three tiers of defenses, two lines of embrasures opening on galleries, and the *chemin-de-ronde* behind the battlements, besides, a fourth and higher line at the summit of the numerous square towers. A unique combination of camp, palace, and fortress was Diocletian's palace at Spalato, also a superb work of late Roman architecture, with heavily projecting circular and rectangular towers.

BYZANTINE. The Eastern Empire continued the traditions of the ancient Orient. Antioch, Edessa, Constantinople, Amida, and other great cities trace their genealogy from Alexander's successors to Justinian. The essay of Procopius on the fortresses of Justinian shows how the Byzantine science of fortification was then being revolutionized under this Oriental influence, as in the great works at Dara. Between the towers permanent échaugettes and machicoulis, hurdles, or overhanging galleries, were built—originally of wood, but then of stone, in order better to let missiles fall on the besiegers. The system of several concentric walls triumphed permanently over the single rectangular Roman circuit. The citadel was not, as with the Romans, placed in the centre, but in touch with one of the outer walls, so that if the city were taken, communication could still be maintained between the citadel and the outside world. Their system was adopted throughout the Empire and even in Europe, under Justinian.

MOHAMMEDAN. In the great wars with the Byzantine Empire, the swarming Arabs and their converts quickly learned the science of military engineering, and exhibited its results throughout their great empire, especially after the Titanic struggle with the Macedonian dynasty in the ninth and tenth centuries. The great field was, as always, Syria, Mesopotamia, Armenia, and Asia Minor. These lands are still covered with the ruins of forts, castles, and fortified cities of this period. Even when Saladin had Cairo fortified, its great gates built, and its triple walled citadel erected, he called architects from Syria. The Mohammedans opposed to the Byzantines lines of fortresses corresponding to theirs, whose strength is celebrated in their literature. When the Crusaders came to the East, they came into contact with these two forms of Oriental engineering, and borrowed its ideas for the West. The golden age of military works in the Orient extended from the ninth to the twentieth century. The combination of citadel and palace, which did not originate in Europe until the fourteenth century, was then a common thing with the emirs of the Mohammedan world; many such castles, of which the Granada Alhambra is an example, are still found in ruins; sumptuously beautiful within, magnificently strong without.

MEDIÆVAL EUROPE. With the barbarian invasions of the fifth and sixth centuries there had been a veritable fury of haste to fortify the cities throughout the Roman world. This was particularly noticeable in Gaul, for instance at Grenoble and Vienna, and in Spain, as at Cartagena. Mediæval cities often—as at Carcassonne—have their later fortifications based on late Roman or Gothic prototypes. But ordinarily the Roman fortification was a *castrum*, which did not inclose the city. City defense seems to have remained at a higher level than feudal castle architecture until the twelfth century, for while castles long remained mere earthworks in the north of Europe, cities had stone walls, and even, as at Piacenza, two concentric circuits; and while the castle keeps were rectangular and in the centre of the circuit, the citadels were often curvilinear and astride the outer walls. For a well-preserved fortified city the best example is Carcassonne in Southern France, built during the twelfth and thirteenth centuries. It has an inner and an outer circuit with towers of several shapes, bastions, and barbicans, with a magnificent citadel on the west edge. Cologne, Cracow, Aigues-Mortes, and Nuremberg have more or less complete mediæval fortifications, usually of somewhat later date.

In so far as military architecture is connected with art and not science, the thirteenth, and especially the fourteenth and fifteenth centuries were the golden age in Europe, because then strength was no longer the sole object, and æsthetic beauty was as much aimed at in these structures as in cathedral, monastic, or private architecture, in so far as consistent with safety. This transformation so far as it affected feudal buildings has been described under CASTLE, and is exemplified by such structures as Vajda-Hunyad castle in Hungary, Marienburg in Prussia, and the ducal castle of Milan. The exquisite details of Gothic architecture and decoration, vaulted halls, giant fireplaces, tracery, and surface decoration were multiplied. The city gates, as at Lübeck, Cologne, Tangermünde, Stendal, became works of municipal decoration as well as defense. Consult the bibliography at the end of the article CASTLE.

MILITARY BRIDGES. See BRIDGES AND DOCKS, MILITARY.

MILITARY COMMISSIONS. Special military courts created during the occupation of conquered territory, for the trial of offenses which cannot by the rules of war be tried or punished by courts martial, and yet which are not within the jurisdiction of any existing court. A military commission, unlike a court martial, is exclusively a war court. It may be legally convened and assume jurisdiction only in time of war or when the civil authority is suspended on account of the existence of martial law or military government. The powers and procedure of this class of military tribunals have not been defined by statute law nor have they even been expressly authorized by any act of Congress, although they have repeatedly been recognized by the legislative, executive, and judicial departments of the Government. According to usage the same rules which apply in the organization and procedures of courts martial are held to be applicable to military commissions, and their proceedings are subject to review in the same manner and by the same authority as courts martial. Certain offenses which in time of peace are regarded as civil offenses become in time of war military offenses, and are triable by military commission, even though the civil courts may be open and in the unobstructed discharge of their duties. During the Civil War and reconstruction periods capital offenses were frequently tried by military commissions and the parties punished, although they were neither in the military or naval service, and in spite of the constitutional provision that all persons held for capital or otherwise infamous crimes, except when arising in the land or naval service, shall be tried by jury. Consult: Benet, *Military Law and Courts Martial* (New York, 1868); Birkheimer, *Military Government and Martial Law* (Washington, 1892); Milligan, *ex parte*. See MILITARY LAW; COURTS, MILITARY.

MILITARY COURTS. See COURTS, MILITARY.

MILITARY EDUCATION. The education of the modern military officer may be divided into two parts, the preparatory and the technical. The increased demands made upon him in the exercise of his profession entail a most exacting and comprehensive preliminary training; so much so, that in many countries candidates for army commissions are trained from earliest youth, and molded mentally and physically for their future career. Below will be given a review of the systems of military education as practiced in Europe and the United States.

In AUSTRIA army training for cadets begins between the ages of fourteen and seventeen—there being fifteen schools (*Realschulen*) set apart for that work. On graduation cadets are taken into the army and granted commissions according to seniority, each selecting his own regiment or corps in the branch to which he is assigned—subject to the approval of the officers of such regiment or corps. The higher academy of Wiener-Neustadt, with its three years' course for cavalry and infantry officers, and the Technical Academy of Vienna, with a similar course for artillery and engineer officers, receive most of their pupils from the higher military preparatory schools set apart for the sons of officers of limited means. Pupils capable of passing the entrance examination of the academies may enter direct. German is the language used in all military educational establishments, the curriculum also being based on the German system.

BELGIUM trains the officers of all arms at the *Ecole Militaire*, Ixelles, the course covering a period of two years for infantry and cavalry, and four for artillery and engineers. Entrance is gained by competitive examination, there being an average of eighty vacancies in the school each year.

ENGLAND possesses two military educational institutions: the *Royal Military Academy* at Woolwich, which is set apart for Royal Engineers and Royal Artillery cadets; and the *Royal Military College* at Sandhurst for cavalry and infantry cadets. No one is allowed to compete who has not been passed by the Commander-in-Chief, as socially qualified to hold a commission. Both institutions are organized on a military basis, each being governed by a military officer styled Governor and Commandant, appointed by and responsible to the Secretary of State for War, through the Commander-in-Chief. The Governor is assisted by a staff officer, with the title of assistant commandant and secretary, who commands the cadet company, and takes charge of all records and correspondence. The entrance examinations are conducted under the supervision of the Civil Service Commissioners; and there is also a rigid physical examination. The age of admission is from sixteen to eighteen years, successful candidates paying half-yearly fees, the amount of which varies with the status, official or otherwise, of their families. Sons of private gentlemen are required to pay £150 each half-year; and sons of admirals or generals £80. If the cadet is the son of an officer below the rank of lieutenant-colonel in the army, or commander in the navy, he pays only £40; and if the son of a deceased officer whose family has been left in poor circumstances, only £20 each half-year is required. Cadet pay at the rate of three shillings per diem is granted by the Government, which does not nearly suffice to meet the regular and necessary expenses of the cadet. He is also required to pay £25 to cover the expense of uniform, books, etc., and to supply himself with all other articles of clothing, etc. The period of instruction covers two years, and is divided into four classes, of which the fourth is the junior. The third and fourth classes are educated together, but on passing out of the third class into the second, the cadets are separated into two divisions, engineers and artillery, where they remain until graduation. Those passing out of the third class with the best percentage of marks go to the engineers, and the remainder to the artillery. Once the assignment has been made to any particular division a transfer is never allowed. The *Royal Military College* at Sandhurst is confined to cadets for cavalry and infantry, the entrance examination, fees, academic terms, and cadet pay being similar to the *Royal Military Academy.* A few cadets are received as Royal cadets, or India cadets, who enter without payment, and receive a small allowance. They are usually specially favored sons of poor or distinguished officers, or have served as Court pages. The course of instruction extends over a period of eighteen months, divided into three terms, or classes of six months each, known as junior, intermediate, and senior. The peculiarity of the British method of instruction, compared with that of all other countries, is the brief period of instruction in the schools, and the very exacting competitive standard and examination for admission, which, as well as the expense involved at the very outset, limits the class from which cadets are drawn.

The *School of Military Engineering* at Chatham is the school at which young officers appointed from the *Royal Military Academy* receive their practical training. It is a school of application, the graduate cadet remaining two years on probation, after which he is assigned to his corps. Officers of other arms receive a short course of instruction in field engineering at the school, as do a proportion of both commissioned officers and men of other arms. and the pioneer sergeants of infantry regiments.

The *School of Gunnery* at Shoeburyness is the school of application for artillery cadets and officers, as well as the general training school for officers and men of the Royal Artillery. The instruction in ordnance manufacture, laboratory work, chemistry, electricity, and metallurgy, etc., is given at the *Artillery College,* Woolwich. The *Army Medical School* at Netley, near Southampton, is for the instruction of candidates already medically qualified in the duties of military, medical, and surgical work, and the system of military hygiene. On conclusion of the course, candidates, if successful, are assigned commissions in the army as vacancies occur. The *Staff College* at Camberly, near Sandhurst, receives a limited number of officers each year, for advanced and special work in the study of modern languages, fortification, and artillery, grand tactics, staff duties, military administration, topography, law and equitation. Admission is obtained by competitive examination, candidates being required to have served at least five years, hold at least captain's rank, or have passed the examination for that rank, and be recommended by their commanding officers as qualified physically, educationally, temperamentally, technically, and to be of good personal habits. They must be under thirty-seven years of age. On passing, graduates are attached for a few weeks to each of those branches of the service with which they have had no previous experience or service. The *School of Musketry* (Hythe) is to the infantry, cavalry, and engineers what Shoeburyness is to the artillery. For schools for rank and file, see ARMY SCHOOLS.

FRANCE possesses twenty-three military schools, grouped into higher schools and preparatory schools. There are seven of the latter, including the orphan school at La Boissière. Of the former class the most important is the *Ecole Supérieure de la Guerre,* where instruction is given in tactics, strategy, etc., as well as in the German and Russian languages. The French system, as a whole, is very minutely and comprehensively organized. The *Ecole Polytechnique* at Paris supplies the education necessary to officers of scientific or technical corps as engineers, artillery, telegraph, etc.

The GERMAN ARMY recruits its officers almost entirely from two classes: *Avantageurs* and cadets. The former either submit to special examination or produce on demand a diploma from an authorized public educational institution. There are ten schools for cadets who enter at eleven years of age. At fifteen they graduate into the *Lichterfelde Academy* near Berlin, and after completing its course, continue their studies with the *avantageurs.* Both classes complete their preliminary education in one of the eleven war schools, the course in which occupies four terms, extending over a period of three years; in all, thirty-five weeks. Artillery and engineer officers after one or two years' army service pass from one to two years in the Berlin or Munich schools of military instruction.

MILITARY SCHOOLS IN ITALY are divided into three classes: (1) The *College Militari,* or preparatory schools. (2) The military academies at Turin for engineers and artillery, and at Modena, for infantry and cavalry. (3) Scuole militari complementari (schools of application). The *Scuola di Guerra,* the school of application for artillery and engineer officers, is at Turin, and the cavalry school is at Pinerola. The course of instruction at the military academies of Turin and Modena is three years and two years respectively. There is a school for under officers at Caserta, where approved non-commissioned officers are educated for commission. In each arm of the service fully one-third of the commissions are held by men from the ranks.

The military academies of Japan compare very favorably with the best in Europe, being in effect organized, as is the army, on the German model. There are establishments devoted to military education under the Minister of War, including the school of military music and the various schools of application. In 1902 several parties of Chinese army officers were sent by their Government to undergo a course of instruction at the Japanese Military Academy.

MILITARY EDUCATION IN THE UNITED STATES is practically a university system, bringing as it does all the different branches of military education into one system and under the direct control and supervision of a body of specially qualified officers, making every part of the system effective. The United States Military Academy at West Point, N. Y. (see MILITARY ACADEMY, UNITED STATES), is the foundation of the entire system, and is generally conceded to be unequaled in the thoroughness and comprehensiveness of its training. The practical education of the cadet, in its broadest sense, begins with his assignment to his regiment or corps, there being in addition an officers' school at each military post for elementary instruction in theory and practice. The special service schools or schools of application are: (a) the Artillery School at Fort Monroe, Va.; (b) the Engineer School of Application, Washington Barracks, D. C.; (c) the School of Submarine Defense, Fort Totten, N. Y.; (d) the

School of Application for Cavalry and Field Artillery, at Fort Riley, Kan.; (e) the Army Medical School, Washington, D. C. The General Service and Staff College (q.v.) is at Fort Leavenworth, Kan., and the War College (q.v.) at Washington Barracks, D. C. A general supervision of all the different schools enumerated above is exercised by the War College Board. Officers' schools at military posts and the General Service and Staff College are open to National Guard and volunteer officers, as well as to graduates of military schools and colleges which have had Regular Army officers as instructors. (For other schools, see ARMY SCHOOLS.) Consult *The Military Schools of Europe* (Military Information Division, War Department, Washington, 1896).

MILITARY ENGINEERING. See ENGINEERING, MILITARY.

MILITARY FRONTIER. See FRONTIER, MILITARY.

MILITARY GOVERNMENT. The administration of territory taken from the enemy which is authorized under martial law (q.v.). It is under this power, arising from the necessity of the case, that provisional governments are instituted in conquered territory. All proceedings of government under martial law are, within the scope of their authority, as legal and constitutional as any other military proceedings.

MILITARY HONORS. Compliments paid to certain officers, officials, or other distinguished persons. See SALUTES.

MILITARY INSIGNIA. Devices used to distinguish the various corps, branches, ranks, and grades of the military and naval services. In all the armies of the world it has been found necessary to employ badges and devices to mark the necessary distinctions incident to such organizations. The term insignia is here employed to include such badges, devices, etc., in contradistinction to equipment, clothing, etc. The custom in Europe is a natural result of the evolution of the various countries both politically and militantly, and in the case of England particularly the badges, mottoes, and devices used by the various regiments are emblematic of conspicuous incidents in their history and not infrequently have been taken in battle from some regiment of the enemy.

Commencing with the insignia distinguishing the various grades of rank, German usage may be described at length, seeing that its system in a large measure obtains in every other army in Europe. Throughout the Imperial Army the epaulets of all commissioned ranks are crescent-shaped. The various grades are distinguished as follows: (1) General field-marshal, two batons (staffs of command crosswise over each other). (2) General-in-Chief, three stars. (3) General of the infantry, cavalry, or artillery, colonel, captain, two stars. (4) Lieutenant-general, lieutenant-colonel, first lieutenant, one star; major-generals, majors, and second lieutenants do not wear a star. Second and first lieutenants and captain wear epaulets having a gold rim but no trimming; colonels, lieutenant-colonels, and majors wear epaulets with gold rims and silver trimming. The general field-marshal, general-in-chief, lieutenant-general, and major-general are distinguished by the silver rims and silver trimming of the epaulets. The non-commissioned ranks are distinguished by the gold or silver lace on the collars, cuffs, and facings of the tunics. On the shoulder-straps is the number of the soldier and the monogram of his regiment. The various arms of the service are also distinguished by the color of the tunic lace; for instance, infantry regiments have red lace. On the right side of every German soldier's helmet is placed the black, white, and red cockade of the German Empire, while the cockade on the left side indicates the particular State of the German Confederation to which the regiment belongs, as follows: Prussia, black-white; Bavaria, white-sky blue; Hamburg-Bremen-Lubeck, white with red cross; Saxony, white-green, Württemberg, black-red; Baden, yellow-red; Hesse, white-red; Mecklenburg, sky blue-yellow-red; Oldenburg, white-dark blue with red cross; Saxe-Weimar, yellow-green; Brunswick, sky blue-yellow; Anhalt, green; Saxon duchies, green-white; Lippe, yellow-red; Schaumburg-Lippe, white-red; Waldeck, yellow-red; Schwarzburg-Sondershausen, white-dark blue; Schwarzburg-Rudolstadt, dark blue-white; Reuss, yellow-red. Other distinguishing marks between the various services of the German Army are found in the color of their uniform, for which see UNIFORMS, MILITARY.

In the British Army insignia plays an important part. It is used as much to encourage esprit de corps as a mark of distinction between regiments. There is a large degree of variety in the badges in use among the various regiments of the army, most of them reminiscent of stirring periods in regimental history. In 1836 the King commanded that an account should be published concerning the insignia, badges, devices, etc., of the regiments of the army, together with the particulars recounting the reasons for their existence. The result was a very excellent history of the British Army. The introduction of the territorial system in 1881 destroyed in a measure the individuality of the regiment and made it a part of the territorial district to which it was assigned. In the effort to still further bind the regiment and its district together the attempt was made by the military administration to abolish much of the insignia formerly characteristic of the different regiments. The attempt, however, created so much opposition and ill will among all ranks of the army that a compromise was effected, and to-day nearly all the old devices are employed, the expense usually being borne by the officers of the regiment. The authorized and unauthorized badges include the royal arms (in the case of the guards and all other regiments distinguished by the prefix 'royal'), the whole or part of numerous orders, and other royal honors. Still others are purely regimental, i.e. badges distinguishing regiments of the same arm, as castles, arms of counties and cities, the Prussian eagle, the French eagle, the death's head, the elephant, the antelope, tiger, dragon of Wales, dragon of China, the sphinx of Egypt (this is worn by the thirty regiments who served in the first English expedition against the French in Egypt), the Paschal Lamb, the white horse of Hanover, the white horse of Kent, the lion of England, a gun, a grenade, the bugle (all light infantry and rifle regiments are distinguished by this badge), the bear and ragged staff, the figure of Britannia, Saint George and the dragon, the harp and crown, the shamrock (as in the case of the newly formed Irish guards), the Scottish thistle, the Cross of Saint Andrews, and many others. The royal arms are borne by the Royal Engineers and the Royal Artillery, the difference between them being in the mottoes, *Quo fas et Gloria ducunt* and *Ubique*. With the latter motto is coupled an artillery gun.

As with Germany, the various branches, arms, departments, etc., of the service are distinguished by their distinctive uniforms and not by any particular badge. In the mounted branches, rough riders (or young horsemen) are distinguished by a spur worn above the elbow on the sleeve of the tunic; farriers and shoeing smiths wear a horseshoe. Expert swordsmen, and gymnasium instructors of all branches, wear the crossed swords. Marksmen (sharpshooters) of all arms wear the crossed guns placed immediately above the cuff of the tunic. Pioneers wear the crossed axes on the upper sleeve. Commissioned and non-commissioned ranks of the infantry wear the sash, which in the case of officers is of silk and is worn over the left shoulder, and with non-commissioned officers is of worsted and worn over the right shoulder. Scottish Highland regiments are further distinguished by the differences in pattern of their clan tartans. See UNIFORMS, MILITARY.

In the United States at the time of the Revolution the distinguishing characteristics of army ranks were largely copied after French, Prussian, and English usages. General and staff officers were distinguished by the color of their sash or 'ribband,' which was worn over the waistcoat and under the coat. Cockades were worn by all other commissioned officers, and the non-commissioned officers were distinguished by the color of their epaulet. On June 18, 1780, a general order was promulgated authorizing the following insignia of rank and grade: Major-generals to wear two stars on each epaulet; brigadier-generals, one star; field officers wore two epaulets; captains, one epaulet on the right shoulder only; and lieutenants, one epaulet on the left shoulder. Other distinguishing marks were details of uniform. In 1782 the system of wearing stripes as badges of rank and service by the rank and file was instituted. Changes were frequent up to the Civil War, but the insignia since that time have remained substantially the same, the more important changes, particularly those of 1902, having had to do with uniform and equipment rather than of insignia. Officers' insignia are as follows:

(A) A coat of arms of the United States, made of gold or gilt metal, or dull finish bronze, worn on the collar of the dress, service, or white coat, is placed at a distance of one inch from each end of the collar. When worn upon the dress or white uniform the coat of arms is of gold or gilt metal. When worn upon the service uniform it is of dull bronze metal.

(B) The insignia of corps, department, or arm of service are as follows: Adjutant-General's Department, a shield of gold or gilt metal; Inspector-General's Department, gold or gilt sword and fasces crossed and wreathed; Judge Advocate-General's Department, sword and pen in gold or gilt metal, crossed and wreathed; Quartermaster's Department, sword and key crossed on a wheel, surmounted on a spread eagle, of gold or gilt metal, platinum and enamel; Subsistence Department, a silver crescent, one-half inch between cusps, cusps to the rear; Pay Department, a diamond, three-quarters of an inch by one inch, in gold or gilt metal, placed with shorter diameter vertical; Medical Department, a caduceus, of gold or gilt metal; Corps of Engineers, a silver turreted castle; Ordnance Department, shell and flame, of gold or gilt metal; Signal Corps, two crossed signal flags and a burning torch, in gold and silver; officers of the Record and Pension Office, a silver trefoil within and partly upon a wreath of gold or gilt metal; professors and assistant professors of the United States Military Academy, shield and helmet surrounded by a scroll, in gold or gilt metal, according to pattern adopted; aides-de-camp, a device, one and one-third inches high, consisting of a shield of the United States, of properly colored enamel three-fourths inch high and three-fourths inch wide at top, surmounted by a gold or gilt eagle, with wings displayed, on blue field of the shield a star or stars according to rank of the general on whose staff the officer is serving. This device is worn on the collar in lieu of corps or line device.

The devices appropriate to the various arms of the service are as follows: Cavalry, two crossed sabres, one inch high, with number of regiment above intersection; of gold or gilt metal. Artillery, two crossed cannons, design to be one inch high, of gold or gilt metal, with oval at intersection having a scarlet centre; the red oval in the insignia for officers of coast artillery exhibits an oblong projectile in gilt outline; for officers of field artillery, a gilt wheel in outline. Infantry, two crossed rifles, design to be one inch high, with number of regiment above intersection; of gold or gilt metal. Regimental staff officers, regimental adjutants, quartermasters, commissaries, and squadron and battalion adjutants wear in the lower angles of their insignia the devices (of gold or gilt metal) of the respective departments to which their duties correspond; the battalion adjutant and quartermaster of engineer battalions wear the same devices above the centre turret. Chaplains, the same as for regimental staff officers, except that the pendant design is a Latin cross of the same material and size. The insignia of corps, department, or arm of service is placed upon the collar of the dress, service, and white coat at a distance of five-eighths of an inch from the coat of arms, and is of gold or gilt metal with the dress or white uniform and of dull bronze metal with the service uniform.

(C) The insignia of rank is placed on the shoulder loops of the service coat and the white coat near the shoulder seam as follows: General and lieutenant-general, such as they may prescribe; major-general, two silver stars; brigadier-general, one silver star; colonel, one silver spread-eagle; lieutenant-colonel, one silver leaf; major, two silver bars; captain, two silver bars; first-lieutenant, one silver bar.

Braid Insignia of Rank.—Colonel, a single knot composed of five strands of gold wire braid not exceeding one-eighth inch in width is applied to the sleeve of the full dress coat below the elbow, the base resting on the gold band of the sleeve; lieutenant-colonel, four braids, single knot; major, three braids, single knot; captain, two braids, single knot; first lieutenant, one braid, single knot; second lieutenant, without braid; chaplain, without braid. The outside dimensions of the braid insignia are the same for all officers, the diminution being made by taking strands from the interior.

Braid insignia for overcoats, made of flat black mohair soutache braid one-eighth of an inch in width, follows the form of the braid insignia for dress coats, but is applied with the base resting at lower end of the sleeve.

Epaulets.—For general officers—Of gold with solid crescent, the only device being the coat of arms of the United States embroidered in gold.

Shoulder Knots.—Of gold wire cord one-fourth inch in diameter, formed of three cords in four plaits and rounded top, finished with small gilt regulation button; about five and one-half inches long, extending from the seam of the sleeve to the seam of the collar; slightly stiffened with a flexible backing which is covered with cloth of the color of the coat and made detachable.

Shoulder straps are as follows: General—Dark-blue cloth, one and three-eighths inches and four inches long, bordered with an embroidery of gold, one-quarter of an inch wide; two silver embroidered stars of five rays each and gold embroidered "Arms of the United States" between them. Lieutenant-General—Dark-blue cloth, one and three-eighths inches wide and four inches long, bordered with an embroidery of gold one-quarter of an inch wide, three silver-embroidered stars of five rays each, one star in the centre of the strap and one at each end, equidistant between the centre and outer edge of the strap, the centre star to be the largest. Major-General—The same as for a lieutenant-general, except that there are two stars instead of three; the centre of each star to be one inch from the outer edge of the gold embroidery on the ends of the straps; both stars of the same size. Brigadier-General—The same as for a major-general, except that there is one star instead of two at the centre of the strap. Colonel—The same as for a brigadier-general, omitting the star, with a silver embroidered spread eagle on the centre of the strap, two inches between the tips of the wings, having in the right talon an olive branch and in the left a bundle of arrows; an escutcheon on the breast as represented in the "Arms of the United States." Color of the cloth of the straps to be that selected for the trimming of the uniforms. Lieutenant-Colonel—The same as for a colonel, according to corps, department, or arm, of service, omitting the eagle, with a silver embroidered leaf at each end, each leaf extending seven-eighths of an inch from the end of the strap. Major—The same as for a lieutenant-colonel, with a gold embroidered leaf at each end, instead of silver leaf; each leaf extending seven-eighths of an inch from the end of the strap. Captain—The same as for a major, omitting the leaves; at each end two silver embroidered bars of the same width as the border, placed parallel to the ends of the strap; the distance between them and the border equal to the width of the border. First Lieutenant—The same as for a captain; at each end one silver embroidered bar of the same width as the border, placed parallel to the ends of the strap, at a distance from the border equal to the width of the border. Second Lieutenant—The same as for a first lieutenant, omitting the bars. Additional Second Lieutenant—The same as for a second lieutenant. Chaplain—Of dark-blue cloth of the usual size and pattern, with a plain Latin cross of silver in the centre.

Corps badges were first employed during the Civil War and proved to be an extremely valuable means of identification. The devices employed include a triangle (Fourth Army Corps); the star and crescent (Seventh); a six-pointed star (Eighth); an acorn (Fourteenth); an arrow (Seventeenth); a maltese cross (Nineteenth); a shield (Twenty-third). The device for Wilson's cavalry corps consisted of crossed swords surmounted by a carbine. The Signal Corps was distinguished by the crossed flags and torch. Division headquarters were marked by a square flag upon which was a badge designating the character of the headquarters. The old Twentieth Corps did not at first wear a badge, but when the new Twentieth was formed by the consolidation of the Eleventh and Twelfth Army Corps, it adopted the badge of the Twelfth, a five-pointed star. During the Spanish-American War the various corps were distinguished by the following corps badges: Artillery Corps, crossed conical projectiles, with round shot above the centre; Cavalry Corps, a winged horse-foot; First Corps, the letter "I" inclosed in a circle; Second Corps, a four-leaf clover; Third Corps, a three-toothed clutch; Fourth Corps, a caltrop; Fifth Corps, a five-bastioned fort; Sixth Corps, a six-spoke hub; Seventh Corps, a seven-pointed star; Eighth Corps, two overlapping circles, very much resembling the figure eight; Ninth Corps, a nine-toothed buzz-saw; Tenth Corps, two triangles point to point; Eleventh Corps, same design as for the Tenth Corps, with the addition of a horizontal bar through the centre; Twelfth Corps, a square with a clover-leaf at each corner; Thirteenth Corps, a palm-leaf; Fourteenth Corps, a square with half circles on each side; Fifteenth Corps, a bugle; Sixteenth Corps, a spear-head; Seventeenth Corps, a battle-axe; Eighteenth Corps, an arch. The color of the symbol determines the division of the corps, as: red, First Division; white, Second Division; blue, Third Division. Such badges are worn on the hat or cap. Commissioned officers wear them on the left breast, and not on the hat. See UNIFORMS, MILITARY; UNIFORMS, NAVAL; AIGUILLETTES; CHEVRONS; etc.

MILITARY JUSTICE, BUREAU OF. See MILITARY LAW.

MILITARY LAW. That part of the law of the land which prescribes and enforces the public obligations of persons in the military service. The civil law not being adequate for the government of the military community, peculiar laws and institutions have been framed for its regulation, which invest military authority with the right to punish offenders who are under military rule for offenses contrary to military discipline, or breaches of military duty, the essential object being to maintain order and discipline in the army. Every country that maintains a standing army generally enacts articles for its government, and confers special and limited powers upon the military authorities to enable them to enforce their provisions.

The Constitution of the United States confided to Congress the power to keep up a standing army, and to make rules and regulations for its government. Under this grant Congress has enacted "Articles of War" and other similar enactments which together constitute the statutory military law of the United States. These statutes deal not only with military offenses and punishments, but also with the constitution, composition, jurisdiction, and procedure of military courts. The power of the President to issue regulations and orders to the army is a right incidental to his constitutional power as Commander-in-Chief, and is a means for carrying into execution his sovereign power. Such orders of the President, as Commander-in-Chief, and of superior officers, when not in conflict with existing law and regulations, are also a part of the code military. To declare what the law for the army shall be is the province of Congress. But to interpret this law is a judicial function. While American military law is mostly statutory, we must go to the decisions of the courts and to the opinions of the attorneys-general for interpretation and explanation of the enacted word.

Customs of the Service in peace and in war are a source of military law. These usages have become to the army a kind of common law, supplementing the statute law and regulations. The oath administered to the members of a court-martial requires them in doubtful cases to administer justice according to "the customs of war in like cases." This oath is almost identical with the one taken by members of courts-martial in the British service, and the term "custom of war" as used in the Articles of War of the United States must not be understood as referring only to the usages of the army of the United States.

Persons Subject to the Military Law are (1) officers and soldiers on the active list, whether militia or others, mustered and in pay of the United States, (2) retired officers and soldiers, (3) persons who fraudulently enlist and receive pay and allowances thereunder, (4) discharged officers and soldiers who have defrauded the United States, (5) discharged officers after summary dismissal and general prisoners. In time of war spies, retainers to the camp, persons who relieve and aid the enemy in the way specified in the statutes, are included. When a person subject to military law commits an offense he is placed in arrest or confinement. Except in cases of quarrels, frays, and disorders commanding officers only have power to put officers in arrest. An officer arrested confines himself to his quarters until his arrest is made open or its limits extended. He is not permitted to wear a sword or to visit officially his commanding or superior officer, unless directed to do so. Whenever a commanding officer places an officer in arrest and releases him without preferring charges he makes a written report to the department commander of the cause. When an officer is put in arrest for the purpose of trial, except at remote stations, the officer ordering the arrest must see that he has a copy of the charges on which he is to be tried within eight days after his arrest. Non-commissioned officers and privates to be tried by summary court are generally placed in arrest in their quarters. Privates to be tried by general court-martial are confined in the guardhouse. Confinement without trial as a punishment for an offense is forbidden. Consequent upon arrest follows a preliminary investigation as to the crime or offense charged against the prisoner and the evidence upon which it is to be supported. If the offense is one for trial by a superior court, the charges are forwarded by the commanding officer with the statement that he has investigated them, and his opinion as to whether or not they can be sustained.

Certain various offenses against military law when committed in time of war are punishable with death. In time of peace the ordinary punishments are dishonorable discharge, confinement at hard labor, and forfeiture of pay. The maximum punishment is only given when the offense is of the worst type, or when an example is necessary. In a few instances the punishments are peremptory. The purposes of military process and proceedings in respect to offenses against military law have reference always to the prevention in future of the commission of these offenses. In the military code of England prominence is given to the principle of honor, and as the life of the military community will always depend on the zealous maintenance of this professional characteristic, one of the most important purposes for which the military law exists is to preserve the honor and purity of the service.

American military law began with the War of the Revolution. Articles of war were first made for the government of the army on the 30th of June, 1775. In April, 1806, the present military code was established. This code was derived immediately from the English military laws, and for many years the American officer was compelled to look to English treatises on military law to solve questions which arose in the course of his judicial duties. In 1864 a military law department was established by Congress, to be known as the Bureau of Military Justice. In 1883 this bureau was consolidated with the corps of the judge-advocates of the army under the title of "Judge-Advocates Department," which it still retains. This department as now organized consists of a judge-advocate-general, and eleven judge-advocates, holding permanent commissions in the department. These judge-advocates are stationed in time of peace at the headquarters of the several military departments into which the country is divided. In time of war they are at the headquarters of corps and divisions. They are consultative officers and legal advisers. In important trials the direct responsibility of their prosecution is upon them. They receive and revise the proceedings of courts-martial held in their several departments, give legal opinions, and administer oaths. In the English Army a judge-advocate never acts as a prosecutor or witness for the prosecution. He is a helper to the court, and the prosecutor and the prisoner are entitled to his opinion on any point of law that is relevant to the trial. The judge-advocate-general is a member of Parliament, a Privy Councilor, and a responsible adviser to the Crown in all cases of general courts-martial which the Crown confirms.

Military law requires that before a sentence of a court can be executed it must be confirmed. In England the sentences of general courts-martial are confirmed by the King, or by an officer holding a warrant from the King. In the United States the officer ordering the court, or the officer commanding for the time being, must approve a sentence before it can be executed. Except in certain convictions in time of war a sentence of death must be confirmed by the President. In time of peace no sentence of a court-martial directing the dismissal of an officer can be executed until approved by the President. It is the duty of a confirming officer to see that the finding and sentence are legal, and that the latter does not award a punishment in excess of the punishment authorized by law. Where the sentence of a court-martial imposes several punishments one or more may be approved.

The principal offenses committed by soldiers are desertion, fraudulent enlistment, disobedience to superiors, quitting or sleeping on post, drunkenness, absence without leave, selling or losing by neglect clothing or equipment, and miscellaneous offenses to the prejudice of good order and military discipline. A person in the military service is not freed from his civil obligations. He is still a citizen and amenable to the civil authority for violation of local laws. He is liable to be taxed for his real estate or household goods. He may vote at the place where he has a legal residence.

French Military Law is administered by means of regular trial and sentence before a military tribunal, or by infliction by any superior of inferior punishments for mere faults. The punishments inflicted upon officers for faults against discipline are: Simple arrests, rigorous arrests, reprimand from the colonel, and prison. Faults of officers too grave for disciplinary punishment are referred to courts of inquest. Councils of war, answering to our general court-martial, take cognizance of the graver violations of military law, which can only be punished by afflictive or infamous punishments. The judgments of councils of war may be revised by councils of revision. If the latter annul the judgment referred to them, proceedings and decision are sent to a second council of war having jurisdiction in cases of judgments annulled by councils of revision. There is also a court of appeal in cases of trial and sentence for the crime of capitulation. This court is styled 'The Court of Cassation.' Punishments in the German, Austrian, and Russian armies are similar to those in the French service.

English Military Law so nearly resembles the American as to require in this article but brief description. It is embodied in the Army Act of 1881, and is kept in operation from year to year by the passing of the Army Annual Act. It consists of a written and unwritten part. (1) The written part consists of the Army Act, rules of procedure, King's Regulations, general orders, army circulars and orders, royal warrants, and orders in council. (2) The unwritten part consists of the laws or customs of war. The sovereign has power to make articles of war, but the articles of war and the Mutiny Act have been consolidated in the Army Annual Act, and it is doubtful if the necessity for articles of war will ever arise again. The military code of England describes in detail the serious offenses against military law and prescribes the maximum punishment that can be awarded for them.

Consult: For the United States, Winthrop, *Military Law and Precedents* (Boston, 1896); *Manual for Courts-Martial*, prepared by direction of the Secretary of War for the use of the army of the United States (ed. 1901). For England, Simmons, *Courts-Martial;* Clode, *Military and Martial Law* (London, 1872); and Pratt, *Military Law* (London, 1892). See Courts, Military; Martial Law.

MILITARY MUSIC. See Band.

MILITARY ORDER OF FOREIGN WARS. See Foreign Wars, Military Order of.

MILITARY POLICE. A distinct corps of military police, with functions similar to the provost guard in the United States Army (see Army Organization), is a part of many European armies. In the British Army it consists of mounted and dismounted branches, with headquarters at Aldershot (q.v.). Their duties are similar to the civil police, but are confined to the soldiers of the district in which they are stationed. In time of peace they are scattered in detachments of varying strength throughout the standing camps and large garrisons of England and Ireland. On active service they carry out the orders of the provost-marshal (q.v.), and maintain good order and military discipline in the command to which they are attached. On the march they are in the rear of the column, to arrest stragglers, deserters, etc. (See Marching.) They are recruited from the regular army, and are confined exclusively to noncommissioned officers and men of several years' service and unblemished record. Every member of the force is a noncommissioned officer, and acts with the full authority of such. Their uniform is similar to that of the field artillery. In France these duties are performed by the gendarmes (q.v.). The military police of Germany come into active employment during war time, when each army corps mobilizes two detachments, one to accompany the corps itself, and one for the line of communications. Police forces organized on a semi-military basis exist throughout the British Empire. The Royal Irish Constabulary was the model upon which the Canadian Northwest Mounted Police was organized, a force which is altogether military in organization and equipment, and which has on various occasions served as a military corps. Their principal duties are to patrol the frontier, maintain the laws, and control the Indians, in which latter duties they have been conspicuously successful. Similar bodies were organized throughout Australia, for duty in the gold-mining camps primarily, and afterwards to control the natives and protect isolated ranches or stations. In organization there is generally a colonel, lieutenant-colonel, or major at the head, who is in turn responsible to the Minister of the Interior. Rank and title are the same as in the regular army. In South Africa the Cape Mounted Police, a force consisting in 1901 of 68 officers, 1922 men, and 1572 horses, are available for military duties whenever required, and are included in the military defenses of the colony. The British Central Africa Protectorate employs a military police, consisting of about 250 Sikh from the Indian Army and 1070 trained native troops. They are under British officers, and are charged with the duties of maintaining order and suppressing the slave traffic. The area under their jurisdiction covers 42,217 square miles, and is divided into twelve districts. They also police the eastern portion of the British South Africa Chartered Company's territory, north of the Zambezi, for which they receive payment. The Uganda Rifles constitute the armed constabulary of the Uganda Protectorate, and consist of native levies, numbering about 4000 men, under British officers. The Natal Mounted Police numbers about 660 officers and men, and constitutes the nucleus of the military forces of the colony. The Rhodesian military police forces now include all the small bodies of men formerly engaged in the division of what is now termed Rhodesia, the corps as a whole being under the

High Commissioner, as are also the forces of the Bechuanaland Protectorate and Basutoland. Similar forces are maintained throughout the German possessions in East and Southwest Africa. See PROVOST MARSHAL.

MILITARY PRISON. A prison set apart for military prisoners. In the United States soldiers sentenced by court-martial to long terms of imprisonment are sent to the military prison at Fort Leavenworth, Kan. Short terms of punishment are usually served at the prison of some post in the department. The same system obtains in England.

MILITARY PUNISHMENTS. See MILITARY LAW.

MILITARY RESERVATION, UNITED STATES. A term applied to every military post, station, or other locality selected and set apart for present or future military occupation. Department commanders supervise all such reservations within their territory, and are responsible that trespass and damage are prevented. They are also required to see that every consideration is given to their care, preservation, and adornment, and that every available means is employed to make them attractive homes for the army. The grounds are improved as far as possible. Where the reservations are of considerable extent or sufficiently practicable, they are stocked with game, and stringent rules made for the protection of native singing birds. Lands reserved for military use, and military posts temporarily evacuated by troops, are under charge of the quartermaster's department. Permanent works of defense, and lands appurtenant thereto, are under the direction and charge of the engineer department.

MILITARY SCHOOLS. See MILITARY EDUCATION; MILITARY ACADEMY, UNITED STATES.

MILITARY SCIENCE. This subject may be divided into four general branches: *Strategy,* or the science of manœuvring an army while out of the fire of the enemy upon points the possession of which is of importance to both sides; *tactics,* or the art by which strategical plans are carried into effect; *engineering,* or the art of disposing troops and arranging or removing obstacles; and *logistics,* or the art of moving and supplying an army. These subjects will be found fully treated under the separate heads.

MILITARY SERVICE INSTITUTION OF THE UNITED STATES. An organization of officers of the United States Regular Army and allied forces, associated for professional improvement, the interchange of views upon military matters, and such topics in general as may be calculated to promote the best interests of the army of the United States. In 1877 General Stanley, General Fry, General Rodenbough, and Colonel Lieber issued a circular requesting the presence of the officers in the army at a meeting to consider the practicability of forming an association similar to the Royal United Service Institution of Great Britain. About forty officers responded, and in 1878 the Military Service Institution was organized, with General Hancock as president. Subsequent presidents have been Generals Schofield, Miles, and Ruger. The headquarters of the Institution are at Governor's Island, N. Y. The *Journal of the Military Service Institution* published its first number in January, 1880, and is devoted to regimental histories and the discussion of contemporary military questions, domestic and foreign. It is universally regarded as a publication of great international importance in its own domain. Under the management of the publication committee, prize essays upon important military subjects have been a prominent annual feature. The library of the Institution contained in 1903 nearly 20,000 volumes, among which are many rare books and manuscripts. There is also a valuable collection of military relics and trophies.

MILITARY TENURE. See TENURE.

MILITARY TERRITORIES OF FRENCH SUDAN. The official name of three territories comprising the eastern part of the African region formerly known as French Sudan (q.v.), and extending from the eastern boundary of French Senegal and French Guinea to Lake Chad, and from the northern borders of Nigeria, Dahomey, Togo, the Gold Coast, and the Ivory Coast northward into the Sahara Desert (Map: Africa, D 3). The total area is estimated at over 250,000 square miles, and the population at 2,700,000. The first of the three territories covers the region around Timbuktu, including the towns of Yatenga, Dori, and Macini. The second comprises the Middle Niger region, including the greater part of the area within the bend of the Niger, with residences at Mossi and Gurunsi. In its eastern boundary are the Niger and Dahomey; on the west the territory extends to the Sankarani River; on the south it is bordered by the Gold Coast and by the Ivory Coast generally along the parallel of latitude 10° N. The third territory, organized December 20, 1899, embraces all the territory between the Niger and Lake Chad, with the towns of Koni and Maradi. Its headquarters are at Zinder. It extends into the Sahara on the north, reaches the Wadai on the east, and is bordered by Nigeria on the south.

The territories are at present administered by three officers, assisted by residents under the supervision of the Governor-General of French West Africa (q.v.). However, a French decree dated October 4, 1902, proposes to group the Middle Niger region (chiefly embraced in the second military territory as above described) with the region of the upper Senegal River and with the Senegal Protectorate, so as to form a new administrative and financial unit under the name of the "Territory of Senegambia and the Niger." This decree also proposes for the future some changes in the system of administration.

The expense of the region to the mother country is somewhat heavy, especially for military needs. The army numbered 8400 in 1901, about one-half natives. The region of these territories is little known. Many portions are considered very fertile, and full of agricultural and commercial possibilities. The French are preparing to make systematic and extensive investigations into these subjects, as well as into that of the population. The climate in general is not unhealthful. The natives raise rice, millet, and wheat. In the country around Timbuktu (q.v.) and south into the land of the Mossi has sprung up an active commerce since the entry of the French into the region. Timbuktu is a centre of trade in gums. Rubber is the other leading article of traffic. The railway, which has been building for many years from Senegal west through Kays and Kita to Bammaku to connect the Niger with the ocean, is now expected to reach this destination about 1906. Only about 150 miles remain to be constructed. The first French expedition entered the region of the territories in 1860. The French began an active conquest in 1880. In 1894 Timbuktu fell into their hands. French control of the district was ratified by a treaty with Great Britain in 1898.

MILITCHEVITCH, mē'lē-chĕv'ĭch, MILAN (1831—). A Servian writer, born near Belgrade. Having studied theology and done some teaching, he obtained, in 1852, a State office, and was made secretary to the Servian Minister of Education in 1861. Among his geographical and ethnological writings are an exhaustive topographical work, *The Principality of Servia* (1876); *Servian Peasant Life* (1867 and 1873); *The Kingdom of Servia* (1884); *Letters on the History of the Servians and Bulgarians* (1858-59); *Education in America* (1863); *Letters of a Tourist* (1865); *Schools in Servia* (1868); the pedagogical periodical *The School* (1868-76), and the short sketches *Jurmus and Fatima* (1879) and *Winter Evenings* (1879). Militchevitch is one of the most learned as well as talented Servian authors.

MILITELLO, mē'lē-tĕl'lō. IN VAL DI CATANIA. A town in the Province of Catania, Sicily, situated about 25 miles southwest of Catania, with which it is connected by rail (Map: Italy, J 10). It trades in wine, fruit, and silk. Population, in 1901 (commune), 11,539.

MILITIA (Lat. *militia*, military service, soldier, from *miles*, OLat. *meiles*, soldier). An organized military force. Originally organized for national defense, it has, since the advent of standing armies, become practically the second line of defense in England and in the United States, representing the entire able-bodied part of the population. Specifically the title applies to the purely defensive branch of the national military system of the countries referred to, the *mobile* and *territorial militia* of Italy and the *opoltchenie* of Russia closely resembling it. The *Landwehr* and *Landsturm* of Germany and Austria, and the *territorial army* of France, may also be regarded as the militia equivalent. In the United States the system differs somewhat from the English in that it is not a Federal or national force, unless called into the service of the Federal Government, it being normally a State organization. From 1775 to 1783 the bulk of the Federal armies consisted of State troops, a condition which continued to exist long after the Revolution itself. The United States militia consists of every able-bodied male citizen of the respective States, Territories, and the District of Columbia, and every able-bodied citizen of foreign birth who has declared his intention to become a citizen, who is more than eighteen and less than forty-five years of age. It is divided into two classes—the organized militia, known as the National Guards of the State, Territory, or District of Columbia, or by such other designation as may be given them by the laws of the respective States or Territories, and the remainder known as the reserve militia. The organization, armament, and discipline are the same as those prescribed for the regular and volunteer armies of the United States. The President may call out, for a period not exceeding nine months, such numbers of the militia of the States, Territories, or District of Columbia as he may deem necessary. During their period of service they become subject to the same rules and articles of war as the regular forces. Each State and Territory and the District of Columbia has an adjutant-general, who is charged with the duties as prescribed by the State, and the rendering of regular reports to the Secretary of War regarding the strength, condition, etc., of the organized militia of the State to which he belongs. See *United States* in article ARMIES.

The table following is an abstract of the militia force of the United States (organized), according to the returns of the Adjutant-General for 1902.

The militia of Great Britain is a constitutional force raised under authority of Parliament for national defense only. It cannot be used on foreign service without its consent and the authority of Parliament. Before the Norman Conquest rents for land were paid in body service, the able-bodied men of each family bearing arms in numbers proportionate to the land held by the family. This system is attributed to the Saxon King Alfred. The country was organized into dukedoms, hundreds, tithings (ten tithings making the hundred), and families, the number of families in a tithing varying with the necessities of the times. After the decisive battle of Hastings (1066) the *fyrd*, as the militia was then called, ceased to exist officially, although continuing to give the Normans considerable trouble. The national exigencies during the Seven Years' War rendered imperative the reorganization of 1757, since which period more attention has been devoted to it. In 1871 the War Office assumed control, and the county authorities ceased to have any active interest in it other than the right to nominate officers. It is now (1903) a part of the military territorial system, two or more local militia battalions being attached to each territorial district, and forming the third, fourth, or fifth battalions (as the case may be) of the regular regiments to which they are attached. See *Great Britain* in the article ARMIES.

In Russia, what is now the *opoltchenie* was originally a simple militia, which was reorganized in 1888 and again in 1891, when the period of service was changed from forty to forty-five years for the soldiers and from fifty to fifty-five for officers. The *opoltchenie* is now divided into two parts. The first, *pyervi razryad* —which is practically a reserve, and includes all who have passed or served the active term or period—is intended principally as a source of supply for the filling up of regiments.

In time of war or national need cadres (q.v.) are formed in connection, so that when the *opoltchenie* is mobilized the organization is complete. The *vtoroyi razryad*, or second part, includes all who have served in the first part, men excused from other services for physical reasons, or those who have been excused as being the sole support of their families. This division can only be called out for the organization of militia corps, and then only by Imperial manifesto. In Italy the militia is largely a reserve of the regular army. The annual levies are in three divi-

ORGANIZED STRENGTH, 1901

STATES AND TERRITORIES	General officers	General staff officers	Regimental, field, and staff officers	Company officers	Total commissioned	Total non-commissioned officers, musicians, privates, etc.	Aggregate
States							
Maine	......	6	31	71	108	1,156	1,264
New Hampshire	1	9	21	79	110	1,232	1,342
Vermont	......	5	19	36	60	716	776
Massachusetts	2	20	129	231	382	4,737	5,119
Rhode Island	1	21	59	74	155	1,258	1,413
Connecticut	3	8	56	127	194	2,425	2,619
New York	4	58	299	498	859	13.551	14,410
New Jersey	2	47	69	155	273	3,765	4,038
Pennsylvania	4	47	194	455	700	8,643	9,343
Delaware	......	13	9	20	42	326	368
Maryland	1	9	42	87	139	1,915	2,054
Virginia	......	2	38	106	146	2,185	2,331
West Virginia	1	23	36	52	112	883	995
North Carolina	......	17	48	111	176	1,684	1,860
South Carolina	......	11	36	305	352	2,677	3,029
Georgia	......	13	100	225	338	4,429	4,767
Florida	......	7	41	56	104	1,348	1,452
Alabama	1	23	49	147	220	2,361	2,581
Mississippi	1	18	41	93	153	1,220	1,373
Louisiana	1	11	28	88	128	1,390	1,518
Texas	3	33	65	150	251	2,829	3,080
Arkansas	3	24	21	78	126	1,516	1,642
Kentucky	......	7	25	87	119	1,658	1,777
Tennessee	......	5	20	66	91	1,213	1,304
Ohio	3	25	121	267	416	5,585	6,001
Indiana	1	13	59	113	186	2,222	2,408
Michigan	1	16	56	122	195	2,911	3,106
Illinois	3	33	147	287	470	6,524	6,994
Missouri	1	8	55	129	193	2,484	2,677
Wisconsin	......	9	59	127	195	2,578	2,773
Minnesota	1	8	39	85	133	1,789	1,922
Iowa	......	26	48	144	218	2,412	2,630
Nebraska	1	5	25	80	111	1,484	1,595
Kansas	1	4	35	75	115	1,196	1,311
Nevada	......	4	1	6	11	127	138
Oregon	1	22	21	60	104	1,176	1,280
California	4	45	91	159	299	3,173	3,472
Colorado	1	9	14	54	78	1,005	1,083
North Dakota	......	10	16	45	71	647	718
South Dakota	......	10	22	63	95	854	949
Montana	......	6	......	18	24	316	340
Washington	......	8	21	42	71	887	958
Idaho	......	7	......	24	31	637	668
Wyoming	......	5	1	20	26	297	323
Utah	1	6	5	31	43	483	526
Territories							
Alaska	......	......	......	......	......	....	....
Arizona	......	6	11	25	42	341	383
New Mexico	......	3	20	27	50	562	612
Oklahoma	......	7	13	40	60	566	626
Hawaii	......	7	12	27	46	495	541
District of Columbia	1	13	47	69	130	1,130	1,260
Grand aggregate	48	752	2,415	5,536	8,751	106,998	115,749

sions, the first consisting of men of the permanent army who serve in the militia as follows: Carabineers and non-commissioned officers of all other corps serve ten years, with unlimited leave; other corps, including cavalry, serving in the mobile militia three or four years, and in the territorial militia seven years. The levies of the second division serve three or four years (according to the branch of the service) in the mobile militia, and seven in the territorial. The levies of the third division serve nineteen years, with unlimited leave, in the territorial militia. The period of training for men of the second division is from two to six months, spread over a period of several years. The third division has thirty days' training. In time of war it does garrison duty, and constitutes the last reserve.

The French territorial army, with its reserves, is organized similarly to the militia of England, on a purely local basis. After serving thirteen years in the active army and its reserve, soldiers are assigned to twelve years' service in the territorial army and reserve. In Switzerland the entire army, comprising as it does every able-bodied citizen, is a militia, regarding which see *Switzerland* in the article ARMIES. See LANDSTURM; LANDWEHR; NATIONAL GUARD; VOLUNTEERS.

MILK (AS. *meolc*, *meoluc*, Goth. *miluks*, OHG. *miluh*, Ger. *Milch*; connected with AS. *melcan*, OHG. *melchan*, Ger. *melken*, Lat. *mulgere*, Gk. ἀμέλγειν, *amelgein*, OChurch Slav. *mlěsti*, Lith. *milsti*, to milk, Skt. *marj*, Av. *marəz*, to rub off). The liquid secreted by the mammary glands of all mammals, and used primarily to nourish their young. From the earliest time it has been esteemed an important and necessary article of food, and many hidden virtues were ascribed to it by the ancients. Its exact composition continued long unknown, and until the beginning of the seventeenth century fat, casein, and whey were the only constituents recognized. In the early part of the eighteenth century Leeuwenhoeck discovered the microscopical characteristics of milk, and about the same time Boerhaave made a qualitative examination. The first quantitative analysis of milk recorded was made in 1737 by Geoffrey, who determined with considerable accuracy the casein, milk sugar, and mineral matter.

Woman's milk contains 87.4 per cent. of water and 12.6 per cent. of solids, the latter including 3.8 per cent. of fat, 1.0 per cent. of casein, 1.3 per cent. of albumin, 6.2 per cent. of milk sugar, and 0.3 per cent. of ash (mineral matter left after burning). The milk from different animals varies considerably in composition, as shown in the following table:

Composition of Milk of Different Animals

KIND OF ANIMAL	Water	Total solids	In total solids				
			Fat	Casein	Albumin	Milk sugar	Ash
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Cow	87.2	12.8	3.7	3.0	.5	4.9	.7
Buffalo	81.4	18.6	7.5	5.8	.3	4.1	.9
Goat	85.7	14.3	4.8	3.2	1.1	4.4	.8
Ewe	80.8	19.2	6.9	5.0	1.5	4.9	.9
Llama	86.5	13.5	3.2	3.0	.9	5.6	.8
Mare	91.5	8.5	1.2	1.2	.1	5.7	.3
Ass	89.6	10.4	1.6	.7	1.6	6.0	.5
Camel	86.6	13.4	3.1	4.6	4.0	5.6	.7
Sow	84.0	16.0	4.0	7.2	7.2	3.1	1.1
Elephant	67.9	32.1	19.6	3.1	3.1	8.8	.6
Porpoise	41.1	58.9	45.8	11.2	11.2	1.3	.6
Dog	75.4	24.6	9.6	6.1	5.1	3.1	.7
Cat	82.1	17.9	3.3	3.1	6.0	4.9	.6

The above are general averages of a greater or less number of analyses, depending upon the kind of milk animal, each kind of which gives milk that varies more or less with the individual as well as with the species. There is, furthermore, some difficulty in arriving at a general average for any kind of mammal, since normal milk is obtained with difficulty from animals unaccustomed to being milked.

Properties of Cows' Milk. Since, in general properties and composition, cows' milk is typical of all milks, is of chief commercial interest, and has been studied much more in detail, it will be the main subject of this article. The milk secreted immediately after parturition is termed *colostrum* (q.v.), or *beastings*, and differs considerably from normal milk in both physical and chemical characters. Milk from which the fat has been removed by skimming or by the separator is called skim milk (q.v.), and the residue left after churning cream is known as buttermilk (q.v.). Whey (q.v.) is the liquid remaining after the curd of the milk has been separated.

Cows' milk is an opaque, whitish liquid, sometimes faintly yellow or bluish, with a slight alkaline reaction and a sweetish taste when fresh. It is heavier than water, its specific gravity ranging usually from 1.029 to 1.035, the average for mixed milk being about 1.032. By removing the fat (skimming the cream) the specific gravity is raised, and by adding water it is lowered. This is the basis of a simple, but (when taken alone) unreliable, test of the quality of milk and of the practice of skimming. Chemically, milk consists of an aqueous solution of milk sugar, casein, albumin, and ash, with the fat in suspension, forming an emulsion. The water and the constituents dissolved in it constitute the milk serum, and the constituents (i.e. the dry matter) minus the water are designated total solids. The proportion of total solids is a general indication of the richness of the milk. Among the solids the chief importance attaches to the fat. First, it is the measure of the value of milk for butter-making, and to a very great extent for cheese-making also; second, it is the constituent which more than any other gives milk its appearance of richness; third, it fluctuates more widely than any other constituent. Milk fat is a familiar substance in the form of butter, which contains about 85 per cent. of fat, some water, salt, and casein. The fat in milk is in the form of minute globules held in suspension, and on standing it rises to the surface as cream (q.v.), which contains some of the other constituents in smaller proportion. The globules may be readily seen by means of a microscope. For a long time fat globules were believed to be surrounded by a membrane or proteid coating, which was destroyed by churning the cream, and thus allowed the fat to unite into a solid mass. This view is still held by some, but the prevailing belief at present is that the globules are free and owe their spherical form to the surface tension. The globules vary greatly in size, being from $\frac{1}{1500}$ to $\frac{1}{25000}$ of an inch in diameter. A pint of average milk has been estimated to contain not far from a million globules. The size of the globules varies with the period of lactation, diminishing toward the close, and to some extent with the breed and the individual. The globules in the Jersey and Guernsey milk are relatively large; in Holstein milk very small. The large globules rise more rapidly, and milk containing them creams more readily and completely.

Milk fat is a pale yellow substance consisting of a mixture of the glycerides of 8 or more fatty acids. Of these olein constitutes about 35 per cent., palmitin 25.7, myristin 20, laurin 7.5, butyrin 3.85, caprin 3.6 per cent., and the remainder is principally caprylin and stearin. By the action of caustic alkali these glycerides are broken up into their respective fatty acids and glycerin, and a certain relatively small proportion of these, including the butyric, caproic, and caprylic acids, are volatile. The characteristic flavor and aroma of milk and butter are due largely to butyrin, and this decomposes readily, forming butyric acid, which is evident in rancid or 'frowy' butter. The chief nitrogenous or albuminoid constituent of milk is casein, which is of prime importance in cheese-making. It is coagulated by rennet and by acids, and this is what gives sour milk its thick curdled appearance. The acid developed in souring precipitates the casein, which gradually separates from the soluble constituents, inclosing much of the fat. Casein is held in solution in milk by the presence of lime salts, and lime water causes it when curdled to separate in a much more finely divided condition. The albumin of milk is not curdled by acids or rennet, but is acted upon by heat. Fibrin, similar to that of blood, globulin, nuclein, and several other nitrogenous bodies, have been found in milk in small quantities, but are of little importance. The sugar in milk, chemically known as lactose, is not as sweet as cane sugar. It is in solution. The ash of milk consists of a mixture of a number of salts, but is composed principally of the phosphates of lime and potash, the chlorides of potash and soda, and small amounts of phosphate of iron and magnesia. Some of the phosphate of lime appears to be associated with the casein, which also contains some sulphur. Most of the salts are in solution. Besides the constituents named, milk contains normally a coloring matter. a trace of citric acid, urea, and several other bodies. The fat and the albumin of milk are the most variable constituents. the ash and the sugar the least so. The casein bears a quite constant ratio to the fat, rising and falling with it.

Variations in Milk. The richness of milk is to a certain extent an individual characteristic; i.e. some individuals normally give rich milk, while others, for no apparent reason, give milk containing several per cent. more water. The richness of milk has been increased by domestication, care, and breeding, and certain breeds of cows, sheep, goats, etc., have been produced which give a characteristically rich milk. The quality also varies with the stage of lactation. The milk given early in the lactation period is usually poorer than that secreted later, and grows richer toward the close of the period until the animal 'goes dry.' Young animals usually give poorer milk and less of it than after the third or fourth parturition, and the milk from the first part of any milking is poorer than the last part, or 'strippings.' The kind of food has little effect on the composition of milk, provided it is wholesome and the amount sufficient. Food influences the proportion of the different fatty acids composing the fat, and so has an effect on the hardness and other qualities of butter. But the rather prevalent notion that the milk fat, for instance, can be permanently increased by feeding has been shown by much careful investigation to be a fallacy. Little is known of the physiological processes by which the constituents of the food are transformed into milk constituents. In some cases there appears to be a direct transmission of the constituents from the food to the milk, as is noticeable when cows eat garlic, onions, etc. The experiments of Jordan at the New York State Experiment Station have shown that milk fat is not derived solely from the fat of the food, for cows fed upon food from which the fats were practically completely extracted continued to secrete milk of normal composition for long periods, and, judging from the maintenance of their weight, did not draw upon their body fat to supply this ingredient. Under the conditions of the experiments, the carbohydrates seemed to be utilized to some extent in the elaboration of milk fat. The more the process of milk secretion is understood the more apparent it becomes that richness and the volume of the yield are individual characters, and if cows have a tendency to give poor milk no amount of feeding will overcome it. The remedy lies in getting better cows. For general statements regarding the composition of the milk of different breeds of cows, see Cattle.

As an illustration of the variation of the milk of ordinary cows of mixed breeding, the data obtained by Van Slyke in New York from the analysis of the mixed milk of 15,000 cows each month from May to October may be cited. The total solids ranged from 11.17 to 13.91 and averaged 12.67 per cent., and the fat from 3.04 to 4.06 and averaged 3.75 per cent. The content of total solids and of fat was lowest during the summer months and increased in the fall. In the analysis of over three thousand samples of milk at the Massachusetts Experiment Station, the total solids varied from 10.02 to 19.55 and averaged 13.57 per cent., and the fat from 1.5 to 10.70 and averaged 4.32 per cent. The analysis of eight hundred samples made at the experiment stations in different parts of the country varied in total solids from 9.3 to 19.7 per cent., averaging 12.8 per cent., and in fat from 1.7 to 6.5, averaging 3.7 per cent.

Milk Fermentations. Milk is subject to a great variety of fermentations, for it is a favorable medium for the growth of many kinds of bacteria, yeasts, and other fungi which cause numerous changes in its constituents. Thus, while one class of organisms curdles milk by the production of lactic acid, another class gives it an alkaline reaction, at the same time curdling it; others impart to it a deep blue, violet, yellow, green, or red color, by the production of pigments in the milk; others give it a bitter or other unpleasant taste; another class produces alcohol from the milk sugar, and is taken advantage of in the preparation of such beverages as koumiss and kephir (qq.v.), and still others cause putrefaction. The most common and familiar change is the souring of milk, due usually to the action of lactic-acid bacteria. Under ordinary conditions normal milk nearly always undergoes some sort of lactic fermentation on standing. The production of lactic acid soon curdles the milk and obscures all other forms of fermentation, and the acid stops the growth of other bacteria so that no subsequent effects are usually seen. The popular belief that the electricity in the air during thunderstorms sours milk appears to be unfounded, but its rapid souring at such times is due to the climatic conditions prevailing, which hasten bacterial growth. The same difficulty in keeping milk is experienced during very hot weather. Curdling is not always due to the formation of acid; milk apparently 'sour' may have no acid taste. In such cases the cause is due to alkaline fermentation, induced by another class of organisms. The milk becomes coagulated into a soft slimy mass, which is usually bitter and has an alkaline or neutral reaction. Ordinarily this form of fermentation is not very apparent, as the organisms causing it grow slowly and the lactic-acid organisms get the start of them. The organisms which produce butyric acid in milk attack and decompose the fats, giving a rancid odor. In the ordinary handling of milk the latter are of little importance, but it is supposed that they have an important effect upon the keeping properties of butter. Several organisms have been described which impart a bitter taste to milk, due, in some cases at least, to the production of a bitter principle. Milk which has been boiled is likely to develop a bitter taste, for the reason that the heating kills the lactic-acid germs, while the bacteria causing the bitter taste usually possess endospores which are not destroyed by heat, and so have a clear field for action. A slimy fermentation of milk is a somewhat common occurrence, and occasionally produces great trouble in dairies, since it destroys the milk for all ordinary uses. Such milk becomes thick and ropy, will not cream, cannot be churned, and is unfit for drinking. It may be caused by a variety of organisms. There are several forms of the trouble. One known as the 'lange wei' (long or stringy whey) is made use of in the manufacture of Edam cheese in Holland, to control the gassy fermentation of the curd.

In addition to the fermentations and other changes in milk due to micro-organisms, rennet, an unorganized ferment obtained from the stomach of the calf and from some plants, ferments milk, causing it to curdle. This ferment is employed in cheese-making to produce the curd. Babcock and Russell have discovered an unorganized ferment termed galactase in milk, which they believe to be a normal and inherent constituent, and which is active in the ripening of cheese, causing the characteristic changes in the green cheese which make it suitable for eating.

The chief sources of bacteria in milk are the cow herself, the milker, the dust of the stable, and the dairy utensils. It has long been believed that pure milk drawn from a healthy cow contains no bacteria, and that all bacterial contamination of the milk comes from external sources. However, the large calibre of the milk duct makes it possible for bacteria to enter it and grow to a considerable extent, so that it becomes a matter of extreme difficulty to obtain milk from the cow, even with the greatest precautions, which shall not be contaminated. The hairs of the cow are always covered with dirt and dust, and the air of the stable is charged with dust from the fodder and bedding material, so that it is impossible to prevent some of this dirt falling into the milk pail. Thus large numbers of bacteria, especially in poorly ventilated stables, reach the milk. Any dirt upon the hands or clothing of the milker will have abundant chance to get into the milk pails and cans. The milk vessels themselves are an important source of contamination, the corners and creases retaining bacteria which have not been removed or killed by the washing. The warm milk furnishes favorable conditions for the growth of these micro-organisms which have gained access, and which for a time multiply rapidly.

Several species of bacteria classed as pathogenic organisms are capable of living or even increasing in milk, but since they do not ferment the milk or alter its appearance sufficiently to be detected by a physical examination, their presence is not readily determined. Except in very rare instances the milk becomes contaminated after it has been drawn and in practically all these cases the cause of contamination is some form of uncleanliness, either of the stables, the water, the utensils, or the attendants. It is gratifying to know, however, that through the efforts of the United States Department of Agriculture, the agricultural experiment stations, and the dairymen themselves, the sanitary management of dairies is being constantly improved, and through the vigilance of State appointed dairy inspectors unsanitary conditions are destroyed as soon as discovered.

MILK ADULTERATION AND CONTROL. The milk supply of towns and cities has for many years been regulated by laws and ordinances, and subjected to inspection. The object of this was formerly to prevent adulteration, but of recent years the inspection has often extended to the herds and stables and all that relates to the milk trade. It has come to be realized that such factors as the health of the cows, hygienic condition of the stables, and cleanliness in the handling of the milk are quite as essential to pure wholesome milk as freedom from adulteration. Hence the veterinary inspection, which has been introduced in some cities, should be extended. Milk is most often tampered with by removing a part of the cream, or by diluting it with water or skim milk. Coloring matter is sometimes added to make it appear richer, but the addition of chalk, burnt sugar, or similar substances is now rare. Preservatives, such as formaldehyde, borax, and salicylic acid, are sometimes added to prevent milk souring. Opinions differ as to the injuriousness of these preservatives, but their use is generally condemned on the ground that they are unnecessary in pure milk, and that they are a cloak for unsanitary practices in the dairy. The standards for milk adopted by different States vary from 11.5 to 13 per cent. for total solids and from 2.5 to 3.5 per cent. for fat. Milk found below these standards is held to be adulterated. A standard of 12.5 per cent. of total solids and at least 3 per cent. of fat seems fair.

Various means of testing milk as to its quality have been suggested from time to time. Of these the lactometer is the simplest, and has been extensively used by milk inspectors who have a large number of samples to examine daily, to detect watering or skimming. It is a form of hydrometer, which shows the specific gravity of milk upon a graduated scale. But there are so many factors that affect the specific gravity, and this may vary so much in pure milk, that the lactometer reading is only an indication and cannot be relied upon as final. The most reliable and satisfactory of the simple milk tests is the Babcock test, which has come into very widespread use in the milk inspection of towns and cities, and in determining the fat content of milk as a basis for paying for the product at creameries. (See CREAMERY; BUTTER-MAKING.) This test is made in a special bottle having a narrow graduated neck. A definite quantity of milk is treated in the bottle with sulphuric acid to dissolve the curd and set the fat free. The bottle is then whirled rapidly in a centrifugal apparatus for a few minutes, to aid in separating the fat; hot water is added to bring the fat up into the neck, after which the bottle is whirled a second time and the column of fat read off on the graduated scale. The reading gives the percentage of fat without calculation. A large number of samples may be tested simultaneously, and the method has been shown to be very accurate after a little practice. It shows only the fat content, which is the common measure of richness; but from it and the lactometer reading the total solids and other constituents can be calculated. A bacteriological examination is rarely made in connection with the ordinary milk inspection.

Milk as Food. Milk is peculiarly adapted to be a food for man principally because it contains the four classes of nutrients—protein, fat, carbohydrates, and mineral matter—in more nearly the proper proportions to serve as a complete food than perhaps any other single food material. (See Food.) A quart of milk contains about four ounces of nutritive material, or about the same as three-quarters of a pound of beef or six ounces of bread. Although these quantities of milk, beef, and bread supply like amounts of total nutrients, their nutritive values are not the same. In other words, they would not be equally useful as food, owing to the relative proportion in which the nutrients are present. Protein, fat, and carbohydrates occur in milk in about equal proportions. The chief nutrients in bread are carbohydrates and protein, and in meat protein and fat. Either milk or bread eaten alone would make a better balanced food for man than meat. In general, milk and cream together furnish to the diet of average American families about 20 per cent. of the total food, 11 per cent. of the total protein, and also of the total fat, and about 5 per cent. of the total carbohydrates. Dairy products (milk, cheese, butter, and cream) furnish over 22 per cent. of the total food, 12 per cent. of the protein, 32 per cent. of the fat, and 5 per cent. of the carbohydrates.

As regards the digestibility of all its ingredients, milk is one of the most digestible of animal foods. It has been found that on an average an adult digests about 97 per cent. of the protein, 95 per cent. of the fat, and 98 per cent. of the carbohydrates of milk. According to American experiments, a child one year old eating milk digests on an average only about 90 per cent. of the protein, 96 per cent. of the fat, and 86 per cent. of the carbohydrates of cows' milk. When milk is taken into the stomach it is speedily curdled by the action of the pepsin and acid of the gastric juice. When eaten alone or in large quantities, the casein gathers in large lumps, which in some persons may be difficult to digest. This is particularly the case with infants and with adults whose digestion is weak. The casein of human milk is precipitated in more flocculent form than that of cows' milk, and is thus more easily digested and does not cause irritation. Lime, which tends to prevent the curdling of the casein of cows' milk in lumps, is frequently added as lime water to milk that is to be fed to infants or to adults of delicate digestion. The results of experiments upon the effect of cooking milk are conflicting. The more common experience seems to indicate that cooking or heating the milk renders it more difficult to digest. Some persons, however, cannot take fresh milk with comfort, but can digest boiled milk.

Milk is often said to be a 'perfect food.' It is so for the young of the species of animal producing it, but there are three reasons why it cannot be considered a perfect food for adults. (1) The proportion of water is so large that great quantities (from 4 to 5 quarts) would have to be consumed each day in order to obtain the necessary nutrients. (2) The protein is present in rather large quantities as compared with the fats and carbohydrates. Thus the milk necessary to furnish the 0.28 pound of protein per day, estimated to be required by a man at moderately active work, would yield only 2700 calories of energy, while milk in sufficient quantity to furnish the 3400 calories estimated as necessary would yield 0.34 pound of protein. (3) It is a well recognized fact that the digestive functions require that food itself, besides the water taken with it, shall have a certain bulk. Cattle cannot generally be maintained in health upon a condensed ration such as grain; they seem to require a certain distention of the stomach, such as is brought about by the fibre (cellulose or woody matter) of grass or hay. In like manner it seems desirable that man should have a certain amount of bulky material to produce distention or to promote peristaltic action of the intestines, or for other purposes not well understood. Of course, the nutritive constituents of milk, considered separately, are highly concentrated foods. While, therefore, milk alone cannot be considered as a perfect diet for adults, it is of special value as a food for invalids, because it is, as a rule, easily taken, easily digested, and does not generally irritate the alimentary canal. Furthermore, a milk diet is more readily under the control of the physician both as regards quantity and quality than a mixed diet is. If for any reason a child cannot be nourished on mother's milk, the most useful substitute is modified cows' milk. Various infant foods and milk substitutes have been proposed and are sold under divers trade names.

As a food for adults cows' milk is unusually well adapted for use in connection with other foods, either in its uncooked form in tea and coffee, as a beverage, as bread and milk, etc., or incorporated and cooked with other materials. In many culinary products it can be used instead of water. Analysis of bread, rolls, etc., made with milk would show about one-tenth more protein and one-twentieth more fuel value than bread made with water. Milk is very generally used in many kinds of cake and pastry and in custards. Where desirable from economical reasons, or as a means of increasing the proportional amount of protein in a diet, skim milk can be advantageously substituted for whole milk. At the price ordinarily paid in our large cities milk is a food of reasonable cheapness, and at the prices prevailing in small cities and country towns it is an economical food. Condensed milk is a more nutritious food, pound for pound, than fresh milk, since it has been concentrated by evaporation. It is, however, usually diluted before it is used, and then approximates fresh milk more or less closely in composition and food value. If the condensed milk contains added sugar its carbohydrate content is, of course, higher than that of unsweetened condensed milk, and when diluted, proportionally higher than that of fresh milk. Cream, which contains the greater part of the fat of the milk, as well as some protein and carbohydrates, is chiefly valuable in the diet as a source of energy. Curds obtained in the manufacture of cheese are eaten to a limited extent. They consist quite largely of the casein of milk, and hence supply the body with building material as well as energy. Butter and cheese (qq.v.), the principal milk products used as food, are of great importance as articles of diet.

The former, consisting almost entirely of fat, supplies energy; the latter, containing protein in addition to fat, supplies both building material and energy.

There are at least four distinct fermented beverages prepared from milk—kephir (q.v.), koumiss (q.v.), matzoon, and leben. They are properly classed as food beverages, and are often recommended for the sick and for convalescents. A number of special foods are made from the dry casein of milk and are used to a considerable extent by physicians to supply protein in a readily digestible form. The albuminoids of milk are used in the manufacture of egg substitutes. Milk sugar prepared from whey is an important article of diet for invalids and is used in medicine and in other ways.

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MILK CURE. The treatment of disease in the adult by the use of milk as a diet. In the milk cure all other food and drink is suspended for a time. Acting upon the information that milk requires about three hours for complete digestion, four ounces of milk are taken by the patient every three hours, beginning on rising in the morning. In a few days, one or two tumblerfuls are taken at a time, in place of the smaller quantity. Usually a patient takes two quarts a day; in some cases the total amount reaches five quarts. It is generally administered warm. In cases of stomachic or intestinal disorders, the milk is allowed to stand for twenty-four hours, and is then skimmed before being administered. Lime water, in the proportion of one-fourth of the bulk, overcomes the patient's repugnance to the diet and renders it more easy of digestion. Or the milk may be flavored with coffee, cocoa, salt, or caramel. After two or three weeks of strict milk diet, it is advised that a little stale bread be added, three times a day. A week later, about two tablespoonfuls of rice or a little arrowroot is added. At the fifth week a chop is given once a day, and a few days later two chops a day are allowed. At the end of the sixth week full meals of various foods are resumed, milk continuing to be a principal part of the diet. Coffee, or aloes, or laxative mineral water is employed to overcome the constipation incident upon a milk diet in adults.

The milk cure is successful in some cases of dyspepsia, gastric ulcer, chronic intestinal indigestion, enteralgia, chronic diarrhœa and dysentery. In the treatment of ascites of hepatic origin, it has been used since the days of Hippocrates, who refers to it. It has also proved efficacious in diabetes, eczema, gout, aneurism, and cardiac disease.

MILK FEVER (in Women). Coincidently with the appearance of milk in the breasts of a mother who has given birth to a child three or four days previously, there is a slight general rise of temperature, accompanied by an accelerated pulse, and in some cases a diminution of the lochial discharge. The breasts become swollen, hot, and rosy, and somewhat sensitive. Many women in robust health suffer no discomfort; some have no rise of temperature. No treatment other than relief of existing constipation is necessary.

MILK FEVER, Parturient Apoplexy, or Parturient Paresis. A disease of cows, especially good milkers of improved breeds and in good condition at time of calving. As the most important predisposing causes of the disease veterinarians have long recognized confinement in improperly ventilated stables, high temperature, electrical disturbances, constipation, mature age, and calving. Later writers regard the cause as ptomain poisoning originating in the udder and affecting the brain and central nervous system. The disease never follows the first calving, and rarely follows the second. One attack seems to predispose toward another. It appears in two forms, apoplectic and torpid. In the apoplectic form the cow suddenly becomes dull, allows the head to droop, and staggers in attempting to walk, falls, and lies either on the breast-bone, with the head turned around to the right, and resting on the muzzle, or stretched out on the side. The pupil of the eye is dilated, and the head and horns are hot; the bowels and bladder soon become torpid or completely paralyzed, and fail to operate unless recovery takes place. In the torpid form there is no marked fever and no congestion of the head. The animal slowly becomes drowsy and weakened, falls down, and, unless relieved, finally succumbs. Insensibility is a pronounced symptom in the later stages of both forms.

The usual treatment consists in the administration of Epsom salts, and doses of 20 to 30 drops of tincture of aconite. Ice is applied to the head in the apoplectic form. After the symptoms of fever and constipation abate, stimulants are administered until the cow is able to stand. Recently satisfactory results have been obtained from a method known as the Schmidt treatment, which consists in injecting an infusion of ten grammes of potassium idodide into the udder. If no improvement is noted, the dose may be repeated after 24 hours. A large percentage of cases recover from the first dose. A modification of the method, which has also given good results, consists in giving hypodermic injections of iodide of potash.

MILKFISH. A large, silvery, herring-like fish of the genus Chanos and family Hiodontidæ, which inhabit the warmer parts of the Pacific. One well-known species (*Chanos chanos*), from two to five feet long, is a food fish of some importance in the South Pacific, Japan, Hawaii, and the Gulf of California. Foreign names for it are 'chani,' 'awa,' 'auged,' 'sabalo,' etc.

MILKING MACHINE. An apparatus designed to do away with hand labor in milking cows. Milking tubes, inserted into the milk ducts within the teats, have been tried, but found unsatisfactory. Several forms of milking machines have been devised which milk a number of cows at the same time. One of the most successful of these, the Thistle, operates on the principle of a vacuum maintained by a hand or power air pump. Pipes connected with a large storage tank from which the air is exhausted pass to the stalls and terminate in cups, which fit over the cows' teats so as to make an air-tight joint. A pulsating motion resembling hand milking or the sucking of the calf is imparted by the vacuum, alternating in pressure from 5 to 15 pounds at quite rapid intervals. Other forms of milking machines operate on a similar principle. They are said to be rapid and effective, but are expensive to install and maintain, and must be thoroughly cleaned or they will soon become foul and contaminate the milk. As yet milking machines have come into only very limited use, either in America or Europe.

MILK LEG. See PHLEGMASIA ALBA DOLENS.

MILKOWSKI, mĭl-kŏv'skē, ZYGMUNT (1824—). A Polish novelist, who wrote under the pseudonym Theodor Thomas Jez. He was born near Balta, in Podalia, and was educated at the Odessa Lyceum and in the University of Kiev, where he made a special study of physics and mathematics. He took an active part in the Hungarian uprising of 1848 and then traveled in the East. After identifying himself with the Polish insurrection of 1863 he was obliged to live abroad, and he settled in Geneva in 1877. Besides romances founded upon Slavic history, he wrote stories of contemporary life in Poland.

MILK PRODUCTION. In a well-conducted dairy farm the following conditions should be enforced: The stable or cow house should be roomy, clean, dry, light, and well ventilated, for only under such conditions can cows be kept in the best of health. The animals themselves should be clean and healthy, and should be well fed and contented. There should be an abundance of pure water, to which the cows should have access at least twice a day. The food should be of good quality, and the grain and coarse fodder should be free from dirt and decay, and not in a musty condition. All utensils which come in contact with milk should be thoroughly washed and sterilized or scalded after using. After the milk has been drawn from the cow it should be taken to a milk room which is free from all stable and other odors, poured through a fine strainer, and run over a cooling aërator (q.v.), to free it of animal and stable odors and cool it quickly. The milk is next transferred to the shipping can and set in cold water, or bottled and stored in a cold place until needed. During transportation from the farm to the town or city the milk should be kept as cool as possible. Refrigerator cars are provided by some railroads for that purpose. Much of the milk that is brought to large cities by rail is from 24 to 36 hours old before it reaches the consumer. This makes it necessary to exercise every precaution in its handling, in order to prevent spoiling, and cooling immediately after milking is an important factor in this connection.

Not only has the demand for clean, pure milk led to an increased demand, but it has led to the enactment of more rigid restrictions and closer supervision of dairies, and by the production at some dairies of so-called sanitary milk. Such milk is produced under the most sanitary and hygienic conditions as regards the food and care of the animals, the stables, the milking, and the care and handling of the milk. The herds in these dairies are inspected often to determine their freedom from disease, and not infrequently the milk is 'certified' or guaranteed to contain a certain fixed percentage of fat, as 5 per cent., this being maintained the year round by the addition of cream when necessary. Such sanitary or certified milk is usually sold at an advanced price, as the cost of its production is greater than that of ordinary market milk. The so-called modified milk is a prepared product used principally for infant feeding, and usually made according to a physician's prescription. Many physicians prescribe a milk with a definite composition, usually resembling mother's milk as closely as possible, but varying according to the apparent needs of the individual. Such prescription milk is generally prepared from cows' milk by reducing the amount of fat, but more particularly that of proteids, and increasing the proportion of sugar. Lime water is frequently added to reduce the acidity, and at times preparations made from cereals are added.

For the preservation of milk pasteurization is now extensively practiced. Pasteurization consists in heating the milk in closed vessels at from 60° to 65° C. (140° to 150° F.) for about half an hour, and then cooling it as quickly as possible by cold water or ice. By this means most of the organisms contained in it are killed, and the milk will keep much longer than when it has not been so treated. Continuous pasteurizers are used in many creameries and large dairies, and there are a variety of small pasteurizers for family use. Where there is any doubt as to the purity of the milk it is much safer to pasteurize that used for children at home. To a certain extent, however, pasteurization may be used to cover up the effects of careless methods, and many people prefer the sanitary milk. In sterilizing milk the liquid is heated to boiling; but this changes the character of the milk, making it less suitable for drinking, and giving it a cooked taste. Pasteurization is sufficient for household purposes.

CONDENSED MILK. This is made by evaporating whole milk so as to remove a large portion of the water. The milk is first heated and then introduced into vacuum pans, where it is boiled until sufficiently concentrated, when it is placed in cans and hermetically sealed. By far the greater portion is sweetened, about 1¼ pounds of cane sugar per gallon being added during boiling; but some is evaporated without sweetening, although this does not keep as long after the can is opened. Plain condensed milk contains about 60 per cent. of water and 10 per cent. of fat, while the sweetened product contains from 25 to 30 per cent. of water, about 10 per cent. of fat, and 35 to 40 per cent. of sugar. Evaporated cream and condensed cream are nothing more than condensed milk, as their composition shows. Cream or even enriched milk is seldom condensed. The manufacture of condensed milk has grown to enormous proportions, and its use is widespread where fresh milk of good quality cannot be obtained.

STATISTICS. According to the returns of the census of 1900, over 18,000,000 cows are kept in the United States for the production of milk. These produce annually nearly 8,000,000,000 gallons of milk. The creameries use the milk from about 2,500,000 cows for butter-making, and the cheese factories that from about 1,130,000 cows. The total value of the milk consumed as such is estimated at $277,645,100, and of the cream, $4,435,444. There were 50 condensed-milk factories in the United States in 1900, which used 421,378,073 pounds of milk and produced 186,921,787 pounds of the condensed product, an increase of nearly 400 per cent. over the returns for 1890. The product was valued at nearly $12,000,000. The aggregate value of the dairy products of the United States is given by the Twelfth Census as $599,827,154. The annual consumption of dairy products per capita, aside from the milk consumed as such, is estimated as follows: Butter, 19 pounds; cheese, 3.3 pounds; condensed milk, 2.3 pounds.

See also DAIRYING; BUTTER; CREAMERY; CHEESE; BUTTERMILK; WHEY.

MILK SNAKE, or HOUSE SNAKE. A common widely spread North American colubrine snake, classified as an Eastern variety (*triangula*) of the Southern king-snake (*Osceola doliata*). It sometimes reaches a length of four feet, and its general color above is yellowish gray, with a dorsal series of large blotches, normally 55 in number, and separated by narrow intervals, which are dull chocolate bordered with black. There are also a double row of rounded spots along the sides, and a dark band from the eye back to the corner of the mouth. The abdomen is yellowish white, with square black blotches alternating with those above them. This subspecies is abundant in the Middle States and Southern Ontario, changing southward and west of the Mississippi into other forms of this far-extended and highly variable species. (See KING-SNAKE.) Everywhere it is an entirely harmless denizen of fields and gardens, and often comes into barns and out-houses in search of the mice upon which it principally feeds, thereby deserving the protection of farmers. It is swift and agile. Its name 'milk snake' comes from the frequency with which it is seen in dairies or places where milk is kept. It is believed to drink the milk, and there seems to be good evidence that it does so. Another popular belief is that this snake sometimes sucks the milk from the teats of cows, and this belief seems to be founded upon fact, although the occurrence is much less common than some persons believe.

MILK SNAKE.

MILK TEST. See MILK; DAIRYING.

MILKWEED. See ASCLEPIAS.

MILKWEED BUTTERFLY. A cosmopolitan butterfly (*Anosia plexippus*) which is found in nearly all parts of the world where milkweeds (Asclepias) grow. It is a large reddish species, with its wing-veins blackened, and its larva is striking in color, being grayish-white and yellowish, transversely banded with black, giving it a zebra-like appearance. The chrysalis is delicate pale green with bright golden spots, and hangs from the leaves or stems of the food plant. The milkweed butterfly is a famous species for several reasons. It is one of the strongest flyers known among the Lepidoptera; specimens have been taken on vessels many hundreds of miles from the land, and there is in the United States an annual migration northward in the spring from the States bordering on the Gulf of Mexico. (See MIGRATION.) These flights, aided by the south winds, may reach up into Canada, the butterflies occasionally alighting and laying their eggs upon the milkweeds. In the autumn there is a return migration south, and the butterflies hibernate only in the Southern States, hidden away beneath the bark of trees and in other protected places.

Ordinarily the butterflies frequent open ground, but when they congregate, as at night and in cloudy weather, they are found resting on the stems of herbaceous plants, usually in the open spaces of forests, and in enormous numbers. They will alight upon the lee side of a tree, and particularly on the lower branches, in such vast numbers as almost to hide the foliage and to give their color to the trees. If disturbed, they rise like a flock of birds, but immediately settle again. Sometimes a tree will be so festooned with butterflies that it appears, at a short distance, to be covered with dead leaves.

This butterfly is one of the especially protected species, and is provided with scent-scales, 'androconia,' which are supposed to make the insect distasteful to its natural enemies. It is the commonest and most widespread representative of the large group of butterflies which are thus protected, and is mimicked in coloration by other non-protected species, e.g. in the United States by *Basilarchia disippus*. Consult Scudder, *The Life of the Butterfly* (New York, 1893). See MIMICRY; VICEROY; and Plate accompanying the article BUTTERFLIES.

MILKWORT. A plant common in the north temperate zone. See POLYGALA.

MILKY WAY. See GALAXY.

MILL (AS. *mylen*, *myln*, from Lat. *molina*, mill, from *mola*, millstone, from *molere*, to grind; connected with Eng. *meal*, mold). A name originally given to machinery for grinding grain for food, or to the factory where this was done. The term is now applied in a general way to many other kinds of manufactories besides those where raw material is transformed by a grinding process, as a saw-mill, planing-mill, or cotton-mill. See FLOUR; ROLLING-MILL; GRINDING AND CRUSHING MACHINERY.

MILL, JAMES (1773-1836). A British economist and philosopher. He was the son of a shoemaker, born near Montrose, Scotland, April 6, 1773. He studied at the University of Edinburgh, where he distinguished himself in Greek and in moral and metaphysical philosophy. He was licensed to preach in 1798; but instead of following this career, he went to London in 1802, as tutor to Sir John Stuart's children, and there settled as a literary man. He became editor of the *Literary Journal* and wrote for various periodicals. Not long after he settled in London he made the acquaintance of Jeremy Bentham, who influenced him greatly in his views. In 1806 he commenced his *History of British India*, which he carried on along with other literary work, and published in the winter of 1817-18. This important work, though containing an attack upon the administration of the East India Company, secured for him in 1819 the post of assistant examiner of Indian correspondence. Before his death he was appointed head of the examiner's office, where he had the control of all the departments of Indian administration—political, judicial, and financial —managed by the secret committee of the court of directors. He contributed many important articles to the *Encyclopædia Britannica*. These essays were printed in a separate form, and became widely known. In 1821-22 he published his *Elements of Political Economy*, a work prepared primarily with a view to the education of his eldest son, John Stuart Mill. In 1829 his *magnum opus*, the *Analysis of the Human Mind*, appeared. The work is almost the Bible of associationism, and deserves to be classed among the great English philosophical productions. He attempted to simplify associationism by recognizing only one principle at work, that which was later called association by contiguity. (See ASSOCIATION OF IDEAS.) This principle can so fuse various ideas and feelings that a result may be produced entirely different from the original element. This has been called 'mental chemistry.' Mill made great use of mental chemistry in support of the doctrine that morality is based on utility. (See UTILITARIANISM.) In this way he furnished a psychological basis for Bentham's ethical and legislative reforms. He took great interest in political questions and was a powerful advocate of an extended suffrage. Much of his influence was due to his strong personality and great conversational powers. In later life he entirely broke away from his early religious views and brought up his son John Stuart in utter religious indifference. He took a leading part in the founding of University College, London. He died at Kensington, June 23, 1836. See *Autobiography* of J. S. Mill (London, 1873); Bain, *James Mill: A Biography* (London, 1882); Bower, *James Mill and Hartley* (ib., 1881). All of these works are quite popular in character.

MILL, JOHN (1645-1707). A scholar of the Church of England. He was born at Shap, Westmoreland; studied at Queen's College, Oxford, and was elected a fellow in 1670. He entered the ministry, and became distinguished as a preacher; became rector in 1681 of the college living of Bletchington, Oxfordshire, and chaplain to Charles II. In 1685 he was principal of Saint Edmund Hall; in 1704 he became prebendary of Canterbury. The work for which he is most distinguished is his new edition of the Greek Testament, on which he spent thirty years, and which appeared only fourteen days before his death. It was undertaken at the advice and expense of Dr. Fell, Bishop of Oxford, but after the Bishop's death (1686) Mill continued it at his own expense, and repaid to the executors what he had received. The text which Mill adopted is that of Robert Stephens of 1550, and his work contains 30,000 various readings collected from manuscripts, commentaries, writings of the Fathers, etc. Dr. Daniel Whitby attacked the work in his *Examen variantium lectionum Johannis Millii* (London, 1709); but Dr. Richard Bentley approved the labors of Mill, and Michaelis, Marsh, and other critical scholars acknowledged the value of the edition.

MILL, JOHN STUART (1806-73). An English philosopher, the son of James Mill. He was born in London, May 20, 1806, and was educated at home by his father, who, however, unwisely forced the child beyond his years. He is said to have begun Greek at three. He was never allowed to indulge in the plays of childhood. In 1820 he went to France, where he lived for upward of a year, making himself master of the French language, and occasionally attending public lectures on science, but also, now that he was away from his father, getting some physical exercise in fencing and like sports. This stay in France gave him an intense appreciation for the pleasures of travel, and to the end of his days he was an ardent lover of mountain scenery. But the world of men had also its interest for him while he was abroad, for then he laid the foundation of his great familiarity with and interest in the politics as well as the literature of the French nation. On his return he read law, history, and philosophy, and in 1823 entered the India House as a clerk in the examiner's office, where his father was assistant examiner. For thirty-three years he was in the service of this company, gradually rising till at last he was head of his department, as his father had been before him. When the government of India was transferred to the Crown in 1858, he declined a seat at the New Indian Council, and retired from office in October of the same year, on a compensating allowance. At the general election of 1865 Mill was returned to Parliament for Westminster, and till he lost his seat at the election of 1868 he acted with the advanced Radicals, and urged the extension of suffrage to women. In 1851 he married Mrs. John Taylor, with whom he had maintained quite unconventional relations before her first husband's death. She died in 1859, but Mill's devotion to her memory was his religion till his death, which took place May 8, 1873, at Avignon, where he had spent the greater part of the last years of his life.

Mill became an author at a very early age, and may be looked upon as one of the foremost thinkers of his time. His first publications consisted of articles in the *Westminster Review*. He took an active part in the political discussions that followed the revolution of 1830 in France and the reform-bill movement in England; and from 1835 to 1840 was editor, and along with Sir W. Molesworth, proprietor, of the *London and Westminster Review*, where many articles of his own appeared. His chief works are: *A System of Logic, Ratiocinative and Inductive* (1843); *Principles of Political Economy* (1848); *On Liberty* (1859); *Discussions and Dissertations* (4 vols., 1859-74); *Utilitarianism* (1863); *Comte and Positivism* and the *Examination of Sir William Hamilton's Philosophy* (1865); *Inaugural Address at the University of*

Saint Andrews (1867); *England and Ireland* (1868); and *The Subjection of Women* (1869). After his death appeared his *Autobiography* (1873) and *Three Essays on Religion* (1874). In philosophy he was an empiricist, sensationalist, and associationalist. In ethics he was a utilitarian, but departed from the utilitarianism of Bentham by recognizing differences in quality as well as in quantity of pleasures. "It is quite compatible," he says, "with the principle of utility to recognize the fact that some kinds of pleasure are more desirable and more valuable than others. It is better to be a human being dissatisfied than a pig satisfied; better to be Socrates dissatisfied than a fool satisfied." In political theory Mill was a modified individualist, believing that every man should be allowed all liberty compatible with the liberty of his fellows. The tendency of modern thought has been so far away from individualistic standards that Mill's renown has been somewhat obscured; but his influence on his own generation would be difficult to over-estimate. His greatest work, however, was in logic, to which he added a fruitful treatment of the subject of induction (q.v.). His work in this science was considerably impaired by his sensationalistic empiricism, but when everything is taken into account, it must stand alongside that of Aristotle and of Hegel. His book was for many years the standard authority among those who shared his general standpoint in questions of philosophy, though it was keenly criticised from the opposite camp by Whewell and W. G. Ward.

Consult: Bourne, *Life of J. S. Mill* (London, 1873); Cairnes, *J. S. Mill* (ib., 1873); Courtney, *Metaphysics of J. S. Mill* (ib., 1879); T. H. Green, *The Logic of J. S. Mill*, in Green's *Works*, vol. ii. (ib., 1886); Gomperz, *J. S. Mill* (Vienna, 1889); Courtney, *Life of J. S. Mill* (London, 1889); Douglas, *John Stuart Mill, a Study of His Philosophy* (ib., 1895); id., *The Ethics of John Stuart Mill* (ib., 1897); Watson, *An Outline of Philosophy* (Glasgow, 1898); Stephen, *The English Utilitarians* (London, 1900); Albee, *History of English Utilitarianism* (ib., 1902). Douglas's two works are especially to be commended to the reader who wishes to get in compact form a statement of Mill's doctrines in his own words.

MILLAIS, mĭl-lā′, Sir John Everett (1829-96). An English genre, landscape, and portrait painter. He was born at Southampton, June 8, 1829, and was brought up in the Isle of Jersey. In 1837 he received his first instruction in art from Bessel, a drawing-teacher at Southampton. In 1838 and 1839 he studied at the School of Henry Sass in Bloomsbury, and the following years at the Royal Academy, in which he carried off every prize, receiving a gold medal in 1847. In 1848 he became associated with William Holman Hunt, Dante Gabriel Rossetti, and others in the formation of the Pre-Raphaelite Brotherhood (q.v.). His work attracted the attention of Ruskin, for whom he made some architectural designs, and whose portrait he painted. In 1855 he married Ruskin's divorced wife. He was made associate member of the Royal Academy in 1854 and member in 1863. From 1860 to 1870 he was employed as illustrator, and among other books illustrated Tennyson's poems and Trollope's novels. He received a medal of honor at the Paris Exposition in 1878 and was an honorary member of several foreign academies. He was knighted in 1885, and a few months before his death, which occurred in London, August 13, 1896, he was made president of the Royal Academy.

Aside from his landscapes and portraits, his subjects include Scriptural, historical, and legendary themes, scenes from every-day life, and a few national in character, such as "The Rescue" (1855), painted in honor of the London firemen. From 1847 to 1853 his work is strongly influenced by Pre-Raphaelite theories and aroused much criticism. Works of this period are: "Isabella" (1849); "Christ in the House of His Parents" (1850); "Ophelia" (1852); "The Proscribed Royalist" (1853); "The Huguenot" (1852), Birmingham Art Gallery. After 1855 his work developed greater individuality and breadth. His landscapes betray the ardent nature lover; his portraits are painted with sympathetic fidelity. From 1870 on he gave most of his time to portrait painting, his sitters including Gladstone (National Gallery); Leech, Lord Beaconsfield and Wilkie Collins, in the National Portrait Gallery; Carlyle, John Bright, Irving, Tennyson, and others. His landscapes include: "Spring" (1858); "Chill October" (1871); "The Vale of Rest" (1878); "Dew-Drenched Furze" (1881), National Gallery of British Art. Other important pictures are: "The Northwest Passage" (1874); "Eve of Saint Agnes" (1863), National Gallery of British Art; "Effie Deans;" "The Black Brunswicker" (1860); "A Yeoman of the Guard" (1877); the "Bride of Lammermoor," in the William H. Vanderbilt collection; "Saint Stephen" (1891); "Speak! Speak!" (1891); "A Disciple" (1891), all in the National Gallery of British Arts.

Consult: *Millais' Life and Letters*, by J. G. Millais (London, 1899); Baldry, *Millais: His Art and Influence* (ib., 1899); Spielmann, *Millais and His Works* (ib., 1898).

MILLAMANT. In Congreve's *Way of the World*, a willful coquette, sought by Mirabel. The character is modeled on that of Célimène in Molière's *Misanthrope*.

MILLAU, mē̇′lō′, or **MILHAU.** The capital of an arrondissement in the Department of Aveyron, France, 74 miles by rail from Béziers (Map: France, J 7). Its chief building of interest is the Romanesque Church of Notre Dame, with its sixteenth century tower. The town is the centre of a cattle-raising and grape-growing section and has a variety of manufactures, particularly of kid gloves. Millau was the Roman Æmilian Castrum; during the religious wars it was a stronghold of Calvinism, and Louis XIII. destroyed its ancient castle and walls in 1629. Population, in 1901, 18,701.

MILLBANK PRISON. A famous London penitentiary in Westminster, facing the Thames. It was built in 1812 (finished in 1821) in accordance with the plans of Howard and Bentham. It could shelter 1100 inmates and was so constructed that from a central room every cell could be seen. The confinement was solitary. Those sentenced to penal servitude served a term here first. The prison was closed in 1890 and the buildings torn down in 1891. Consult Griffiths, *Memorials of Millbank* (2d ed., London, 1894).

MILL-BOY OF THE SLASHES. A popular nickname of Henry Clay, from a tract of swampy land called the 'Slashes' near his birthplace in Hanover County, Va.

MILL'BURY. A town in Worcester County, Mass., six miles southeast of Worcester; on the Blackstone River, and on the New York, New Haven and Hartford and the Boston and Albany railroads (Map: Massachusetts, D 3). It has a public library, and is extensively engaged in the manufacture of cotton and woolen goods, edge tools, foundry and machine shop products, loom harness and heddles, linen cloth and thread, hosiery, and lumber products. From 1743 to 1813, when it was incorporated, Millbury was the North Parish of Sutton. The Lyceum Lecture System is said to have originated here about 1820. Population, in 1890, 4428; in 1900, 4460.

MIL'LEDGE, John (1757-1818). An American soldier and statesman, born in Savannah, Ga. When the Revolution began he was one of Habersham's party which seized Wright, the royal Governor. Milledge escaped from Savannah when it was taken by the British in 1778, and he assisted in the unsuccessful siege of the town by the Americans in 1779. In the following year he was made Attorney-General of Georgia. After the war he was frequently a member of the State Legislature, and was a Representative in Congress from 1792 to 1798, and again from 1801 to 1802, when he resigned to become Governor. In 1802 he was one of the three commissioners who negotiated the cession of Georgia's western territory to the United States. From 1806 to 1809 he was a United States Senator. Milledge took an active part in establishing the University of Georgia, and gave the institution 700 acres of land, upon which the university and a part of Athens now stand. The town of Milledgeville was named in his honor.

MIL'LEDGEVILLE. A city and the county-seat of Baldwin County, Ga., 32 miles northeast of Macon; on the Oconee River, at the head of navigation, and on the Central of Georgia and the Georgia railroads (Map: Georgia, C 2). It is the seat of the Georgia Military College and the Georgia Normal and Industrial College for Girls, and of the Georgia State Lunatic Asylum, which accommodates 2500 patients. The 'Prison Farm,' three miles northwest of the city, employs some 350 State convicts. The city is the centre of a cotton-growing section and its industrial interests are mainly in the preparation for market of this staple. The government, under a charter of 1900, is administered by a mayor, elected every two years, and a unicameral council, of which the mayor is a member, chosen on a general ticket. Milledgeville, named in honor of Gov. John Milledge of Georgia, was located in 1803, was chartered as a city in 1836, and was the capital of the State from 1807 to 1877. Population, in 1890, 3322; in 1900, 4219.

MILLENARIANS. See Millennium.

MILLENARY. A period of a thousand years, specifically the celebration of the one-thousandth anniversary of any event. The most important millenary was that commemorating the death of Alfred the Great, which was held in Winchester, England, September 18-21, 1901, which culminated in the unveiling of a large bronze statue of King Alfred by Hamo Thorneycroft. A month later commemorative exercises were also held in New York City.

MILLENARY PETITION (Lat. *millenarius,* containing a thousand, from *milleni,* a thousand each, from *mille,* thousand). A petition presented by Puritan clergy to King James I. in April, 1603, when on his way to London to take his throne. It is so called because it was intended to have 1000 signatures, although as a matter of fact it had only 750. The original of the petition is supposed to be lost, but Fuller gives it in his *Church History* (Book x. 27, ed., London, 1837, vol. iii.), and it is thence reprinted by Gee and Hardy, *Documents Illustrative of English Church History* (London, 1896, pp. 508-511). It sets forth in firm but respectful language those points connected with the Church service (cross in baptism, baptism by women, public reading of the Apocrypha, unabridged liturgy, etc.), the Church ministry (illiterate ministers, non-residency, clerical celibacy), the Church revenue (commendams, pluralities, impropriations), and with the Church discipline (excommunications for trifling causes, extortionate fees, protracted ecclesiastical suits, frequency of marriages without banns asked), which the Puritan party would see removed or modified. The King's answer was the calling of the Hampton Court Conference in January, 1604, which resulted in no redress, but rather the confirmation of the abuses complained of.

MILLENNIUM (Neo-Lat., from Lat. *mille,* thousand + *annus,* year). A period of one thousand years preceding the final judgment (q.v.) during which, according to a widely accepted system of Christian eschatology, the Christ and his saints will reign on the earth. The division of the world's course into periods is found among many peoples. Thus the Hindus divided the history of the world into *kalpas* of hundreds or thousands of years, and the Incas made four great periods. (See Eschatology.) A long national existence and a tradition of certain epoch-making events naturally account for such a partition. The Persians counted twelve periods each of one thousand years. It is likely that this division into twelve parts was derived from the Babylonians, and ultimately goes back to calculations of the sun's course through the twelve signs of the zodiac. It is significant that the third, fourth, fifth, sixth, seventh, and eighth thousand years are attributed respectively to Cancer, Leo, Virgo, Libra, Scorpio, and Sagittarius in *Bundahish* 34. The number 1000 may have a different origin, since the great cosmic year would demand a larger figure. According to the Parsi doctrine, six of the twelve thousand years are occupied by the history of man. Zarathushtra appears at the beginning of the fourth and the Saoshyant will come at the end of the last to raise the dead and to renew the world. While this doctrine is fully presented only in late Pahlavi writings, such as the *Bundahish* and the *Dinkart,* there are indications of a much higher age, as Mani (c.200 A.D.) was familiar with the Zoroastrian doctrine of a cycle of twelve thousand years, and Berosus (c.300 B.C.) seems to have rationalized the doctrine of *Zrvan akarana,* boundless time, and its period. It is altogether probable that the conception that human history would endure 6000 years before the Messianic Age came into Jewish thought from a Persian source. The Scriptural justification was found in Psalm xc. 4, "A thousand years in thy sight are but as yesterday when it is past," and the length of the Messianic Age was inferred from an interpretation of Gen. ii. 2, based on the word of the Psalmist, as is seen by utterances of rabbis living in the second century A.D. (*Midrash Tehillim* to Ps. xc. and *Yalkut Shimeoni* to Ps. lxxii.). Before the fall of Jerusalem in A.D. 70 there is no evidence that the expected Jewish world-empire, whether with or without a Messiah, was thought of as being of limited duration. That Israel would never yield its supremacy to any other nation was a firm conviction. The Messianic King was probably looked upon as the founder of a dynasty. Toward the end of the first century, however, the conception of the Messiah became more transcendent, and his reign might be thought to last 'until the corruption of the world should end,' characterized by great prosperity (*Apocalypse of Baruch* xl. 3; xxix., lxxiii.), or, more precisely, 400 years to be followed by seven days of silence, the general resurrection, and the last judgment (q.v.) as set forth in the *Apocalypse of Ezra* (vii. 28, 29). The first mention of the millennium is in the *Slavonic Enoch* (xxxii. 2-xxxiii. 2); but in this book there is no Messiah. A summary of opinions in the Babylonian Talmud (Sanhedrin 97a, 99a) shows that it was comparatively seldom that a Jewish teacher estimated at a thousand years the length of Yahweh's reign, 40, 70, 365, 400, 600, 2000, and 7000 years being suggested by different teachers.

In the New Testament the doctrine of a millennium is clearly taught in Rev. xx. After the returned Messiah has conquered the beast, Satan is cast into the abyss in chains for 1000 years, the martyrs are raised from the dead and reign with Christ as kings and priests during the millennium. At the end of the millennium the powers of evil are let loose again for a short time, whereupon follow the resurrection of the rest of the dead, the last judgment, the destruction of death and Hades, which is the second death, and the new heavens and the new earth. Critical exegesis agrees with the Chiliasts of the Early Church and the present pre-millenarians that the author of this passage no doubt believed that Jesus would return upon the clouds before the millennium to reign with some of His saints for a thousand years in visible form. It cannot be proven, however, that other writers in the New Testament cherished this view, or that they all held the same opinion concerning the world's future. The Gnostics rejected this doctrine and their opposition was continued by such teachers of the Alexandrian School as Clement and Origen. On the other hand, Irenæus informs us (*Adv. Haer.*, v. 33) that Papias, Bishop of Hieropolis, had recorded as a saying of Jesus a remarkable description of the fertility of the vine in the millennium; the epistle attributed to Barnabas describes the millennium as a period of rest following six thousand years of work to be ushered in by the return of Christ (xv. 5); and Justin Martyr likewise expressed his belief in the pre-millennial coming of Christ and the thousand years of His reign in Jerusalem (*Apol.* 52; c. *Tryph.* 45, 49, 113). Irenæus, Tertullian, and Hippolytus were also Chiliasts. An ardent expectation of the millennial kingdom characterized the Montanists, who looked for its establishment at Pepuza in Phrygia. The reaction against Montanism led to a more general rejection of the doctrine of a millennium. Dionysius of Alexandria attacked the very foundation of this doctrine in denying the Johannine authorship of Revelation. Such doubts did not disturb the Western Church, and men like Commodian and Lactantius were Chiliasts. Only through the influence of Jerome and especially Augustine, whose *Civitas Dei* identified the Church with the kingdom of God and the millennium with the history of the Church, did Latin Christianity commit itself to an eschatological programme excluding the pre-millennial advent, the first resurrection, and the visible reign on earth. During the Middle Ages earnest and spiritually minded men, grieved at the many abuses that spread in the Church, could not but look for Divine chastisement. While there does not seem to be sufficient foundation for the current statement that the end of the world was generally expected about the year 1000 A.D., there are many indications of the anxiety that at sundry times filled pious hearts as well as guilty consciences. The great hymn *Dies iræ, dies illa* reveals both a fearful looking forward to the impending judgment and the part that the Sibylline Oracles and similar works played in creating this mood. Millenarian views were held by men like Joachim of Floris and Occam and by numerous religious bodies. In the Reformation Era the hope of a speedy establishment of the Messianic kingdom was especially cherished by many of the Baptists. They were led to it by their doctrine of the inner light and the continuance of prophecy, by their sympathy with the oppressed, and by their disapproval of the union of Church and State. Looking for the establishment of the truth and the righting of social wrongs to God alone, and expecting a direct revelation from Him, some naturally were led astray by their impulses under pressure of circumstances. But the establishment of the millennial kingdom by John of Leyden (q.v.) at Münster was an error regretted and condemned by the great majority of Baptists. The Fifth Monarchy men of Cromwell's time looked upon the millennium as having actually begun with the overthrow of the royal family in England. Many English mystics looked forward to the second advent in the year 1666, and their faith found a curious reflection even in Judaism. (See MESSIAH.) Chiliastic views were embraced by Comenius, who translated into Latin a number of recent prophecies as to the end of the world, Jurieu, Spener, and other pietists. Swedenborg held that the millennial dispensation began in 1757. Bengel calculated that the millennium would commence in 1836; Miller expected it in 1843; Channing in 1867; Baxter in 1881. While some pre-millennians devote much attention to prophetic chronology, assuming a double fulfillment of the predictions in Daniel and Revelation, others refrain from all attempts at fixing the date, but are obliged by the natural interpretation of Rev. xx., with their view of biblical infallibility, to affirm the visible coming of Christ before the millennium. Among the latter there are many learned theologians of recent times. The opinion that this visible coming of Christ will occur after a long period of universal prevalence of Christianity supposed to be vaguely indicated by the thousand years is more widely accepted, but it is further removed from the conceptions of early Christianity and cannot readily find the Scriptural support that it demands. The distinction between pre-millennianism and post-millennianism is rapidly losing its significance, as modern theology has a tendency to look upon the primitive Christian expectation of the return of Jesus as an illusion, historically necessary, but not of permanent worth; to consider the absolute victory of one system of religious faith and practice less desirable than the ascendency of what is morally most excellent in all creeds and cults; and to expect a gradual improvement of the social conditions and the character of the human race to be wrought by actually operating forces.

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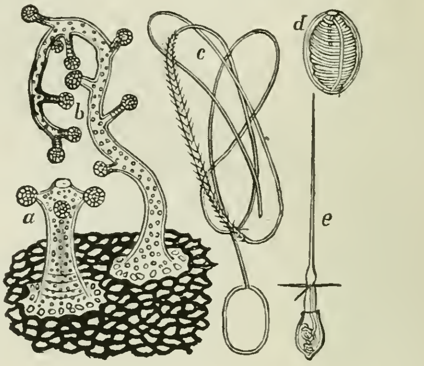
MIL'LEPORE (from Lat. *mille*, thousand + *porus*, passage, pore). A coral-forming hydroid, of the order Hydrocorallina, so named from the numerous minute pores or calicles dotting its surface, which are arranged in irregular circular groups. As the single animal is microscopic, and as it grows in compound coral-like masses on reefs in tropical seas, it was at first confounded with the corals, but was eliminated from the corals first by L. Agassiz and afterwards by Moseley. The animal is not a coral-polyp, being allied rather to Hydra, and especially to Hydractinia and Clava, common on northern coasts. The coral-stocks form irregular branching masses, several inches high, and sometimes a foot or more broad. The mass of the coral incrustation consists of fibres (canals or tubes) traversed in all directions by tortuous spaces forming regular branching systems, like a tree, in which Millepora differs from the coral-stocks (coralla). The animals are of two kinds. Those inhabiting the central cup or pore are short thick zoöids. (See POLYMORPHISM.) These are the 'feelers'—they take in the food. The zoöids in the smaller, outer pores of the circle are the reproductive zoöids. That Millepora is a true hydroid is proved by the coral-stock being at the base provided with canals by which the several zoöids are kept in union with one another by the form of the zoöids themselves, by the absence of all trace of mesenteries (which characterize coral polyps), and by the presence of thread-cells (see NEMATOCYST) of the form peculiar to hydroids. Finally, the position of Millepora as a hydroid has been satisfactorily settled by the discovery, by Duerden in 1899, in Jamaica, of free-swimming female medusæ. (See HYDROZOA.) Our Floridian and West Indian species is *Millepora alcicornis*. Consult articles by L. Agassiz, Moseley, Duerden (*Nature*, December 28, 1899, p. 213, and November 29, 1900, p. 112).



MILLEPORE.

Animal of *Millepora nodosa*. a, nutritive zoöid; *b*, reproductive zoöid; *c*, lasso-cell; *d*, the same coiled up in its cell; *e*, a third form. (All highly magnified.)

MIL'LER, ALFRED JACOB (1810-74). An American portrait, figure, and landscape painter, born in Baltimore. He studied under Thomas Sully, and in Paris and Italy. He made several sketches when in the Rocky Mountains in 1837 with Sir William Drummond Stewart, which are of value. The originals are in Murthley Castle, and there are replicas in water color in the Walters collection in Baltimore. The remainder of his life was spent principally in Baltimore, where he painted many portraits. He also copied the old masters with some success.

MILLER, CHARLES HENRY (1842—). An American painter, born in New York City. He first studied to be a physician, but his love of art made him give up this profession, and after studying in Vienna, Berlin, and other cities he went to Munich in 1867 and became a pupil of Lier, and a student in the Royal Bavarian Academy. Afterwards he went to live in New York City, where he was made an Academician in 1875 and one of the first members of the Society of American Artists. His landscapes are generally taken from Long Island scenery; among these may be mentioned "Sunset, East Hampton" (1878). Other fine works are "Old Oaks at Creedmoor," and "High Bridge, New York." He wrote *The Philosophy of Art in America* (1885) under the pen name of Carl de Muldor.

MILLER, CINCINNATUS HEINE, better known as JOAQUIN MILLER (1841—). An American author, born in the Wabash District, Indiana, November 10, 1841. In 1854 his parents took him to Oregon. Later he became a miner in California. He was a volunteer in Walker's Nicaragua expedition of 1855. From 1855 until 1860 he lived among the Indians of the Pacific Coast. He studied law for a while, then edited a Democratic paper at Eugene City, Ore., which was suppressed by the authorities for disunion sentiments. In 1863 he began to practice law and was a district judge in Oregon from 1866 to 1870. After visiting the Eastern States Miller went to England, where, in the following year, he published his *Songs of the Sierras,* which made him a temporary 'lion' in London society, although the same poems had fallen flat in the United States. He afterwards settled in New York, but he left that city in order to do journalistic work in Washington, D. C., and in Oakland, Cal. (1887), settling at last in Oakland. Among his works in verse are: *Songs of the Sunland* (1873); *Songs of Italy* (1878); *Songs of the Mexican Seas* (1887); in prose: *The Danites in the Sierras* (a novel, 1881); *49, or the Gold Seekers of the Sierras* (1884). Miller's play, *The Danites,* taken from his novel, had considerable success, and his poetry has received some favorable notice, more on account of its genuinely romantic content and its brilliant if crude color, than on account of its artistic excellence. A collective edition of his verses appeared in 1897. The name 'Joaquin' was taken from Joaquin Murietta, a Mexican bandit, of whom Miller wrote a defense.

MILLER, Edward (1760-1812). An American physician, born in Dover, Del. He graduated at the medical department of the University of Pennsylvania in 1784, and in 1797, associated with Dr. Samuel L. Mitchell and Elihu H. Smith, he founded the *Medical Repository,* the first American journal of medicine. He was professor of medicine in New York, and enjoyed a high reputation both in this country and abroad. His writings, with a memoir by his brother, Samuel Miller, were published in New York in 1814.

MILLER, Ferdinand von (1813-87). A German bronze-founder. He was born at Fürstenfeldbruck; studied at the Munich Academy of Fine Arts, and learned his trade under his uncle, Stiglmaier, and in Paris with Soyer. His great reputation was won by his castings from the designs of Schwanthaler, and especially by his success with large and monumental works. His best known work in America is the bronze door at the Capitol in Washington. Miller was succeeded by his sons, Ferdinand (1842—) and Ludwig (1850—).

MILLER, Hugh (1802-56). A Scottish geologist and man of letters, born in Cromarty, October 10, 1802. He was descended from a family of sailors, and when he was only five years of age lost his father by a storm at sea. In consequence he was brought up chiefly under the care of two uncles. He acquired a good knowledge of English at the Cromarty Grammar School and read much. From his seventeenth to his thirty-second year he worked as a common stonemason, and from 1834 to 1840 was an accountant in the Cromarty branch of the Commercial Bank. In 1829 he published a volume entitled *Poems Written in the Leisure Hours of a Journeyman Mason.* He also made researches in Scottish antiquities, contributed to John M. Wilson's *Tales of the Borders* (1834), and wrote *Scenes and Legends of the North of Scotland* (1835). But from his apprenticeship as a stonemason, his studies were mainly directed toward geological formations. In 1840 he went to Edinburgh as editor of the *Witness,* a newspaper started in the interests of the non-intrusion party in the Church of Scotland, and in the course of the same year published in its columns a series of geological articles, which were afterwards collected under the title of *The Old Red Sandstone, or New Walks in an Old Field* (1841). These articles contained a minute account of the author's discovery of fossils in a formation believed, until then, to be destitute of them, and were written in a style which was a harmonious combination of strength, beauty, and polish. His editorial labors during the heat of the disruption struggle were immense, and so seriously injured his health that for the larger part of 1845-46 he had to give up all literary activity. He then resumed his pen as editor of the *Witness,* which, from 1845, when he became, with Robert Fairby, its joint owner, ceased to represent the Free Church. After ten years of hard, earnest, fagging toil, his brain gave way, and in a fit of insanity he killed himself on the night of December 2, 1856. Miller's services to science were undoubtedly great. His observation was keen and exact, his speculations most valuable. He was the first to make geology known to the general reader. He was not less distinguished as a man than as a savant. His principal works, besides those already mentioned, are: *First Impressions of England and Its People* (1846), containing many fine specimens of English descriptive prose; *Footprints of the Creator, or the Asterolepis of Stromness* (1847) designed as a reply to the *Vestiges of the Natural History of Creation; My Schools and Schoolmasters, or the Story of My Education* (1852); and *Testimony of the Rocks* (1857), an attempt to reconcile the geology of the Pentateuch with that of nature. Consult Bayne, *Life and Letters of Hugh Miller* (London and Boston, Mass., 1871).

MILLER, James (1776-1851). An American soldier and politician, born in Peterboro, N. H. He was educated for the bar, but entered the army as major and took part in the frontier warfare, where he displayed great gallantry. In 1812 he was brevetted colonel for gallantry in the engagement at Brownstown, where he commanded, and in 1814 took part in the Canadian invasion in command of the Twenty-first Infantry. In the battles of Chippewa and Lundy's Lane he did material service, the latter contest being virtually decided by his gallant charge on a British battery. For these services a gold medal was presented to him by Congress and he was promoted to the rank of brigadier-general. From 1819 to 1825 he was Governor of Arkansas, then a Territory; and from that time until 1849 was Collector of the Port of Salem, Mass.

MILLER, Johann Martin (1750-1814). A German poet, member of the 'Göttinger Bund.' He was born at Ulm, studied theology at Göttingen and there made the acquaintance of Voss, the idyllist and translator of Homer, and of Hölty, the lyrist. He contributed to the Göttingen *Almanach* poems which became very popular, especially "Was frag' ich viel nach Geld und Gut." But he is better known for *Siegwart, eine Klostergeschichte* (1776), a sentimental romance of the Wertherian type, largely autobiographic and very didactic. His other fiction includes:

Beitrag zur Geschichte der Zärtlichkeit (1776); *Briefwechsel dreier Freunde* (1776-77); and *Geschichte Karls von Burgheim und Emiliens von Rosenau* (1778-79). A collected edition of Miller's poems appeared in 1783, and an autobiography in 1803. Consult Kraeger, *Johann Martin Miller* (Bremen, 1893).

MILLER, John Franklin (1831-86). A soldier and politician, born in South Bend, Ind. He graduated at the New York State Law School in 1852, and was elected to the Indiana Senate in 1860, but resigned in order to enter the army on the outbreak of the Civil War. He was made colonel of the Twenty-ninth Indiana Volunteers, and fought in many of the most important battles in the West. For gallantry at the battle of Stone River he was made a brigadier-general of volunteers. At Liberty Gap he was severely wounded, but he commanded a division at Nashville, and was soon afterwards brevetted major-general of volunteers. Soon after the war he removed to San Francisco, and was for four years Collector of the Port. He then entered business, and was one of the originators and also president of the Alaska Commercial Fur Company. He took an active part in politics, was several times a Presidential elector on the Republican ticket, in 1879 assisted in framing a new State constitution, and in 1881 was elected United States Senator.

MILLER, Joseph, commonly known as Joe Miller (1684-1738). An English comedian. With slight interruption he was connected with Drury Lane from 1714 to his death. Great favorites with the town were his Teague in Sir Robert Howard's *Committee* and Sir Joseph Wittol in Congreve's *Old Bachelor*. He was also popular in a score of other rôles. So ignorant that he was unable to read, he married that he might have some one to read his parts to him. Though he had no great reputation as a wit off the stage, yet the year after his death appeared a small volume of jests ascribed to him under the title *Joe Miller's Jests*. This pamphlet of 72 pages, containing 247 jests, was compiled by a certain John Mottley for the publisher, T. Read. Why it was fathered upon a poor and illiterate actor is not clear; perhaps by mere accident. The jests are taken in part from earlier collections and in part from current witticisms that had not previously found their way into print. Only three are related of Miller himself. As a whole, they are flat; their only piquancy is in their coarseness. But they were exceedingly popular, as is shown by the numerous editions that immediately followed (1st, 2d, 3d, 1739; 4th, 1740; 5th, 1742; 6th, 1743; 7th, 1744; 8th, 1745). The original number of jests, which had increased to 587 in the edition of 1745, continued to grow, until by the middle of the nineteenth century it had reached 1546. Consult the facsimile reprint of the first editions by Bellars (London, 1861); and Hazlitt, *Studies in Jocular Literature* (London, 1890).

MILLER, Joseph Nelson (1836—). An American naval officer, born in Ohio. Entering the navy in 1851, he became commander in 1870, captain in 1881, commodore in 1894, and rear-admiral in 1897. As executive officer on board the ironclad *Passaic* he was present at the attack upon Fort Sumter in 1863, and for bravery in this and the action against Fort Fisher was highly commended. He represented the Navy Department at the Queen's Jubilee in 1897, in 1898 raised the flag of the United States over Hawaii, and at the time of the Spanish-American War organized the Pacific naval reserves. In November, 1898, he was placed on the retired list.

MILLER, Lewis (1829-99). An American philanthropist and inventor, born at Greentown, Ohio. He invented several important agricultural machines, which brought him a large fortune. In 1873 he suggested to Bishop John H. Vincent the plan of the Chautauqua Assembly, and became president of the Assembly after its foundation the next year. He gave largely to the support of the Assembly and to other enterprises.

MILLER, Orest Fedorovitch (1834-89). A Russian writer, born in Reval. He studied at the University of Saint Petersburg (1851-55), and was professor of early Russian literature there until 1888. His lectures on *Russian Literature After Gogol* were published in 1874 (3d ed. 1887), and his *Slav World and Europe* in 1877. Though a prominent Slavophil, he was less radical than some writers, as is shown by his book on the Slav question (1865). He also wrote works on Lomonosoff and Peter the Great in the following year, but became most widely known through his work on the national mythology, entitled *Ilia Muromets i Bogartyrsvo Kievskoe* (1870).

MILLER, Patrick (1731-1815). A Scottish inventor, who is asserted by some first to have invented the steamboat. He was born in Glasgow, became a banker, and having accumulated a considerable property, interested himself in maritime inventions. In 1785 he bought the estate Dalswinton in Dumfriesshire, and there conducted some experiments with a steamboat of his construction which was propelled by a Symington (q.v.) engine. In 1787 he published a description of one of his vessels under the title, *The Elevation, Section, Plan, and Views of a Triple Vessel with Wheels, etc.* Consult Miller, *A Letter to Bennet Woodcroft Vindicating the Right of Patrick Miller to be Called the First Inventor of Practical Steam Navigation* (London, 1862).

MILLER, Samuel Freeman (1816-90). An American jurist. He was born in Richmond, Ky., and removed in 1850 to Iowa, where he became conspicuous as a jurist. In 1862 he was appointed Justice of the United States Supreme Court by President Lincoln. His decisions gave him a national reputation, and he was especially noted for his opposition to the encroachments of railroad corporations. In 1877 he was a member of the Electoral Commission, and in 1887 was the orator of the Centennial Constitution celebration held at Philadelphia.

MILLER, Warner (1838—). An American politician and manufacturer, born at Hannibal, Oswego County, N. Y., graduated at Union College in 1860, and at the outbreak of the Civil War enlisted in the Fifth New York Cavalry and was promoted to be lieutenant. After leaving the army he became a paper manufacturer at Herkimer, N. Y. In 1872 he was elected a delegate to the National Republican Convention, and served as a Republican in the New York Legislature in 1874-75, and in the Forty-sixth and Forty-seventh

Congresses (1879-81). He was elected to the United States Senate in place of Thomas C. Platt, who resigned in 1881 and served until 1887. In 1888 he was the unsuccessful Republican candidate for Governor of New York.

MILLER, William (1782-1849). Founder of the religious sect called 'Millerites' or 'Second Adventists.' He was born in Pittsfield, Mass., but when he was four years old his parents removed to Low Hampton, N. Y., which continued to be his home during most of the remainder of his life. He served as a captain in the American Army during the War of 1812, but soon after its close became deeply interested in religion and devoted himself to the study of the Bible. As early as 1818 he came to the conclusion that Christ's second advent had been prophesied for the year 1843, and during the succeeding years became the author of a creed founded on this basis. In 1833 he was licensed to preach by the Baptist Church in Hampton and Whitehall, and in the same year issued a pamphlet entitled *Evidence from Scripture and History of the Second Coming of Christ about the Year 1843; and of His Personal Reign of One Thousand Years* (1833). Soon afterwards he began to lecture on the same subject to large audiences in the New England and Middle States. As the year 1843 drew near his followers awaited the second coming with intense excitement. When the year ended he wrote to them confessing his error and acknowledging his disappointment. Later he set October 22, 1844. Even after this second failure many of his disciples remained faithful to him and continued so till the day of his death. Consult White, *Sketches of the Christian Life and Public Labors of William Miller* (Battle Creek, 1875).

MILLER, William Allen (1817-70). An English chemist, born at Ipswich. He studied medicine at King's College, London, and then went to Germany, where, in 1846, he entered Liebig's laboratory. After his return to England he became demonstrator of chemistry at King's College, and in 1845 was promoted to the professorship. He contributed several interesting papers on physical chemistry, and wrote *Elements of Chemistry Theoretical and Practical* (1855-57).

MILLER, William Hallowes (1801-80). An English mineralogist. He was born at Velindre, near Llandovery, and was educated at Saint John's College, Cambridge, where, after graduating in 1826, he became fellow and tutor. In 1832 he was appointed professor of mineralogy, and in 1838 was elected a fellow of the Royal Society. In 1838 appeared his famous system of crystallography, the most consistent and adaptable yet devised. From 1843 to 1854 he was engaged as member of a Government commission in replacing the standard of weights and measures, which had been destroyed by fire. In 1870 he served on the Commission Internationale du Mètre, and from 1856 to 1873 was foreign secretary of the Royal Society. He contributed frequently to the scientific press, and published several text-books on hydrodynamics and hydrostatics.

MILLER, William Henry Harrison (1840 —). An American lawyer, Attorney-General of the United States in 1889-93. He was born in Augusta, Oneida County, N. Y., and graduated at Hamilton College, Clinton, N. Y., in 1861. He removed in that same year to Ohio, taught school at Maumee for six months, and then enlisted as a private in the Eighty-fourth Ohio Volunteers, a three-months regiment. When his term of enlistment was completed, he read law for some time at Toledo, and in 1863 settled in Peru, Ind., as superintendent of schools. There he was admitted to the bar. In 1866 he removed to Fort Wayne, where he practiced his profession until 1874, when, having established his reputation, he went to Indianapolis to become the law partner of Benjamin Harrison (q.v.). Their association lasted until the death of the latter, continuing throughout Harrison's administration as President, during which period Miller served as Attorney-General of the United States.

MILLERAND, mĕl′räɴ′, Alexandre (1859 —). A French Socialist, born in Paris, where he was educated at the Lycée Vauves and the Lycée Henri IV., and studied law in the university. He began to practice in Paris in 1881, was counsel to the striking miners of Montceau-les-Mines in 1882, and was elected to the municipal council in 1884 and in 1885, as a Radical Socialist, to the Chamber of Deputies. To this office he was elected again and again, first in 1889, when he carried on a vigorous anti-Boulangist campaign. In the same year he became proprietor of *La Voix*, which he made his personal organ. In the Chamber of Deputies Millerand urged many reforms, especially industrial, and came into prominence as editor-in-chief of the *Petite République* (until 1896) and as an impassioned orator. In 1899, as leader of the Parliamentary or Opportunist Socialists, he was made Minister of Commerce in the Waldeck-Rousseau Cabinet, and in this office procured, in October, the passage of an industrial bill assuring workmen one day's rest a week, only a certain percentage of foreign labor, a set rate, and a fixed day; in 1900 passed a law making ten hours the maximum day for women and children; and in general made many attempts to insure workingmen against loss and to procure the adoption of compulsory arbitration. In 1902, just before the Cabinet went out of office, a bill was passed making eight hours the maximum day for French miners. Consult Lavy, *L'œuvre de Millerand* (Paris, 1902).

MIL′LERITE (named in honor of W. H. Miller). A native nickel sulphide that crystallizes in the hexagonal system, has a metallic lustre, and is of a yellowish color. It occurs usually in capillary crystals in cavities with crystals of other minerals, especially in Bohemia, in Saxony, and in Cornwall, England; in the United States it is found at Antwerp, N. Y.; Lancaster County, Pa., and especialy in geodes in limestone near Saint Louis, Mo., and Milwaukee, Wis. Millerite has been made artificially in groups of needle-like crystals.

MIL′LERSBURG. A village and the county-seat of Holmes County, Ohio, 80 miles south of Cleveland; on Killbuck Creek and on the Cleveland, Akron and Columbus Railroad (Map: Ohio, G 4). It has manufactures of foundry and machine shop products, flour, brick, lumber, etc. There are deposits of coal and iron ore in the vicinity. Population, in 1890, 1923; in 1900, 1998.

MILLER'S TALE, The. One of Chaucer's Canterbury Tales. It is the familiar story of an old husband deceived by a young wife. In this case the husband is a rich old simpleton, a carpenter of Oxford. The source is unknown, but is supposed to be one of the rude jesting stories of the time.

MILLER'S THUMB (so called from the shape of the head), or RIVER BULLHEAD. A small, spiny-rayed fish (*Cottus gobio*) common in the streams of England and Northern Europe and Asia. It rarely reaches five inches in length. It is brown above, varying in intensity, as in many fishes, with the color of the bottom, and white beneath. Its disproportionately large, flattened head compared to its body, and the entire absence of scales, give it an ugly appearance. The flesh is reddish when boiled, is said to be of excellent flavor, and is much sought after in some countries. In the United States a related species (*Cottus ictalops*) is sometimes called 'miller's thumb.' It occurs in all clear streams of the Northern and Middle States. These fishes live on small organisms and on fish-eggs, and are considered a destructive pest by fish culturists, especially in respect to trout-eggs. The English fish is a favorite among anglers.

MILLET (Fr. *millet*, diminutive of *mil*, OF. *mil*, *meil*, It. *miglio*, from Lat. *milium*, millet). A name applied to certain cereal and forage grasses of several distinct genera and species. Millets are extensively used as forage crops in many countries and it has been estimated that they furnish food for about one-third of the inhabitants of the globe. Williams states that "between 35,000,000 and 40,000,000 acres of millets are grown annually in India, and Japan alone uses about 35,000,000 bushels of seed each year for human food." In the United States the cultivated varieties of millet may be divided into three groups, namely foxtail millets, barnyard millets, and broom-corn millets. The foxtail millets, perhaps the most important group, are of very ancient cultivation. They are believed by some writers to have been included in the order of Chinnong, B.C. 2700, requiring certain plants to be sown each year by the Emperor of China in a public ceremony. De Candolle considers this kind of millet a native of China, Japan, and the Indian Archipelago. The most common varieties of this group all belong to one species, Setaria italica, and are grown in North America, Europe, India, China, Japan, and North Africa. The barnyard millets include the cultivated varieties of the widely distributed species Panicum Crus-galli, or barnyard grass, and also the varieties belonging to other species of the genus Panicum, especially Panicum colonum and Panicum frumentaceum. The varieties derived from Panicum Crus-galli are considered the true barnyard millets, and among them a variety of Japanese barnyard millet and the 'Ankee' grass of the Southwestern United States are the most important. Shama or Sanwa millet, or jungle rice (*Panicum colonum*), a tropical plant, closely allied to true barnyard grass, is a valuable food and forage plant in many tropical and subtropical regions and extensively grown in Southern and Eastern Asia, but little in the United States. The third group, or broom-corn millets, comprises the varieties of Panicum miliaceum. This species, universally known to agriculture, has been in cultivation in Europe since prehistoric times and is still the common millet of the Old World. Its origin is very uncertain, but it is probably a native of the warmer regions of Asia. The classification of varieties of this species is based mainly upon the color of the ripe seed—yellow, white, and red. The term Indian or African millet is often loosely applied to certain of the non-saccharine sorghums, such as durra, Kafir corn, and pearl millet (*Pennisetum typhoideum*), which last is also called Egyptian or cat-tail millet.

FOXTAIL MILLET (*Setaria italica*).

Millets are not well adapted to heavy clay or wet soils, but succeed best on fertile friable loams. The preparation of the soil is the same as for other grass crops. In the United States the seed is usually sown late in the spring to prevent the harvest of the millet from interfering with the harvest of the cereals. The seed is usually sown broadcast at the rate of one-half bushel to the acre. It is, however, often drilled. For hay, millet is usually harvested with a mower when the crop has just finished heading, and for the seed with a reaper like cereals a little before it is fully ripe. If harvested when fully ripe there is usually a heavy loss of seed in handling. Where the self-binder is used in harvesting this crop, the sheaves are bound loosely and put up in shocks to cure. The yield of cured hay per acre ranges from four to six tons and the yield of seed from forty to fifty bushels. This crop is practically free from attacks of insects and plant diseases.

FEEDING VALUE. Millet is valuable principally as hay and as a soiling crop. It is also useful for silage. The ripened seeds are seldom fed to stock, but are much used as food for poultry and birds. If used as stock food they should be crushed or ground. The seed of broom-corn millet has found more favor in the United States as a cattle feed than that of other varieties. German millet cut when the heads are well filled but the seeds still soft has the following percentage composition: Water, 71.7; protein, 2.7; fat, 0.5; nitrogen-free extract, 14.3; crude fibre, 9.3; and ash, 1.5. German millet hay: Water, 7.7; protein, 7.5; fat, 2.1; nitrogen-free extract, 49.0; crude fibre, 27.7; and ash, 6.0. Other millets fresh and cured resemble in composition the examples quoted more or less closely. The average percentage composition of millet seed follows: Water, 14.0; protein, 11.8; fat, 4.0; nitrogen-free extract, 57.4; crude fibre, 9.5; and ash, 3.3. In the case of barnyard millet hay 57.4 per cwt., of the protein 63.7 per cwt., of the nitrogen-free extract 51.6 per cwt., and of the crude fibre 61.6 per cwt. was on the average found to be digestible. Millet hay is a useful coarse fodder for cows, but not more than six or eight pounds should be fed daily. When fed to lambs care should be exercised, as millet hay causes scours unless fed in small quantities. It has been observed that when horses were fed millet hay exclusively as coarse fodder, painful conditions called 'millet disease' were induced. It is believed that the trouble may be avoided by using this hay in limited quantities, and not continuously. It is also possible that millet grown in some regions is harmless, while that grown in others is harmful. The plant has been used for farm animals since very early times, and generally speaking has proved a satisfactory feeding stuff. See Colored Plate of Cereals.

Consult *United States Department of Agriculture Year Book for 1898* and *Farmer's Bulletin 101.*

MILLET, mĭl'lā′, Aimé (1819-91). A French sculptor and painter. He was born in Paris, September 27, 1819. He received his first instruction in painting from his father, and in 1842 exhibited three pictures in the Salon. He studied sculpture with David d'Angers, but after 1852 gave up painting entirely. For his work in sculpture he won first-class medals at the expositions of 1857 and 1867, and a gold medal at the exposition of 1889. His most ambitious work was the erection for Napoleon III. in 1865 of a colossal copper statue of Vercingetorix, at Alise-Sainte-Reine. His statues adorn several public buildings in Paris, among them an "Apollo" in bronze at the New Opera. His mythological statues and groups include "Bacchante" (1885); "Narcissus;" "Ariadne" and "Cassandra Under the Protection of Pallas," both in the Luxembourg. Among his portrait statues are those of Denis Papin at Blois, Chateaubriand at Saint Malo, Gay-Lussac at Limoges, and Edgar Guinet at Bourg. He executed many portrait busts and statues in marble and bronze. His art is realistic in character, but theatrical in pose. He died in Paris, January 13, 1891. Consult Dumesnil, *Aimé Millet* (Paris, 1891).

MIL'LET, Francis Davis (1846—). An American genre painter, war correspondent, and author. He was born at Mattapoisett, Mass., November 3, 1846. He was educated at Harvard College and took part in the Civil War as a drummer and assistant surgeon. He was a pupil at the Royal Academy of Fine Arts at Antwerp, 1871-72, and also studied in France and Italy, at the same time writing illustrated articles for American periodicals. During the Russo-Turkish War (1877-78) he was engaged by the New York *Herald* and London *Daily News* as war correspondent, attached to General Skouboloff's staff. He was director of the decorations of the World's Fair at Chicago, where he also received a medal. The year 1898 saw him in the Philippines as the correspondent of the London *Times* and *Harper's Weekly.*

Millet made his home in the village of Broadway, Worcestershire, England. He is best known as a painter of genre subjects of England in the eighteenth century and of classic Rome and Greece, in which costume and interiors are studied with much detail, showing the influence of the Dutch school. His chief paintings include the decorations of Trinity Church, Boston; "At the Inn," Union League Club, New York City; "A Cosy Corner," Metropolitan Museum; "Between Two Fires," National Gallery of British Art, London. He is a member of the Society of American Artists (1880), the National Academy of Design (1885), and the Institute of Painters in Oil Colors, London; received a second medal at the Paris Exposition of 1889; and holds several military orders. His literary works include a translation of Tolstoi's *Sebastopol* (1889); *Capillary Crime and Other Stories* (1892); *The Danube* (1898).

MILLET, mĭl'lā′, Jean François (1814-75). A French genre and landscape painter of the Barbizon group. He was born at Gruchy, near Gréville (Manche), October 4, 1814, and was the eldest son and second child of a peasant. His father, who exercised a great influence upon Millet's life and character, was a man of refined and deeply religious nature, and of musical tastes, being cantor in the village church. As a boy, Millet was fond of books, and under the tuition of the village priest learned to read, but spent his early years on the farm, trying, during hours of rest, to draw the familiar scenery and life about him. His father took him to the neighboring town of Cherbourg, where he studied under Mouchel, a pupil of the school of David, and Langlois. In 1837, aided by a small gift of money from the council-general of the department and by a small pension granted by the town council of Cherbourg, Millet went to Paris. He entered the studio of Delaroche, but, unable to endure his master's conventional methods, and constrained by poverty, he soon withdrew. With Marolle, a friend, he opened a little studio, giving his evenings to study and his days to painting cheap portraits and pastel imitations of Boucher and Watteau. He won some recognition with a portrait in the Salon of 1840, but soon returned to Normandy, where he married (1841). There he supported himself by painting sign-boards, and also produced "Sailors Mending a Sail" and other genre works. In 1842 he returned to Paris, and in 1844 attracted the favorable attention of artists by his "Milkwoman" and "Riding Lesson." On the death of his wife he returned to Normandy, but remarried and came again to Paris in 1845. His "Saint Jerome," contributed to the Salon of that year, was rejected, and Millet painted over it "Œdipus Unbound," a picture in the classical style. "The Golden Age," "The Bird Nesters," "The Bathers," and other works followed, and in 1848 "The Jews in Babylon" and "The Winnower," the last obtaining a real success.

Soon after the outbreak of the Revolution of 1848 he abandoned Paris for the village of Barbizon, where he passed the remainder of his life. Here the 'Norman peasant,' as he called himself, was surrounded by scenes he loved, and with the subjection of color to sentiment he gave up the mythological and the nude, confining himself to rustic art. "The Sower" (1850) was followed by "Man Spreading Manure" (1852); "The Reapers" (1853); "A Peasant Grafting a Tree" (1855); "The Gleaners" (1857, Louvre), one of his very best works; "The Angelus" (1859);

"Death and the Wood-Cutter;" "Feeding Her Bird" (La becquée, 1860), in the Lille Museum; and others, all produced while he was hampered by illness and debts. In 1860 he bound himself by contract to give all his work for three years for 1000 francs a month, but the contract was dissolved in six months. To this period belong "The Sheep Shearing" (1860); "Woman Feeding Child;" "The Sheep Shearer;" "Waiting" (all in 1861); "Potato Planters" (1862); "The Wool Carder" (1863); and "The Man with the Hoe" (1863). From 1860 his reputation was regarded as established, and after 1863 he no longer suffered want. In 1864 he exhibited "The Shepherdess" and "Peasants Bringing Home a Calf;" in 1865 he produced some decorative work. At the Paris Exposition of 1867 he received a medal of the first class, and in 1868 the ribbon of the Legion of Honor. Driven from Barbizon by the Franco-Prussian War, Millet repaired to Cherbourg and did not return until late in 1871. He was deeply affected by the death, in 1867, of his friend Rousseau, with whom, of all others, he was most intimate. Although the state of his health, which had been failing for some time, curtailed the hours of work, he continued to paint until December, 1874, when fever set in and he died on January 20, 1875.

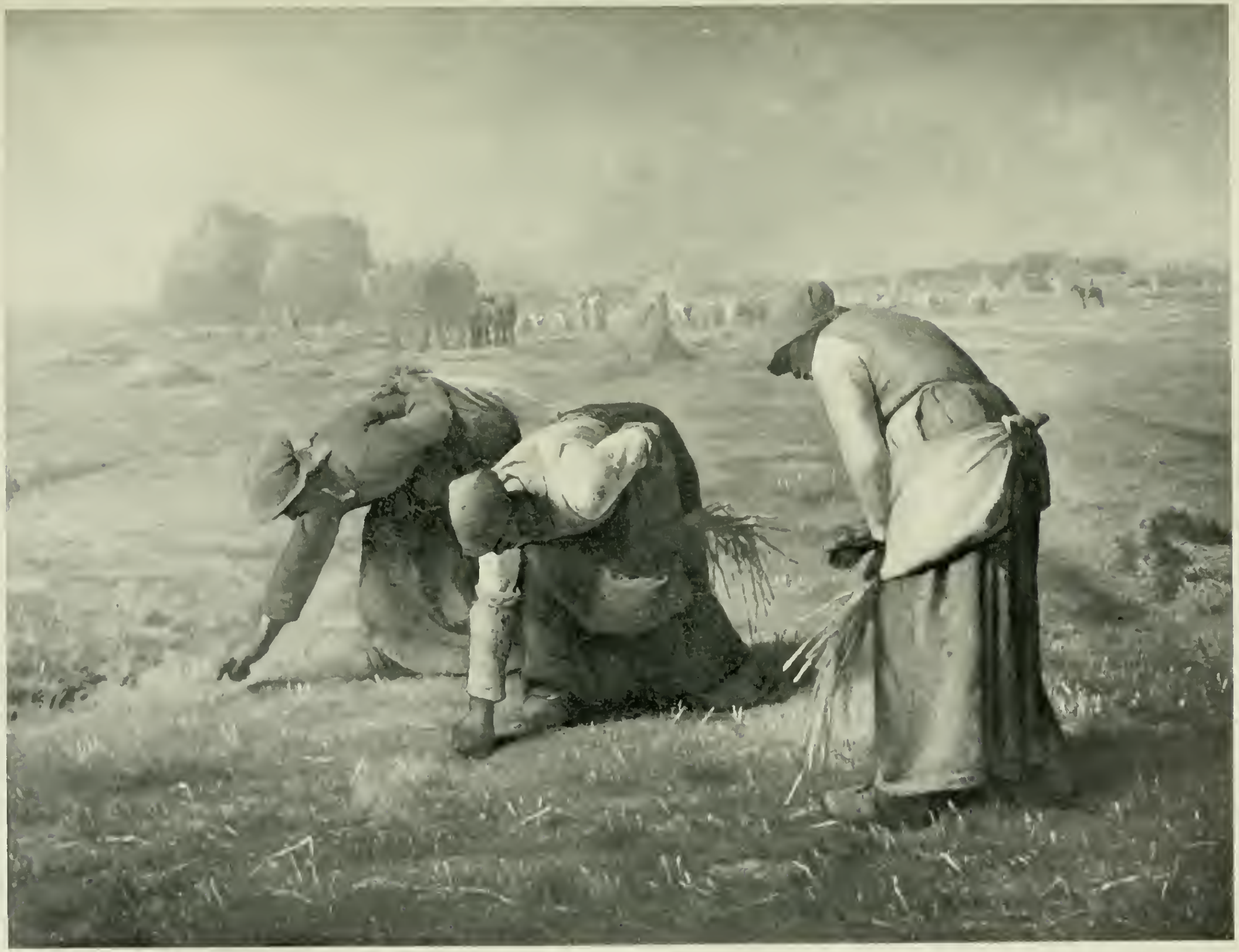
He was one of the artists selected by the Government to decorate the Pantheon, but did not live to complete the commission. A number of important works have been acquired by Americans, among which are: "The Sower" and the "Water Carrier" (Vanderbilt Collection, New York); "The Grafter" (William Rockefeller); "The Turkey-Keeper" (C. A. Dana. New York); "The Buckwheat Threshers" and the "Planters" (Quincy Shaw Collection, Boston); "The Churner" (F. L. Ames, Boston); "Potato Harvest" and "Breaking the Flax" (Walters Collection, Baltimore). Millet's paintings began to increase in value before his death, but his family, being left in straitened circumstances, was pensioned by the Government. His principal pictures have been etched and engraved. It was the master's custom to paint from memory, without using models, and to this is partially due the simplicity and breadth with which he treated his subjects.

Equally famous with Millet's paintings are many of his drawings, such as his own portrait (1848); "Woman Feeding Chickens;" "Shepherd with Flock;" "The New-Born Lamb;" "Laundresses on the Shore;" "First Steps." His pastels, too, are equally prized; good examples are the "Vine Dresser Resting" and "Woman Churning." All show a good draughtsman, with a fine feeling for form. His color is sad in tone, gray and brown usually prevailing; and he achieved harmony by a masterly treatment of light and atmosphere. The landscape background and the animals of his paintings are the equals of those done by the greatest specialists in these branches. Among the best of his pure landscapes are "Church of Gréville," "Spring," and "Winter," the first two in the Louvre. He was also an etcher of great power, as is evident from his thirteen original plates of subjects of peasant life, as well as from a number of others after his paintings. His designs for woodcuts, generally carried out by his two brothers, show great originality, being executed in bold, coarse outlines, more like those of the old German masters than nineteenth century etchings. Monuments to Millet have been erected in Cherbourg and Gruchy, and a bronze plaque attached to a rock at the entrance to the forest of Fontainebleau is dedicated to him and Rousseau.

Bibliography. The best and most complete work on Millet is by his friend Sensier, *La vie et l'œuvre de Jean François Millet* (Paris, 1881; abridged English translation, Boston, 1896). See also Piedagnel, *Jean François Millet: souvenirs de Barbizon* (Paris, 1876); Naegely, *J. F. Millet and Rustic Art* (London, 1898); the biographies by Yriarte (Paris, 1885); Emile Michel in *Les artistes célèbres;* Eaton, in Van Dyke, *Modern French Masters* (New York, 1890); Couturier, *Millet et Corot* (Saint-Quentin, 1876); Gensel, *Millet und Rousseau* (Bielefeld, 1902).

MILLI, mē′lē, Giannina (1827-88). An Italian poet. She was born at Teramó, and when but a child of five years is said to have composed verses. When seventeen or eighteen years of age she became a pupil of the poet Regaldi, the greatest of Italian improvisatores, and soon developed considerable power in improvising popular and amatory verses. Medals of gold and silver were awarded her, and after her trips through the principal Italian cities (1857-60) a pension was bestowed upon her. She was appointed inspector of elementary schools for girls and superintendent of the normal school for young women in Rome. Her poems were published in two volumes in 1862-63.

MIL′LIGAN, Ex Parte. The title of an important decision rendered by the Supreme Court of the United States in 1866, growing out of the events of the Civil War. The precise question raised was whether a citizen domiciled in a State where peace prevails, but which is adjacent to the theatre of war, may be deprived of the right of trial by jury and be subjected to trial before a military commission composed of army officers. The case grew out of the arrest of one Milligan, a citizen of Indiana, by a United States military officer in 1864 on charges of conspiracy, disloyal practices, inciting insurrection, and giving aid and comfort to the enemy. He was tried before a military commission at Indianapolis, was found guilty, and was sentenced to be hanged. His counsel thereupon filed in the Circuit Court of the United States a petition for a writ of habeas corpus denying the jurisdiction of the military commission, on the ground that the civil courts in Indiana were open and unobstructed in the performance of their duties, that a United States grand jury which was then in session failed to find a bill of indictment, that the plaintiff was a civilian in no way connected with the military service, and that he was not a resident of a rebel State. The case was finally carried to the Supreme Court of the United States, where it was held that a military commission organized during the war in a State not invaded or in rebellion, and where the Federal courts were open and unobstructed, had no jurisdiction to try, convict, or sentence for a criminal offense a citizen who was neither a resident of a State in rebellion nor a prisoner of war, nor a person in the military or naval service, and that Congress had no power to confer such authority on it. This opinion was rendered by a bare majority of the court, a vigorous dissenting opinion being delivered by Chief Justice



MILLET

"THE GLEANERS," FROM THE PAINTING IN THE LOUVRE, PARIS

Chase, in which three other justices concurred. The decision is given in *Wallace's Reports*, vol. iv. See Military Law; Martial Law.

MILLIGAN, William (1821-93). A minister of the Established Church of Scotland, born in Edinburgh. He was educated at the University of Saint Andrews (1839). He stood by the 'Auld Kirk' at the disruption (1843), and was ordained minister to the Parish of Cameron, Fife, the following year. He studied in Germany from 1845 to 1846, and was placed at Kilconquhar from 1850 until 1860, when he was asked to occupy the newly created chair of biblical criticism in Aberdeen University. He assisted in the revision of the New Testament in 1870, and published works on the *Higher Education of Women* (1878); *The Resurrection of Our Lord* (1881); *Commentary on the Revelation* (1883); *Baird Lectures on the Revelation of Saint John* (1886); *Elijah* (1887); *The Resurrection of the Dead* (1890); and *Aims of the Scottish Church Society* (1892); besides a notable article for the *Encyclopædia Britannica* on the Epistle to the Ephesians (1879). He was sent to the United States Presbyterian General Assembly (1872) as a delegate from the corresponding body in Scotland.

MILLIN, mē̇′lăɴ′, Aubin Louis (1759-1818). A French archæologist, born in Paris. His first literary attempts were translations from the German and English, which were published in the *Mélanges de littérature étrangère* (1785-86). His protest against the excesses of the Revolution made it necessary for him to fly from Paris, and he was imprisoned for a year in Saint Lazare on his return. In 1795 he was placed in charge of the cabinet of antiques and medals in the National Library, was instrumental in the creation of a chair of antiquities, and the same year undertook the direction of the *Magazin Encyclopédique*. Much of his voluminous writing on his special subject appeared in this periodical, which, in 1817, became the *Annales Encyclopédiques*, and he published also *Antiquités nationales* (1790-98); *Introduction à l'étude des médailles* (1796); *Monuments antiques inédits* (1802-04); *Dictionnaire des beaux-arts* (1806); and *Histoire métallique de la Révolution française* (1806). His travels in Italy and the south of France in search of antiques provided material for *Voyage dans les départements du midi de la France* (1807-11); *Peintures de vases antiques* (1808-10; new ed. 1891); and *Voyage en Savoie, au Piémont, dans le Milanais* (1816-17).

MILLING MACHINE. See Metal-Working Machinery.

MIL′LIPEDE. A myriapod of the order Chilognatha (or Diplopoda) having a dorsally convex body composed of many segments, all of which, except the first four, bear each two pairs of legs; and lacking maxillipes. See Centipede; Myriapoda.

MIL′LIS, John (1858—). An American officer of engineers, born at Wheatland, Mich. He graduated, with first rank, from the United States Military Academy in 1881, and served at Willet's Point, N. Y. (1881-83), and on lighthouse duty, especially in experiments with electric lighting (1883-90). Millis was charged with the preparation of the lighting of the Bartholdi Statue in New York Harbor. From 1890 to 1894 he managed Federal improvements in the Mississippi levees and New Orleans harbor; then for four years was chief engineer of the Lighthouse Board; and in 1900 was delegate to electrical, physical, and navigation congresses in Paris during the Exposition, and was sent to Egypt to report on the Assuan dam. After his return to America he was ordered to Seattle to construct fortifications in Puget Sound and Government improvements in Washington, Idaho, and Montana. He was promoted to be major of engineers in 1900.

MILLÖCKER, mĭl′lē̃-kẽr, Karl (1842-99). An Austrian composer of light opera. He was born in Vienna and received his musical education in the Conservatory of that city. In 1864 he was appointed kapellmeister at the Gratz Theatre and from 1869 to 1883 occupied a similar position at the Theater an der Wien in Vienna. His music is marked by its spontaneous melodiousness and sprightly instrumentation. The principal published works include: *Der todte Gast* and *Die beiden Binder* (1865); *Diana* (1867); *Die Fraueninsel* (1878); *Der Regimentstambour* (1869); *Drei Paar Schuhe* (1870); *Die Musik des Teufels* (1870); *Das verwunschene Schloss* (1878); *Apajune, der Wassermann* (1880); *Die Jungfrau von Belleville* (1881); *Der Bettelstudent* (1881); *Gasparone* (1884); *Der Viceadmiral* (1886); *Die sieben Schwaben* (1887); *Der arme Jonathan* (1890); *Das Sonntagskind* (1892); *Der Probekuss* (1895); and *Das Nordlicht* (1897).

MIL′LOM. A town in Cumberland, England, nine miles northwest of Barrow. It is situated on the west coast of Duddon Sands, and has a shallow tidal harbor (Map: England, C 2). The most productive mines of red hematite ore in England are worked in the vicinity, and it has numerous blast furnaces. Municipal enterprise is particularly active. The town owns its markets, water and gas works, and maintains a library, technical schools, recreation grounds, and isolation hospital. Population, in 1891, 8900; in 1901, 10,400.

MILLO MAIZE. A cereal grain. See Sorghum, paragraph *Non-Saccharine*.

MILL ON THE FLOSS, The. A novel by George Eliot (1860). It is the story of English working people. The heroine, Maggie Tulliver, daughter of the miller, is a girl of rich, passionate nature, restless and unhappy in her narrow life. Thwarted in her first love for Philip, she becomes infatuated with Stephen Guest, and is about to elope with him. Her imprudence is followed by misery, when she and her brother Tom are drowned in the flood of the river Floss. The gloom of the story is relieved by touches of homely humor.

MILLS, Albert Leopold (1854—). An American soldier, born in New York City. He graduated at the United States Military Academy in 1879, was appointed second lieutenant of the First Cavalry, was stationed at Fort Walla Walla, Washington Territory (1879-82), and engaged in frontier duty elsewhere. He saw active service against the Crows in 1887 and against the Sioux in 1890. He was professor of military science and tactics at the State Academy, Charleston, S. C., for a year (1886-87), held an appointment at the United States Infantry and Cavalry School, Fort Leavenworth, Kansas, from 1894 until 1898, and in the Spanish-American War participated in the Santiago campaign as captain and assistant adjutant-general of volunteers. In August, 1898, he was made superintendent of the United States Military Academy, West Point, with the rank and pay of colonel, and in October of the same year was promoted to the regimental rank of captain.

MILLS, Charles Karsner (1845—). An American neurologist, born in Philadelphia and educated at the Central High School and the medical department of the University of Pennsylvania. He began to practice in 1869; was professor of physics in Wagner Institute (1870-73) and lecturer on electric therapy and neurology in the Philadelphia School of Anatomy and Surgery. He held a like position in the University of Pennsylvania (1877-87) and then became professor of the same subjects. He attained a high reputation as an alienist both in practice and in legal cases. He wrote several monographs on mental and nervous strain, and edited a valuable *Treatise on the Nervous System and Its Diseases*.

MILLS, Clarke (1815-83). An American sculptor, born in Onondaga County, N. Y., December 1, 1815. In his youth he followed the trade of a plasterer, at the same time modeling ideal heads in clay. In 1846 he completed a bust of John C. Calhoun, which was purchased by the city of Charleston for the City Hall. In 1848 he furnished a design for an equestrian statue of General Jackson, to be placed in Lafayette Square, Washington. There being no bronze foundry for such work in the United States, Mills erected in Washington an experimental foundry, where in 1852 he succeeded in producing a perfect cast. It was formally accepted January 8, 1853—the anniversary of the battle of New Orleans. He was next engaged on the colossal equestrian statue of Washington, which was formally unveiled February 22, 1860. Mills's last work was the casting of the colossal statue of Liberty (1863), modeled by Crawford, which crowns the dome of the Capitol at Washington. In the light of contemporary sculptors, the works of Mills seem inferior, but they mark a stepping-stone in the advance of American art. He died at Washington, D. C., January 12, 1883.

MILLS, David (1831—). A Canadian statesman, born in Orford, Kent County, Ontario. He graduated in law from the University of Michigan in 1855. After teaching for a time, he was school superintendent for Kent County until 1865, and Liberal member for Bothwell, Ont., in the Dominion Parliament from 1867 until 1896, when he was raised to the Senate. He was Minister of the Interior (1876-78) and Minister of Justice (1897-1901). He practiced law in London, Ont., edited the *Canada Daily Advertiser* in that city (1882-87), and besides magazine articles published *The English in Africa* (1900). From 1887 to 1900 he was professor of international and constitutional law in Toronto University, and he was made a judge of the Supreme Court in 1901.

MILLS, Lawrence Heyworth (1837—). An English Orientalist. He was born in New York City and graduated at the University of the City of New York in 1857. He then studied for orders at the Fairfax County Episcopal Seminary near Alexandria, Va., and was ordained in 1861, after which he held a charge in Brooklyn until 1867. Retiring from the ministry, he went to Europe in 1872, where he devoted himself first to a study of Gnosticism and then to the Avesta, which was to prove his life-work. In 1887 he went to Oxford at the request of Max Müller, and in 1898 he was made professor of Zend philology there for five years, an appointment which was renewed in 1903. The researches of Mills have been devoted chiefly to the older portion of the Avesta texts, the Gathas (q.v.), which he studied exhaustively, adhering in the main to the system of the traditional school of interpretation. He also published many contributions on the early phases of Zoroastrianism (see Avesta; Zoroaster), and must be regarded as one of the foremost of Iranian scholars. Among his works the most important are: "Zend Avesta, part iii.," in Müller, *Sacred Books of the East*, vol. xxxi. (Oxford, 1887); *Study of the Five Zarathushtrian (Zoroastrian) Gâthâs* (1894); *Gâthâs of Zarathushtra (Zoroaster) in Metre and Rhythm* (1900); *Dictionary of the Gâthic Language of the Zend-Avesta* (1902); and *Zoroaster, Philo, and Israel* (1903).

MILLS, Robert (1781-1855). An American engineer and architect. He was born in Charleston, S. C., and studied under Benjamin H. Latrobe. He erected several custom-houses and marine hospitals, and in 1820 was appointed State architect and engineer of South Carolina. In 1837 President Jackson made him the architect of the General Government. Under this and the next Administration, Mills designed and had charge of the erection of the Treasury Building, the General Post-Office, the Patent Office Building, and the National Washington Monument.

MILLS, Roger Quarles (1832—). An American soldier and politician, born in Todd County, Ky. He removed to Palestine, Tex., in 1849, studied law, and was admitted to the bar when only twenty years of age. He was elected to the Texas House of Representatives in 1859, but entered the military service of the Confederacy at the outbreak of the Civil War, and took part in the battles of Arkansas Post (January 11, 1863), Chickamauga (September 19-20, 1863), where he commanded a brigade, New Hope Church (May 27, 1864), and Atlanta (July 22, 1864). In 1873 he was elected to Congress, where he continued as a member of the House until 1892, when he was chosen to fill an unexpired term in the Senate, and the next year was reëlected for the full term. In 1884-88 he was chairman of the House Committee on Ways and Means, in which capacity he drafted the 'Mills Bill' for the regulation of the tariff. This measure was defeated in the Senate.

MILLS, Samuel John, Jr. (1783-1818). An American missionary. He was born at Torringford, Conn., April 21, 1783, and graduated at Williams College in 1809. While in college he formed an association among students who were considering the question of entering upon foreign missionary work. After spending a short time in the study of theology at New Haven, he entered Andover Theological Seminary in 1810. With Judson, Hall, Newell, and Nott he united in a memorial to the General Association of Massachusetts (Congregational), which resulted in the formation of the American Board of Commissioners for Foreign Missions. He was licensed to preach in 1812, and spent two years in mission work in the Southern and Western States. He suggested the formation of a national Bible society, which resulted in the organization of the American Bible Society. To him was due the formation of the United Foreign Mission Society. Through his exertions in conjunction with Dr. Finley, the American Colonization Society was formed in 1817, and he was appointed with Dr. Burgess to visit England in behalf of the society, and to explore the west coast of Africa for a suitable site for a colony of colored people from America. He sailed in November, 1817, and arrived on the coast March 12th. He embarked for the United States, May 22, 1818, and died at sea June 16th. He is called the 'father of foreign missions in America.' Consult the memoir by Spring (New York, 1854).

MILLS, Sebastian Bach (1838-98). An Anglo-American piano virtuoso and teacher, born at Cirencester, in England. He was trained by his father and under Potter and Sterndale Bennett, and was regarded as the most precocious child musician in Great Britain. He completed his musical education under Moscheles, Plaidy, and the other distinguished teachers of the Leipzig Conservatory. After leaving Leipzig he studied for a period under Liszt, who held him in high estimation. He returned for a little while to England, where he held the appointment of organist at the Roman Catholic Cathedral at Sheffield (1855). Three years later he returned to Germany, and played at a Gewandhaus concert (December 2, 1858). The following year he appeared in New York under the auspices of the Philharmonic Society, and thenceforward settled in this country. He was very successful as a teacher, and was as popular in Germany as in the United States as a concert pianist. His compositions are few and comparatively unimportant. He died at Wiesbaden.

MILLS COLLEGE AND SEMINARY. An educational institution for young women at Seminary Park, Alameda County, Cal., founded in 1871 as Mills Seminary and chartered as a college in 1885. It comprises a collegiate department leading to the degree of A.B., and a business department, offering courses in bookkeeping, stenography, and typewriting. In 1902 the students numbered 200 and the instructors 35. The endowment of the college is $150,000, and the value of the property $400,000.

MILL SPRINGS, Battle of. A battle fought at Mill Springs, Ky., about 10 miles west of Somerset, on January 19, 1862, between a Federal force of about 4000 men under General George H. Thomas and an approximately equal Confederate force under General George B. Crittenden. The Confederates attacked with great energy, but were finally driven in some confusion from the field. The engagement is also sometimes called the battle of Fishing Creek, and the battle of Logan's Cross Roads. On the battleground a national cemetery was subsequently established, where 718 soldiers lie buried, 352 known and 366 unknown.

MILLSTONE. A wheel or circular mass of rock used in grinding wheat and other grains. For good millstones the rock must be tough, hard, and possess a cellular structure so as to maintain a rough grinding surface. Several varieties of rocks have been found to possess these qualities in a greater or less degree, and have been extensively employed for millstones. In the United States the rock most commonly used is a coarse granular sandstone, which is obtained in Ulster County, N. Y., in Lancaster County, Pa., and Montgomery County, Va. The celebrated French buhrstones consist of a cellular chert occurring in the Tertiary of the Paris basin. The German millstones are largely quarried from a sheet of basaltic lava found near Cologne. The foreign stone is imported into the United States in small pieces and is then built up into wheels, while the domestic stone is quarried and dressed to form a solid wheel. The introduction of the roller process for the manufacture of flour has curtailed the use of millstones to a great extent. In 1901 the production of millstones in the United States was valued at $57,179. See Abrasives.

MILLSTONE GRIT. A hard siliceous conglomerate with quartz pebbles. Its geological position is at the base of the middle Carboniferous age. The beds along the Appalachian range in Pennsylvania are very coarse and are over 1200 feet thick. The rock here is a light-colored siliceous conglomerate known as the Pottsville Conglomerate, interstratified with some sandstone and thin beds of carbonaceous shells. The formation is represented also in New York and as far south as Alabama. See Carboniferous System.

MILL'VALE. A borough in Allegheny County, Pa., on the Allegheny River, opposite Pittsburg, and on the Pennsylvania, the Pittsburg and Western, and the Buffalo, Rochester and Pittsburg railroads (Map: Pennsylvania, B 3). It has important iron manufactures, foundries, saw works, stone works, lumber mills, breweries, etc. The government is vested in a burgess, elected every three years, and a borough council. The water-works and electric light plant are owned by the municipality. Population, in 1890, 3809; in 1900, 6736.

MILL'VILLE. A city in Cumberland County, N. J., 40 miles south of Philadelphia; on the Maurice River, at the head of deep-water navigation, and on the Pennsylvania Railroad (Map: New Jersey, B 5). It has city and high-school libraries, and a fine high-school building, also a large public park at Union Lake, a beautiful sheet of water, three miles long and one and a half in width, in the northern part of the city. Millville is essentially a manufacturing centre, having extensive glass factories, iron foundries, cotton mills, and bleach and dye works. Under a revised charter of 1873, the government is vested in a mayor, elected every three years, and a common council, the thirteen members of which are all, except one, elected by wards. Millville was incorporated as a town in 1801 and was chartered as a city in 1866. Population, in 1890, 10,002; in 1900, 10,583.

MIL'MAN, Henry Hart (1791-1868). An English poet and ecclesiastical historian. He was the youngest son of Sir Francis Milman, physician to George III., and was born in London, February 10, 1791. He was educated at Eton and afterwards at Brasenose College, Oxford, where he obtained the Newdigate Prize with an English poem on the Apollo Belvidere in 1812 and graduated B.A. in 1814. He published *Fazio, a Tragedy,* which was successfully brought upon the stage at Covent Garden in 1815; took orders in 1817, and in 1818 was appointed Vicar of Saint Mary's, Reading. In 1818 appeared his *Samor, Lord of the Bright City, an Heroic Poem*, which was followed in 1820 by the *Fall of Jerusalem*, a dramatic poem with some fine sacred lyrics interspersed. In 1821 Milman was chosen professor of poetry at Oxford, and held the position for ten years. He published three other dramatic poems, *The Martyr of Antioch* and *Belshazzar*, both in 1822, and *Anne Boleyn*, in 1826. His Bampton Lectures on *The Character and Conduct of the Apostles Considered as an Evidence of Christianity* appeared in 1827, and his *History of the Jews* (3 vols.) in 1830. The last of these works did not bear the author's name. Its weak point was a want of adequate learning, especially in the department of biblical criticism. A new edition, greatly improved and more critical, was published in 1863, and another, with further improvements, in 1867. He became a canon of Westminster and rector of Saint Margaret's, Westminster, London, in 1835, and the same year he published certain translations of Sanskrit poetry. In 1840 appeared a collected edition of his *Poetical Works*, containing some other pieces besides those already mentioned. The same year witnessed the publication of his *History of Christianity from the Birth of Christ to the Abolition of Paganism in the Roman Empire* (3 vols.). In 1849 he was made Dean of Saint Paul's, and discharged the duties of the office in such a manner as to win the title of 'the Great Dean.' In 1854-56 he published his masterpiece, *History of Latin Christianity, Including that of the Popes to the Pontificate of Nicholas V.* (6 vols.). Milman edited Gibbon (1838) and an edition of Horace (1849), and published translations of the *Agamemnon* and *Bacchæ* (1865). He contributed extensively to the *Quarterly Review*. He died in Sunninghill, near Ascot, September 24, 1868. A posthumous work contains his *Annals of Saint Paul's Cathedral* (1868), and another *Essays on Saint Paul, Savonarola, Erasmus*, etc. (1870). His historical works were republished in 15 volumes (1866-67). Consult his biography by A. Milman (London, 1900).

MIL'MORE, Martin (1844-83). An American sculptor. He was born at Sligo, Ireland, September 14, 1844, and in 1851 was taken to Boston. His first instruction was in wood-carving, but in 1860 he began his studies in sculpture with Thomas Ball in Boston. His first work to receive notice was his ideal alto-relief "Phosphor" (1863). In the same year he executed the statuette "Devotion," and also an ideal child statue and cabinet busts of Longfellow and Charles Sumner. In 1864 he was commissioned to execute statues of Ceres, Flora, and Pomona for the Boston Horticultural Hall. One of his most effective pieces is his soldiers' monument for Forest Hills Cemetery, Roxbury (1867), which ranks high among American works of art for its conception and execution. The Soldiers' and Sailors' Monument on Boston Common, unveiled in 1877, is his greatest and most elaborate work. While preparing designs for this work he resided at Rome, where he made busts of Pope Pius IX., Wendell Phillips, and Ralph Waldo Emerson. He died in Boston Highlands, Mass., July 21, 1883. Among other works are his life-size bust of Charles Sumner, Metropolitan Museum, New York City; a statue of General Thayer, West Point, N. Y.; busts of General Grant, Lincoln, Daniel Webster, and others; war monuments at Keene, N. H., Erie, Pa., and Charlestown and Fitchburg, Mass. With his brother he executed the great granite Sphinx in Mount Auburn Cemetery, Cambridge, Mass.

MILNE, mĭln, John (1850—). An English mining engineer and geologist, born in Liverpool. He was educated at King's College and the Royal School of Mines in London, and subsequently went to Newfoundland and Labrador, where he worked as a mining engineer. Later he was the geologist of Dr. Beke's expedition into Northwestern Arabia, and was then for twenty years in the service of the Japanese Government. During those years he established the Seismic Survey of Japan, which comprises 968 stations. In the course of his investigations he traveled over a great part of the world, visiting the United States, Russia, Siberia, Mongolia, Korea, China, the Kuriles, the Philippines, Borneo, and Australasia, and finally devoted himself to the establishment of a seismic survey of the world. He invented seismographs and instruments to record vibrations on railways, and published important works on seismology and geology, including *Earthquakes* (1883); *Seismology* (1888); *The Miner's Handbook* (1894); and *Crystallography*.

MILNE-EDWARDS, mĭln-ĕd'wardz. *Fr. pron.* mēl'nå'dwär', Alphonse (1835-1900). A French zoölogist, son of Henri Milne-Edwards, born in Paris. After holding the position of professor of zoölogy, he succeeded his father as director of the Museum of Natural History. His work on fossil Crustacea appeared in 1865; an extensive and valuable treatise on the fossil birds of France was published in 1862-72. He also described the extinct birds of the Mascarene Islands and of Madagascar. He worked long and patiently on the Crustacea, publishing elaborate reports on the deep-sea forms, in which he was assisted by E. L. Bouvier. His work on the anatomy of *Limulus polyphemus* (1872) was perhaps his most important contribution to science. He also promoted deep-sea explorations and studied the geographical distribution of birds.

MILNE-EDWARDS, Henri (1800-85). A French naturalist, born at Bruges, October 23, 1900; his father was an Englishman. He studied medicine in Paris, but after taking his degree in 1823 he abandoned medicine for natural history. He was first appointed professor of natural history at the Lycée Henri IV. He was appointed in 1841 to the chair of entomology at the Jardin des Plantes, and afterwards professor of zoölogy and physiology at the Faculté des Sciences. He was author of *Histoire naturelle des crustacés* (1834-41); *Eléments de zoologie* (1834-37); *Observations sur les ascidies composées* (1841); *Leçons sur la physiologie et l'anatomie comparée de l'homme et des animaux* (1857-83). He also revised and completed the second edition of Lamarck's *Histoire naturelle des animaux sans vertèbres* (1836-45). He finally became the dean of the Faculty of the Museum at the Jardin des Plantes. Milne-Edwards produced elaborate and carefully illustrated works on the anatomy of worms, crustaceans, and tunicates. In his great work on corals he was assisted by Haime. He will be remembered for establishing the doctrine of the physiological division of labor. His general work on Crustacea is still a valuable and standard work.

MIL'NER, Sir ALFRED (1854—). An English colonial Governor, born at Bonn, Germany. He studied at King's College, London, and at Balliol College, Oxford, where he graduated with a first class in classics. For a short time he was fellow of New College, Oxford, then studied law, and from 1882 to 1885 devoted himself to journalism. His service as private secretary to Mr. Goschen, Chancellor of the Exchequer (1887-89), was the beginning of his public career. He proved an able Under-Secretary for Finance in Egypt (1889-92), and wrote *England in Egypt* (1892). After five years as chairman of the Inland Revenue Board, Milner was appointed High Commissioner of South Africa and Governor of the Cape of Good Hope. He held the former post through the difficult period preceding the second Boer War, as well as afterwards; was made a K.C.B. in 1895, and created a baron in 1901 and a viscount in 1902, and in 1901 was appointed Governor of the Transvaal and Orange River Colonies.

MILNER, JOHN (1752-1826). An English Roman Catholic scholar. He was born in London, October 14, 1752; was ordained priest in 1777; settled at Winchester in 1779, and became titular Bishop of Castabala in 1803. In 1804 he moved to Wolverhampton and entered into the agitation which finally led to the removal of the right of veto on appointment of Roman Catholic bishops as part of Peel's Catholic Relief Act passed in 1829. His firmness and courage in the controversy won him the sobriquet 'The English Athanasius.' He died at Wolverhampton, April 19, 1826. His permanent fame rests upon his *Antiquities of Winchester* (2 vols., 1798-1801; 3d ed. with memoir by Husenbeth, 1839); *Treatise on the Ecclesiastical Architecture of England During the Middle Ages* (1811; 3 ed. 1835); *The End of Religious Controversy* (1818). Consult his *Life* by Husenbeth (Dublin, 1862).

MILNER, JOHN (1752-1826). An English ecclesiastical historian. He was born at Leeds, in Yorkshire. He studied at Catharine Hall, Cambridge, where he took the degree of B.A. in 1766, and afterwards became head-master of the grammar school at Hull. In 1768 he was appointed lecturer at Holy Trinity or High Church, Hull, and later became also vicar at North Ferriby, near Hull. He belonged to the Evangelical School and was not popular with certain of his parishioners. Milner's principal work is his *History of the Church of Christ*, of which he lived to complete three volumes, reaching to the thirteenth century (1794-97); vols. iv. and v. (1803-09) were edited from his MSS. by his brother, Dr. Isaac Milner, dean of Carlisle, who also published a complete edition of his brother's works in eight volumes (1810). The principles on which the *History of the Church of Christ* is written are of the narrowest kind of Evangelicalism; the scholarship is poor, the literary merit still poorer, and the critical insight poorest of all. A greatly improved edition by Grantham appeared in 1847. A life of Milner by his brother Isaac is prefixed to the first volume of Milner's *Practical Sermons* (3d ed., London, 1804-23, 3 vols.).

MILNER-GIBSON, THOMAS. See GIBSON, THOMAS MILNER.

MILNES, mĭln'z, RICHARD MONCKTON, Baron Houghton (1809-85). An English poet and politician, son of Robert Pemberton Milnes, of Fryston Hall, near Wakefield, Yorkshire, born in London, June 19, 1809. He was educated at Trinity College, Cambridge, where he was a member of the famous society called the 'Apostles,' which included Hallam and Tennyson. Soon after receiving the degree of M.A. (1831) he traveled in Germany and Italy, and visited Greece. He returned to London in 1835. In 1837 he entered Parliament for Pontefract, which he continued to represent till 1863, when he was raised to the peerage as Baron Houghton. In politics he was at first a Conservative, but on Peel's conversion to free trade he became an Independent Liberal. He was an advocate of public education and religious equality; labored for copyright laws and the establishment of reformatories for juvenile offenders; and took a decided stand on the side of Italy against Austria. A friend of literary men, he secured a pension for Tennyson, helped Hood, and was one of the first to recognize the merits of Swinburne. Throughout life he was an extensive traveler. In 1842-43 he visited the East, and in 1875 Canada and the United States. He died at Vichy, August 11, 1885. Among Lord Houghton's works are: *Memorials of a Tour in Some Parts of Greece, Chiefly Poetical* (1834); *Poems of Many Years* (1838); *Poems Legendary and Historical* (1844); and *Palm Leaves* (1844). He contributed to the magazines, published several speeches and pamphlets, and edited *The Life, Letters, and Literary Remains of Keats* (1848). Consult his interesting *Monographs, Personal and Social* (London, 1873); *Collected Poetical Works* (ib., 1876); the character of Vavasour in Disraeli's *Tancred;* and Reid, *Life, Letters, and Friendship of R. M. Milnes* (London, 1890).

MI'LO. An island in the Cyclades. See MELOS.

MILO (Lat., from Gk. Μίλων, *Milōn*) of Croton, in Magna Græcia (q.v.). An athlete famous for his great strength, who lived, according to Herodotus, about B.C. 520. He won the prize as wrestler in six Olympian, seven Pythian, ten Isthmian, and nine Nemean games. Among other displays of his strength, he is said to have on one occasion carried a live ox upon his shoulders through the stadium of Olympia, and afterwards to have eaten the whole of it in one day; and on another to have upheld the pillars of a house in which Pythagoras and his scholars were assembled, so as to give them time to make their escape when the house was falling. He lost his life through too great confidence in his own strength, when he was getting old, in attempting to split up a tree, which closed upon his hands, and held him fast until he was devoured by wolves.

MILO, TITUS ANNIUS PAPIANUS (B.C. 95-48). A Roman politician. He was born at Lanuvium, and belonged to a distinguished family. Few details of his life are known till his election as tribune of the people in B.C. 57. He was then a partisan of Pompey, and attempted to bring about the recall of Cicero from exile. This measure was bitterly opposed by Clodius, who, as tribune of the people, had been instrumental in passing the law condemning Cicero to exile. Milo attempted to have Clodius condemned as a violator of the public peace, but the proceedings were quashed. Both Milo and Clodius now hired a body-guard of gladiators, and armed collisions between their retainers became almost every-day occurrences. About this time Milo married Sulla's daughter, Fausta, for her fortune. In 56 Clodius was elected curule ædile, and accused Milo of being a violator of the public peace by keeping a force of armed retainers. Pompey conducted the defense of Milo, but no decision was ever reached. In 53 Milo offered himself as a candidate for the consulship. Clodius opposed the candidature of Milo, who was defended in the Senate by Cicero in a speech of which some fragments are still extant. On January 20th of the next year Milo was on his way to Lanuvium from Rome, accompanied by his band of gladiators. Clodius, also with an armed company, met him near Bovillæ. Milo and Clodius passed each other without trouble; but some of Milo's followers picked a quarrel with the slaves of Clodius, who attempted to interpose, and was stabbed in the shoulder by one of Milo's men. Clodius was taken to a tavern in Bovillæ, but was dragged out by the slaves of Milo and put to death. The corpse of Clodius was placed on the rostra of the Forum in Rome and a mob set fire to the Senate house. These acts of popular violence created a reaction in favor of Milo, who ventured to return to Rome. Milo was tried for the murder of Clodius, and though defended by Cicero, he was condemned to exile, and went to Marseilles. In his absence he was tried and condemned on charges of violence, of bribery, and conspiracy. In 48 he went back to Italy, without permission, to join Marcus Cælius, an expelled Senator, who was attempting to excite a rebellion in South Italy, and he was killed before a fort near Thurii. See CLODIUS PULCHER.

MILORADOVITCH, mē̇′lȯ-rä′dȯ-vĭch, MIKHAIL, Count (1770-1825). A Russian general, born in Saint Petersburg. After active service in the war with Turkey and in that with Poland, he distinguished himself under Suvaroff in the campaign of the Austro-Russian army against the French in Italy (1799) and made the famous passage of the Alps by way of the Saint Gothard Pass into Switzerland. In 1805 he was a division commander at Austerlitz, and in 1812 he fought at Borodino. In 1813 he played a prominent part at Lützen. He was made Governor of Saint Petersburg in 1819, but six years afterwards, as he strove to quell the Decembrist rising, he was shot dead.

MILOSH, mē′lȯsh, OBRENOVITCH (1780-1860). A Prince of Servia, born in Dobrinia. He was the son of a peasant, and spent his youth and early manhood as a swineherd in the service of his rich half-brother, who was a leader in the revolt of 1804. Milosh was his lieutenant and his successor, took his half-brother's patronymic in place of his own, Todorovitch, and became a leader in the opposition against Karageorge. After the latter fled into Austria, Milosh stood his ground against the Turks for a time, then surrendered, and was made commandant or 'knez' of Rudnik. In 1815, what with brave fighting and clever diplomacy, he practically made Servia independent. Two years afterwards he was named hereditary and supreme Prince of Servia, a title conferred in 1822 by the National Assembly, and by the Porte in 1830. Several revolts came to nothing, but in 1839 he was forced to abdicate in favor of his son, Milan. In 1858 he was recalled to power by the National Assembly. He was a man of no education, but, energetic, headstrong, and rather cruel as he was, he deserved the title of 'Father of His Country,' as he gave Servia a place in European politics.

MILREIS, mĭl-rēs′ or **MILREA**, mĭl-rē′ (Port., from *mil*, thousand + *reis*, pl. of *real*, small coin). A Portuguese silver coin and money of account, containing 1000 *reis*. It is valued at $1.075 American. The coin is commonly known in Portugal as the *corōa*, or 'crown,' and since April 24, 1835, has been the unit of the money system in that country. It is used in Brazil, where it is worth about 55 United States cents. The half-corōa, or half-milrei, of 500 reis, is also used in both countries.

MIL′ROY, ROBERT HUSTON (1816-90). An American soldier, born in Washington County, Ind. He graduated at Norwich University, Northfield, Vt., in 1843, and served in the Mexican War as captain of Indiana volunteers. While studying law he served as a member of the Constitutional Convention in 1849-50, and in 1851 was made judge of the Eighth Judicial District of Indiana. At the outbreak of the Civil War he was made captain, colonel, and finally brigadier-general in 1861. In 1862 he was promoted to be a major-general after his service in West Virginia. At Winchester, Va., he opposed for three days a large part of Lee's army, then en route for the invasion of Pennsylvania, and lost heavily. Though he claimed that this detention of Lee was of great advantage to General Meade, enabling him to fight at Gettysburg instead of farther north, an investigation was ordered into his conduct. The charges, however, were dismissed. His commands afterwards were less important, but while in charge of the defenses of the Nashville and Chattanooga Railroad his conduct was again investigated, and he resigned from the army. In 1868 he was trustee of the Wabash and Erie Canal, was superintendent of Indian affairs in Washington Territory from 1868 to 1874, and was Indian agent from 1875 to 1885.

MILTI′ADES (Lat., from Gk. Μιλτιάδης). A famous Athenian general, son of Cimon. He became 'tyrant' of the Chersonesus after his brother Stesagoras, and accompanied Darius Hystaspis in his expedition against the Scythians, about B.C. 508. He was one of those who were left by Darius in charge of the bridge over the Danube, and, when Darius failed to appear at the expected time, he advised that the bridge be destroyed and Darius left to his fate. Afterwards he took Lemnos from the Persians, but, when the Persian fleet came near the Chersonesus, fled to Athens. Being chosen one of the ten generals of the year B.C. 490, he defeated the Persians in that year in the great battle of Marathon. Later he was intrusted with a fleet of seventy ships by the Athenians, with which he proceeded against Paros for the purpose of avenging a private grudge. The expedition having failed, he was, on his return to Athens, condemned to pay a fine of fifty talents. Being unable to do this, he was thrown into prison, where he died of an injury received at Paros.

MILTIADES, less correctly called MELCHIADES. Pope 311-314. He was born in Africa, and his pontificate covers the eventful period of Constantine's conversion. Under him a synod was held in Rome in 313, and a decision was rendered against the Donatists (q.v.).

MIL'TITZ, KARL VON (c.1490-1529). A German ecclesiastic of the Roman Catholic Church, the son of a Saxon noble. He was canon at Mainz, Treves, and Meissen before he became Papal notary in 1515. Three years afterwards he was sent by Pope Leo X. to Saxony on the mission to confer with Martin Luther and his protector, the Elector Frederick the Wise, in the matter of indulgences. An able and politic advocate for a compromise, Miltitz so far succeeded that Luther promised future submission, if not recantation; but though later meetings took place between the two at Altenburg, Liebenwerda, and Lichtenberg, the hope of reconciliation was definitely abandoned on the arrival of a denunciatory Papal bull. Miltitz was charged also with an investigation into the conduct of Tetzel, whom he condemned absolutely. According to some authorities, the delegate was accidentally drowned while on his way to Rome.

MIL'TON. A town and the county-seat of Santa Rosa County, Fla., 20 miles northeast of Pensacola; at the head of Blackwater Bay, and on the Louisville and Nashville Railroad (Map: Florida, A 1). It is in the lumbering section of the State, and has ship-building interests and a flourishing trade. There is a public library (Santa Rosa Academy) with 5000 volumes. Population, in 1890, 1455; in 1900, 1204.

MILTON. A town, including the villages of Blue Hill, East Milton, Lower Mills, and Mattapan, in Norfolk County, Mass., seven miles south of Boston; on the Neponset River and on the New York, New Haven and Hartford Railroad (Map: Massachusetts, E 3). It is an attractive residential suburb of Boston, and has a public library, Milton Academy, Leopold Morse Home, and the Milton Convalescent Home. The crest of the highest hill of the Blue Hills is the site of an observatory and a station of the United States Meteorological Bureau. A fine view is afforded. The town has a trade in garden stuff and ice, and there are granite quarries, paper mills, chocolate and cracker factories, rubber cement works, etc. The government is administered by town meetings. Population, in 1890, 4278; in 1900, 6578. Settled in 1637, Milton was a part of Dorchester until, in 1662, it was incorporated as a separate township. It was the home for many years of Jonathan Belcher, a colonial Governor of both Massachusetts and New Jersey, and of Thomas Hutchinson, the historian and colonial Governor of Massachusetts. Consult Teele (editor), *History of Milton, Mass.* (Milton, 1887).

MILTON. A borough in Northumberland County, Pa., 67 miles north of Harrisburg; on the Susquehanna River, on the Pennsylvania Canal, and on the Pennsylvania and the Philadelphia and Reading railroads (Map: Pennsylvania, E 2). Its extensive manufacturing plants include car and wood-working machinery works; rolling, flour, knitting, planing, and saw mills; washer, nut, and bolt works; and bamboo furniture, nail, fly net, and paper box factories. The borough has a public park with picturesque scenery; and a fine bridge spans the Susquehanna at this point. Settled in 1770, Milton was incorporated first in 1817. It is governed, under a revised charter of 1890, by a chief burgess, elected every three years, and a unicameral council. Population, in 1890, 5317; in 1900, 6175.

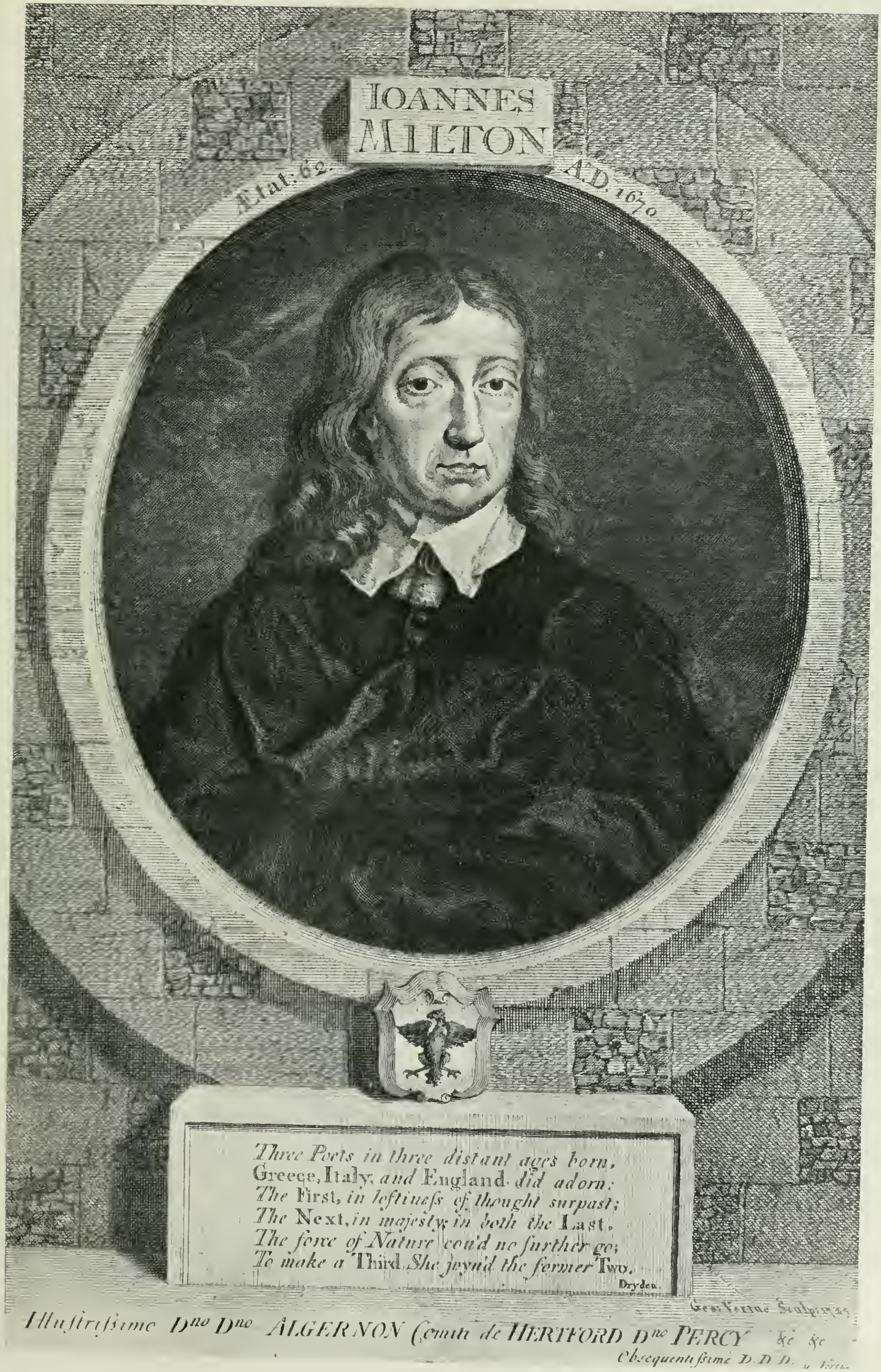
MILTON, JOHN (1608-74). An English poet. He was born in Bread Street, London, December 9, 1608. His father, also named John Milton, belonged to a Roman Catholic family of yeomen living in Oxfordshire. The elder John Milton was converted to Protestantism while a student at Oxford, and as a result was promptly disinherited by his father, Richard Milton. The poet's father settled in London, where he prospered as a scrivener. The younger John Milton received instruction from his father in music; was taught by a private tutor; and was sent to Saint Paul's School (about 1620), where he learned Latin, Greek, French, Italian, and some Hebrew, and read English literature. Spenser's *Faerie Queene* and Sylvester's translation of Du Bartas, which came into his hands at this time, exerted much influence on the formation of his style. In February, 1625, he proceeded to Christ's College, Cambridge. He was of less than the middle height, yet well made, with light brown or auburn hair. In bearing he was courteous and stately, though sometimes sarcastic. Owing to a misunderstanding with his first tutor, he was rusticated for a short time in 1626, but he returned and completed the course, graduating B.A. in 1629 and M.A. in 1632. From childhood Milton had been destined for the Church, but the policy of Laud led him first to postpone taking orders and then to abandon all thought of it. He retired to his father's estate at Horton, Buckinghamshire, where he passed nearly six years (1632-38) in reading the classics and writing at intervals his choicest poems. Believing that he had it in him to write something that would live, he set out for Italy in April, 1638, wishing to fit himself still more for his future work. Probably at Bologna, which he visited in 1639, Milton wrote in excellent Italian five sonnets and a canzone wherein he expresses love for a beautiful lady of Bologna. For some time he stayed in Florence, where he visited in prison the blind Galileo. Thence he went on to Rome and Naples. As he was about to pass over to Sicily and from there to Greece, news reached him of 'the civil commotions in England.' He turned homeward, reaching England toward the end of July, 1639. He took a house in Aldersgate Street, London, where he received as pupils two nephews, children of an elder sister, and occupied his leisure with plans for future poems. From these pursuits he was drawn into ecclesiastical controversies, writing pamphlet after pamphlet. In June, 1643, he married, after a brief courtship, Mary Powell, then only seventeen years old, the daughter of an Oxfordshire squire and Royalist. After a month the bride returned to her father's house. In the summer of 1645 they were reconciled, and he moved to the Barbican, a more commodious house for the increasing number of his pupils. She died in 1652, after bearing four children, of whom the one son died in infancy. A fortnight after the execution of Charles I. (January 30, 1649), Milton issued a memorable defense of the deed, and this led to other pamphlets which gave him European fame as controversialist. On the establishment of the Commonwealth Milton was appointed Latin secretary to the Council of State (March 15, 1649). For this office, involving the duty of turning into Latin all foreign dispatches, he was eminently fitted. In 1652 he lost his eyesight, already long impaired, but with the aid of assistants—one of whom was Andrew Marvell—he performed the duties of his post till the abdication of Richard Cromwell (1659). In the meantime (November, 1656) he had married a Catharine Woodcock, who died in February, 1658. She was honored by one of Milton's most beautiful sonnets (xxiii.). The Restoration put an end to his active career. In 1661 he settled in Jewin Street, Aldersgate, from which he removed two years later to a house in Artillery Walk, Bunhill Fields, his last residence. Here he fulfilled the literary task he had long ago planned and since begun. To the annoyance of his daughters, he married a third wife, thirty years his junior, named Elizabeth Minshull. His relations with these daughters were most unhappy. Brought up in ignorance, they revolted from the service that he demanded of them—reading to him Latin, Greek, and Hebrew, which of course they could not understand. Toward the end Milton stood aloof from religious sects and never went to religious services. He died November 8, 1674, and was buried in Saint Giles's, Cripplegate.

Milton's literary career is clearly divided by the outbreak of the Civil War and by the Restoration into three periods: (1) 1626-40; (2) 1640-60; (3) 1660-74.

First Period. Milton began writing English and Latin verse while a schoolboy. The earliest extant specimens of these exercises are paraphrases of the 114th and 136th Psalms, composed at the age of fifteen. Other early poems are a group of graceful Latin elegies and sylvæ (1626-29); *On the Death of a Fair Infant* (1626); *At a Vacation Exercise* (1628); *Hymn on the Nativity* (1629); *At a Solemn Music* (1630); *On Shakespeare;* and sonnets *To the Nightingale* and *On Arriving at the Age of Twenty-three.* The Latin verses are undoubtedly the best ever written by an Englishman, and the last five of the English poems display high poetical genius. While at Horton, Milton composed four absolutely perfect poems: the two descriptive lyrics, *L'Allegro* and *Il Penseroso* (1634); *Comus*, a masque performed at Ludlow Castle on Michaelmas night, 1634, in honor of Lord Bridgewater's appointment to the wardenship of the Welsh marches; and *Lycidas*, a pastoral elegy in memory of his college friend Edward King, drowned on his passage to Ireland (August 10, 1637). Of these poems, which by themselves would place Milton among the great names in English literature, only a few had been published. The lines on Shakespeare appeared in the second folio of the dramatist's works (1632); Henry Lawes, who composed the music for *Comus*, published the masque anonymously (London, 1637), and *Lycidas* formed one in a collection of memorial poems (Cambridge, 1638). To this period belong six sonnets in Italian and Milton's two finest Latin poems: *Mansus* (1638), addressed to the Marquis of Manso, the friend of Tasso, who in his old age hospitably received Milton at Naples; and *Epitaphium Damonis*, an elegy on the death of his college friend Charles Diodati.

Second Period. For full eighteen years Milton was distracted from poetry by domestic perplexities and the revolutions in Church and State. The separation from his wife led to pamphlets on divorce, of which the most important are *The Doctrine and Discipline of Divorce* (August 1, 1643), and *The Tetrachordon* (1645). Against episcopacy he launched, in 1641-42, five tracts, of which the best known is *The Reason of Church Government Against Prelaty.* In 1644 appeared the valuable letter *Of Education* and a noble plea for the freedom of the press under the title *Areopagitica.* The execution of Charles I. and the establishment of the Commonwealth were defended against Continental criticism in *The Tenure of Kings and Magistrates* (1649), *Eikonoklastes* (1649), *Pro Populo Anglicano Defensio*, and sequels. These tracts, vehement and often scurrilous in style, contain autobiographical passages of interest. Throughout this period Milton was almost silent. He composed, however, at intervals his magnificent sonnets, as *On His Blindness, To Fairfax, To Cromwell,* and *The Massacre in Piedmont;* and in 1645 appeared a volume of collected poems in English and Latin. Besides this he wrote some Greek and Latin verse and made a few translations. In 1902 there appeared a valuable work called *Nova Solyma: the Ideal City of Zion; or Jerusalem Regained;* translated from the Latin by the Rev. Walter Begley, and by him attributed to John Milton. This romance was published in London (1648) with the title *Novæ Solymæ Libri Sex.* Whether or not the work belongs to Milton, it undoubtedly shows strongly many of his characteristics in thought and style. The romance is written in prose and in verse, and is wholly in Latin. It shows advanced theories on education, it considers love philosophically, and deals with the philosophy of religion, with conversion, salvation, the brotherhood of man, with almsgiving, self-control, angels, the fall of man, and man's eternal fate. It contains some 256 hexameters of a projected epic on the Armada, and there runs through it a vein of adventures with tales of outlaws, robbers, sea-rovers, and fighting on sea. There is an account of a man possessed by the devil, and an allegory of Philomela's Kingdom of Pleasure.

Third Period. The great epic that Milton now composed is the spiritual summary of his life of lost ideals. As early as his return from Italy, he had meditated the production of some great poem. By 1642 his mind was turning toward a mystery play on the loss of paradise. When he resumed the subject in 1658, it took the form of an epic. *Paradise Lost*, in ten books, completed by 1665, perhaps even by 1663, was first published on August 10, 1667. After several reprints with slight changes, it was enlarged to twelve books (1674). For this poem, of which 1300 copies were sold in eighteen months, Milton received from his publisher in all £10. At the suggestion of Thomas Ellwood, a Quaker friend of the poet, Milton wrote *Paradise Regained*, which was published with *Samson Agonistes*, an intense lyrical drama, in 1671. Once Milton was known mainly as the author of *Paradise Lost.* Since the romantic revival, this epic has been unfavorably compared with the so-called minor poems. The fascinating imaginative state in which the early lyrics were conceived certainly departed from Milton during the civil conflict. But as years went on, his imagination became invested with sublimity. Had *Paradise Lost* been written in 1642, it would have been a perfect mystery play, as *Comus* is a


IOANNES MILTON
Ætat. 62.
A.D. 1670
Three Poets in three distant ages born,
Greece, Italy, and England did adorn;
The First, in loftineſs of thought surpast;
The Next, in majesty; in both the Last.
The force of Nature cou'd no further go;
To make a Third, She joyn'd the former Two.
Dryden.
Geo: Vertue Sculpsit
Illuſtriſsimo Dno Dno ALGERNON Comiti de HERTFORD Dno PERCY &c &c
Obsequentiſsime D.D.D. G. Vertue

JOHN MILTON
FROM AN ENGRAVING BY GEORGE VERTUE

perfect masque. Delayed twenty odd years it became a sonorous epic, which, though barren in places, abounds in the noblest poetry in the English language.

Bibliography. For his biography, consult: Masson, *Life of John Milton, Narrated in Connection with the Political, Ecclesiastical, and Literary History of His Time* (6 vols. and index, London, 1859-94), an exhaustive work; Pattison in the "English Men of Letters Series" (New York, 1880); Garnett in the "Great Writers Series" (London, 1890); and Masterman and Mullinger, *The Age of Milton* (ib., 1897). For works, consult: *Prose Works*, ed. by Saint John, Bohn's Library (5 vols., London, 1848-53); *Poetical Works* ed. by Masson (Cabinet edition, 3 vols., ib., 1890; Globe ed., 1 vol., ib., 1877, often reprinted); *Poetical Works after the Original Texts*, i.e. reprints, ed. by Beeching (Oxford, 1900); and *Facsimile of Milton's Minor Poems*, from manuscripts in Trinity College, Cambridge, ed. by Wright (Cambridge, 1899). For estimate, consult: essays by Dr. Johnson (London, 1779), Macaulay (ib., 1840). Lowell (ib., 1845), and *A Short Study*, by Trent (New York, 1899); Corson, *An Introduction to Works*, containing the prose autobiographical pieces (ib., 1899); and the notable *Study*, by Raleigh (London and New York, 1900). The student will find of much value: Osgood, *The Classical Mythology of Milton's English Poems* (New York, 1900); and Lockwood, *Lexicon to the Poetical Works of John Milton* (ib., 1902). A contemporary biography of Milton, discovered in 1889 in a volume of Anthony Wood's papers in the Bodleian Library at Oxford, was edited and published by E. B. Parsons in 1903, under the title, "The Earliest Life of Milton," in the *Colorado College Studies* (Colorado Springs, March, 1903).

MILTON COLLEGE. A coeducational institution at Milton, Wis., under the auspices of the Seventh Day Baptists. It was organized as Du Lac Academy in 1844, renamed Milton Academy in 1848, and incorporated as Milton College in 1867. It has collegiate and academic departments and a school of music. In 1902 it had 13 instructors and 100 students, of whom 30 attended the collegiate courses. Its property was valued at $125,000, the buildings and grounds at $35,000, and the equipment at $10,000. The endowment was $84,000, and the income about $12,000. The library contained 6580 volumes and 2000 pamphlets.

MIL'VIAN BRIDGE. An ancient bridge over the Tiber at Rome, built in B.C. 109 by Marcus Æmilius Scaurus. At this bridge, in B.C. 63, Cicero caused the arrest of the ambassadors of the Allobrogi, who were conspiring with Catiline, and Maxentius was drowned there after his defeat by Constantine in A.D. 312. On the foundations of the ancient bridge stands the modern Ponte Molle.

MILWAU'KEE. The largest city in Wisconsin, a port of entry, and the county-seat of Milwaukee County. It is situated on the western shore of Lake Michigan, at the mouth of the Milwaukee River, 85 miles north of Chicago and 83 miles east of the State capital, Madison (Map: Wisconsin, F 5).

The city occupies an area of about 22 square miles, divided by the Milwaukee River and its affluents, the Menominee and Kinnickinnic, and is one of the most beautiful cities of the Northwest. It has an elevation of from 600 to 700 feet above sea level, rising from 80 to 125 feet above Lake Michigan, and reaching its greatest height in Kilbourn Park, which affords a fine view. The business quarter is near the Milwaukee River, while the largest and most beautiful residence sections lie to the west and east, and are characterized by handsomely shaded avenues and detached houses. The accessibility of popular health and pleasure resorts and the beauty of its suburbs add to the attractions of Milwaukee. Among these suburbs is the city of Wauwatosa—the seat of the State Fair Grounds and of a group of county institutions: almshouse, hospital, hospital for the insane, chronic insane asylum, and a children's home. Milwaukee is laid out in broad streets, 310 miles of which are paved out of a total street mileage of 520. The famous cream-colored Milwaukee brick, which is largely used in the construction of the buildings, lends a distinctive architectural appearance to the city. The rivers are spanned by a number of bridges, and there are three viaducts, one of which, over the Menominee Valley, is nearly a mile long.

Buildings and Institutions. Among the most prominent buildings are the city hall, occupying a triangular block and commanding from its tower a good view of the city; the county courthouse of brown sandstone; the United States Government building, a massive granite structure, erected at a cost of $1,750,000; and the public library and museum. The library has 120,000 volumes and maintains a number of branches in various parts of the city. The Layton Art Gallery is located in a fine building and possesses a valuable collection. In the Industrial Exposition Building annual exhibitions are held. The Chamber of Commerce, Athenæum, Lighthouse, Squadron Armory, Saint Paul's Church (Protestant Episcopal), Church of Gesu (Roman Catholic), and the Wells Building, the Herman Building, and the Germania, Pabst, and Mitchell buildings also are noteworthy structures. A mile west of the city limits is a National Soldiers' Home, accommodating 2400 inmates and surrounded by 400 acres of well-kept grounds.

Milwaukee is the seat of Concordia College (Lutheran) and Marquette College (Roman Catholic), both opened in 1881, and of Milwaukee Downer College for women, opened in 1895, having been established on the foundation of the Milwaukee Female College, which was organized in 1849. There are also a State Normal School and two medical colleges, besides a large number of public and parochial schools. The Johnston Emergency Hospital, the Milwaukee General Hospital, the United States Marine Hospital, and the State Industrial Home for Girls are among a large number of charitable institutions of various kinds. Owing to the large population of German birth and descent, Turner and musical societies play an unusually important part in the club and society life of the city. Milwaukee is the seat of a Roman Catholic archbishop and of a Protestant Episcopal bishop.

Parks. The public park system comprises about 500 acres. It includes Lake Park (124 acres) on the lake, laid out with fine drives and bicycle paths; Washington Park (148 acres) with an island-studded lake, a dense growth of timber, picnic and athletic grounds, and a deer preserve; Riverside, Sherman, Humboldt, Mitchell, and Koscinsko parks; and Juneau Park on the lake front. The last commemorates, by its name and a monument, the founder of the city; it has also a statue of Lief Ericson. Statues of Washington and Bergh, and a Soldiers' Monument are in other sections of the city. The city water tower, near Lake Park, marks the North Point Pumping Station. There are also several parks, from 1 to 20 acres in area, in various parts of the city. These smaller resorts are owned by the wards in which they are situated. Forest Home Cemetery is worthy of mention as one of the most beautiful in the United States.

Commerce and Industry. Milwaukee is favorably located with reference to extensive resources of farm, mine, and forest. It enjoys the advantages of water transportation afforded by the Great Lakes, in addition to excellent railroad facilities. Among the railways that enter the city are the Chicago, Milwaukee and Saint Paul, the Chicago and Northwestern, the Wisconsin Central, and the Pere Marquette. The city has become important both as a collecting and a distributing centre, and is noted also for its manufacturing enterprises. Its wholesale trade exceeds $300,000,000 annually. There is an excellent harbor protected by a breakwater. In the shipments eastward there is competition between the lake system of transportation and the railroads, while a considerable traffic crosses Lake Michigan and finishes its transit east by rail. In the lake commerce the shipments far exceed the receipts. The principal commodity received from the East is coal, which reaches Milwaukee by way of the lakes. Milwaukee's foreign trade, which consists chiefly of imports, is comparatively inconsiderable. The following table shows the receipts and shipments of some of the principal articles for the year 1900:

	Receipts	Shipments
Flour.....................Barrels	3,012,625	3,788,658
Wheat.....................Bushels	9,631,380	2,166,431
Corn..................... “	5,780,400	4,958,140
Oats..................... “	8,506,100	7,962,204
Barley..................... “	15,963,100	8,348,776
Rye..................... “	1,165,150	793,398
Lumber.....................Feet	194,229,000	19,934,000
Coal.....................Tons	1,807,493	674,472

With respect to corn and oats, the city is primarily a distributing rather than a consuming centre. It will be noted, however, that there is a marked difference between the receipts and the shipments of barley and wheat, Milwaukee being a large consumer of these products in the milling and brewing industries. Barley is used principally in the manufacture of beer, which is one of the most notable industries of the city. No other American city enjoys so high a reputation for its beer. The value of the malt liquors produced in the census year 1900 was $13.899.390, and of malt $2.317.870. The output of the flour and grist mills in the same year was valued at $6.357.983. The most important industry, and one that is developing rapidly, is the manufacture of foundry and machine-shop products, the value of which in 1900 was $14,495,362. Other large industries are tanning, currying, and finishing of leather, the value of that product in 1900 being $10,267,835, and the manufacture of iron and steel products which were valued at $7,210,213. Slaughtering and meat-packing, and the manufacture of clothing, lumber, and planing-mill products, boots and shoes, and agricultural implements also are important. The value of all manufactured products according to the census of 1900 was $123,786,449. Statistics compiled by local authorities show an immense increase in the output for 1901 and 1902, over that returned by the census. The gain in the production of iron, steel, and machinery has been especially noteworthy.

Government. Milwaukee is governed by a mayor and a board of aldermen, consisting of 46 members—two from each ward. Other elective officers are the treasurer, comptroller, attorney, justices of the peace, and constables. The term of all officers, except the city attorney, who serves four years, is two years. The various administrative boards and heads of departments—the board of public works, commissioner of health, chief of fire department, and chief of police—are appointed by the mayor with the approval of the board of aldermen. The board of school directors is chosen by four school board commissioners, appointed by the mayor, not more than two of whom can be of one political party. The mayor also appoints the commissioners of the public debt. The mayor, city clerk, tax commissioner, and ward assessors constitute a board of review for correction of assessment rolls. The civil service system is under the supervision of a board of civil service commissioners. The bonded debt of Milwaukee in 1902 was $7,152,750, and the floating debt $137,010, making a total debt of $7,289,760. The legal borrowing limit is 5 per cent. of the average assessed valuation for five years. The legal basis of assessment is the full value of both personal and real property, but in practice the basis is about 70 per cent. The assessed valuation of real and personal property in 1902 was $171.881.364. The tax rate was 2.33 per cent. The actual income of the city, including proceeds from the sale of bonds, was $5,675,000. The expenditures for maintenance and operation, including cost of new buildings, etc., were $5.350.000; the main items being $777.516 for schools, $349.351 for the police department, $458,891 for the fire department, $286.654 for interest on debt, and $160.022 for the waterworks. Milwaukee owns and operates its waterworks, which were built in 1872. The system has cost $5,068,443 and now includes 360 miles of mains.

Population. Milwaukee ranks fifth among the Lake cities and fourteenth in the United States. The population by decades has been as follows: 1840, 1712; 1850, 20,061; 1860, 45.246; 1870, 71,440; 1880, 115,587; 1890, 204.468; 1900. 285,315. There is a large foreign-born population, amounting in 1900 to 102.647, of whom 63.952 were Germans. The negroes numbered only 862.

History. Probably as early as 1790, Jean Baptist Mirandeau, an emigrant from France, settled within the present limits of Milwaukee, where a Pottawattomie village of this name was then situated. Here he lived continuously until his death in 1819, for the greater part of the time being the only white man in the vicinity. In 1818 Solomon Juneau came hither and established a trading station, but a town was not laid out until 1835. In 1836 there was a big 'boom,' and settlers came in considerable numbers; but in the following year a reaction set in and retarded the growth of the village for several years. In 1847, with a population of 12,000, Milwaukee was chartered as a city, and Juneau was elected the first mayor.

Consult: Wheeler, *Chronicles of Milwaukee* (Milwaukee, 1861); Buck, *Pioneer History of Milwaukee* (3 vols., ib., 1876-84), the third volume of which is entitled *Milwaukee Under the Charter.*

MILYUTIN, mĭl-yōō′tĭn, Dmitri, Count (1816—). A Russian general and military reformer. He was born in Moscow; entered the army in his youth, and was appointed chief of staff in the Caucasus in 1856. In 1862, after submitting his programme for a reform of the Russian army, he was made Minister of War, remaining in office for a score of years. In 1898 he was made field-marshal. Milyutin wrote on the campaign of 1839 in Northern Daghestan (1856), and on Suvaroff's campaign of 1799 against France (1856).

MILYUTIN, Nikolai (1818-72). A Russian statesman, brother of Count Dmitri. Before he was twenty he entered the employ of the Department of Interior; in Alexander II.'s reforms he took a prominent part, especially in the reorganization of credit, in the introduction of provincial institutions centring on the *mir,* in the emancipation of the serfs, and in agrarian commissions in Lithuania in 1863 and in Poland in 1864. He was Secretary of State for Poland from 1866 to 1868, and attempted to break down the power of the Roman Catholic clergy in that province. Milyutin wrote on Russian military statistics. Consult Leroy-Beaulieu, *Un homme d'état russe* (Paris, 1884).

MIMAMSA, mē-mäm′sȧ (Skt. *mīmāṁsā,* investigation, discussion). The collective name of two of the six orthodox systems of Hindu philosophy. The two Mimamsa divisions are: first, the *Pūrva-mīmāṁsā,* 'Prior Inquiry or *Karma-mīmāṁsā,* 'Inquiry concerning Works'; the second is *Uttara-mīmāṁsā,* 'Later Inquiry,' or *Brahma-mimāṁsā,* 'Inquiry concerning the Supreme Spirit,' or more commonly simply *Vēdānta* (q.v.). As a matter of fact, the two systems comprised under the name Mimamsa have little in common, though both are theistic in nature and both arose about the beginning of our era. The former deals chiefly with the Vedic ritual and its significance, the latter with speculations as to the nature of the Supreme Spirit.

The reputed founder of the system is Jaimini, and the principles are embodied in a series of *Sūtras,* or aphorisms, in twelve books, discussing the sacred ceremonies of the Veda and the merit accruing from their proper performance. The oldest extant commentary on this obscure work is the *Bhāshya* of Sabara-Svamin, whose date is placed long after the birth of Christ. This composition in turn was critically annotated, about A.D. 700, by the great Mimamsa authority, Kumarila.

The Mimamsa system has been one to which less attention has been given by European scholars than to any of the others. One of the earliest treatises on the subject was an essay on the Mimamsa by Colebrooke in 1826, reprinted in his *Miscellaneous Essays* (London, 1873). Consult: Garbe, *Philosophy of Ancient India* (Chicago, 1897); Max Müller, *The Six Systems of Ancient Indian Philosophy* (New York, 1899); Cowell and Gough, *The Sarva-Darśana-Samgraha of Madhava Achārya* (London, 1894).

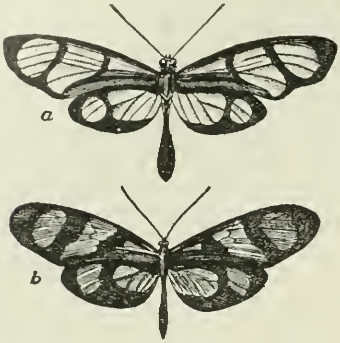
MIME (Lat. *mimus,* from Gk. *μῖμος,* imitator, actor, sort of drama, from *μιμεῖσθαι, mimeisthai,* to mimic). A species of popular comedy among the ancients, in which scenes of common life were represented with imitative gestures and dancing, and with jocose dialogue more or less freely improvised. It was said to have been invented by Sophron of Syracuse, who wrote in the Doric-Greek dialect. Mimes were a favorite amusement of convivial parties, the guests themselves being commonly the performers. Among the Romans, the mime early appeared, though in a somewhat different character, and shared popular favor along with the primitive Latin *Saturæ* and Atellan farces. Although abounding in rough ridicule and often indecent, yet in the hands of such writers as Laberius and Publilius Syrus the mime included much homely wisdom in the shape of familiar saws and proverbial lines which have survived the pieces that contained them. In the theatres, mimes came to be used later as afterpieces. The actors, themselves called mimes (*mimi*), appeared in front of the stage, without buskins or masks, but characteristically attired in patch-work cloaks (centunculi), as were the harlequins (q.v.) of a later day. Under the Empire, however, they were largely superseded in popular liking by the pantomimes (q.v.). Consult: Teuffel and Schwabe, *History of Roman Literature* (Eng. trans., London, 1900); Friedländer, *Sittengeschichte Roms,* vol. ii. (Leipzig, 1890); Patin, *Etudes sur la poésie latine* (Paris, 1875); Grysar, *Der römische Mimus* (Vienna, 1854).

MIM′EOGRAPH. See Copying Machines.

MIMESIS. See Orthography, Figures of.

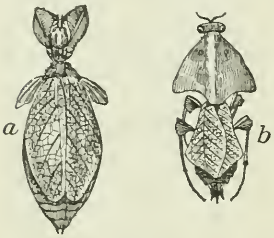
MIMICRY (from *mimic,* from Lat. *mimicus,* from Gk. *μιμικός, mimikos,* relating to mimes, from *μῖμος, mimos,* mime). A form of protective resemblance (q.v.) by which one species so closely resembles another in external form and coloring as to be mistaken for it, although the two may not be really allied and often belong to distinct families or orders. As early as 1746 Rösei von Rosenhof in his *Insekten-Belustigungen* drew attention to the resemblance which geometric caterpillars, and also certain moths when in repose, present to dry twigs, and thus conceal themselves; and afterwards Erasmus Darwin, first in his *The Lives of the Plants,* and afterwards in his *Zoönomia* (1794), sketched out the subject of protective mimicry.

Bates's Theory of Mimicry. These facts received little attention, however, until 1862, when Bates proposed a general theory to account for them. He found during many years' residence in Brazil strikingly colored butterflies belonging to the brilliantly colored family Heliconidæ, and associated with them and indistinguishable, except on close examination, certain butterflies belonging to the structurally very different family of Pieridæ; also certain swallow-tail butterflies and day-flying moths. None of the mimicking insects were as abundant as the Heliconidæ they resembled. The Heliconidæ have an offensive taste and odor, in consequence of which they are immune from attacks by insectivorous animals; they fly deliberately, and they make no attempt at concealment although their bright, distinctive colors permit them to be recognized and avoided, as obnoxious. If any other butterflies in the same region were to become indistinguishable from the Heliconidæ they would profit by a corresponding immunity from attack. The theory assumes that some of the Pieridæ happened at the start to resemble the primitive Heliconidæ and received a partial immunity as a result; that such Pieridæ alone survived and produced descendants of like character; and that a selection of the most heliconid-like of these followed. By a continuation of this process the pierids and the other Lepidoptera gained their present close resemblance to the Heliconidæ. The theory is a broad one, and accounts for cases of mimicry in other groups of Lepidoptera as well as in other orders of animals. It is not necessary, however, to go to South America for examples of mimicry. In North America, as well as in Asia and Africa, occurs the genus Danais, which is also a protected form. Our common American species *Anosia plexippus* is closely mimicked by *Basilarchia disippus*, a butterfly of rather remote affinities. Three genera of Danaidæ in tropical Asia, Euplæa, Danais, and Hestia, are very different, but are all protected. In each genus certain species are mimicked with extraordinary accuracy by species of the genus Papilio.



MIMICRY IN BUTTERFLIES.

a, *Methona psidii* (Heliconidæ); b, *Leptalis orise* (Pieridæ).



MIMICRY IN INSECTS.

a, A leaf-like grasshopper (*Phyllium siccifolium*); b, a mantis (a canthops) which feeds on insects found among dry leaves, and is benefited by resembling them.

But mimicry is not confined to the Lepidoptera. Especially well protected wasps and bees have many imitators, and there are cases of mimicry even in vertebrates.

Müller's Theory of Mimicry. In 1879 Fritz Müller, as the result of many years' observation in Southern Brazil, proposed a modification of and addition to the foregoing explanation of Bates. Bates himself, when first describing the cases he observed, had suggested that they might be due to some forms of parallel variation dependent on climatic influences, and Wallace (*Island Life*, p. 255) adduced other cases of coincident local modifications of color, which did not appear to be explicable by any form of mimicry. Müller's theory is founded on the assumption that insect-eating birds only learn when young and by experience to distinguish the edible from the inedible butterflies, and in doing so necessarily sacrifice a certain number of distasteful butterflies. "Now," says Müller, "if two distasteful species are sufficiently alike to be mistaken for one another, the experience acquired at the expense of one of them will likewise benefit the other; both species together will only have to contribute the same number of victims which each of them would have to furnish if they were different. If both species are equally common, then both will derive the same benefit from their resemblance—each will save half the number of victims which it has to furnish to the inexperience of its foes. But if one species is commoner than the other, then the benefit is unequally divided, and the proportional advantage for each of the two species which arises from their resemblance is *as the square* of their relative numbers." Wallace, who fully accepts Müller's theory, in his statement of the theory (*Darwinism*, p. 253) adds: "But if the two species are very unequal in numbers, the benefit will be comparatively slight for the more abundant species, but very great for the rare one. To the latter it may make all the difference between safety and destruction."

The facts of mimicry are very remarkable: as to causes there is much difference of opinion. The theory of Bates is accepted by many—also that of Müller. Others, like Eimer, Elwes, and Piepers, deny that the mimicry is due to natural selection, but rather to definitely directed evolution, the result of "outward influences such as climate, nutriment, etc., acting on a given constitution." Others, rejecting the Müllerian theory, accept Bates's facts, but ascribe more to the influence of the local environment, such as the action of light, heat, dryness or moisture, etc., yet allowing that in the end natural selection may act as a preservative agent.

The objections to the Müllerian theory are the following: Neither Bates nor Wallace himself, though each lived for several years and collected butterflies in the American tropics, ever actually saw a bird chase and devour a butterfly, although insectivorous birds are said by them to be abundant in Brazil and the Eastern Archipelago. Piepers, Pryor, Skertchley, and other tropical naturalists of long and intelligent experience agree that very rarely has any bird been seen even to chase a butterfly; while Judd concludes from an examination of stomachs of insectivorous birds that none of the American birds feeds upon butterflies "during any month of the year to the extent of one-tenth of 1 per cent. of its food." Ornithologists confirm this abstinence from eating butterflies. From these and numerous other cases it appears that butterflies enjoy a peculiar immunity from the attacks of birds.

It is sometimes the case that it is difficult to tell which is the model and which the mimic. On the Solomon Islands a dark brown Euplæa and a Danais, both inedible, were accompanied by a Hypolimnas butterfly, also inedible, all three genera being avoided by birds both in the larva and imago stages. The fact, says Packard, that the mimickers belong to more primitive groups than the models, and that they are as a rule rare, and apparently on the verge of extinction, indicates that they are the relics of an earlier geological period, and having been exposed to the same local and modifying changes in the environment as the models, have thus been preserved. Most of the cases of mimicry are really cases of convergence produced by similar conditions of life. Moreover, the ground colors of butterflies are restricted in range to reds, shades of brown, yellow, white, and more rarely blue and green. Also the patterns are limited; nature has repeated them over and over again. It is no wonder that there should be apparent cases of mimicry, in regions so similar as the hot and damp forest-covered plains of Brazil, or the upland hot plains of Southern Africa, and the deep forests of the East Indies.

As authorities differ so greatly in their interpretations of the facts, the subject may be considered an open one. That the bad-tasting butterflies are not eaten by birds any more than hairy and bad-tasting caterpillars, is an acknowledged fact; that the edible species mimicking and flying with them are in very rare cases devoured by birds, may be allowed, but its importance as a factor in evolution has been in some quarters unduly magnified. For other cases of mimicry, see PIGMENT; PROTECTIVE RESEMBLANCE.

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MIMIR, mē′mĭr. A water giant of Norse mythology, who dwelt beneath the world-ash Yggdrasil and guarded a spring, considered the source of memory and wisdom and called Mimir's well. Odin in his wanderings asked for a drink from the well and was obliged in exchange to give one of his eyes, the moon, which Mimir sank deep in the spring.

MIMNER′MUS (Lat., from Gk. Μίμνερμος) OF COLOPHON (or Smyrna). A Greek poet, who lived in the latter half of the seventh century. His book *Nanno* was so named from a flute-player whom he had loved in vain; it is a collection of elegies that were models for later poets in sustained calmness and tender sentimentality as opposed to the political elegiac verse previously in vogue. Mimnermus is credited with having brought the elegy back to its original design of expressing personal grief, and his musical temperament found it a fitting medium.

MIMS, FORT. See FORT MIMS, MASSACRE OF.

MIN, mĭn. An Egyptian deity, the local god of Panopolis or Akhmim (q.v.) and of Koptos (q.v.). He was the god of agriculture, typifying the generative forces of nature, and annual harvest festivals were held in his honor. He is generally represented as an ithyphallic human figure wearing a headdress of two enormous feathers, and holding in his right hand a flail. Behind him is a shrine with trees upon it or near it. His sacred animal was the ram. In later times he was often identified with Ammon-Rê. The Greeks identified him with their god Pan. Consult: Wiedemann, *Religion of the Ancient Egyptians* (New York, 1897); Erman, *Life in Ancient Egypt* (London, 1894).

MI′NA, or **MNA** (Lat. *mina*, from Gk. μνᾶ, *mna*, measure of weight, sum of money, from Heb. *māneh*, weight, from *mānāh*, to divide, measure out). A Greek weight and sum of money, equal to 100 drachmas (q.v.), and the sixtieth part of a talent. The value varied according to the talent used. The Attic mina was worth about $18. It was used for purposes of account, and was never minted as a coin.

MINA, mē′nȧ, FRANCISCO XAVIER (1789-1817). A Spanish soldier. He was born at Otan in Navarre, took part with his uncle in the guerrilla warfare of 1808-09 against the French, but was taken prisoner in 1810, and detained four years at Vincennes. In 1814 he was in arms against Ferdinand VII., but was forced to flee to France. Thence he went to England, where he interested himself in the cause of the Mexican patriots, and with the aid of some prominent Englishmen organized an expedition and sailed for America. In the United States he received sympathy and substantial support, and took 200 volunteers with him, arriving at Galveston in November, 1816. Soon afterwards, crossing over to New Orleans, he obtained more assistance, and after being reinforced by 100 Americans at Galveston, landed at Soto Marina, Province of Tamaulipas, April, 1817. At the head of 300 men he defeated Generals Armiñan and Ordoñez, and took the towns of Leon and Guanajuato with the fortress of Sombrero. Deserted by most of his followers, he was surprised on October 17th by an overwhelming force, taken to Mexico and shot, November 11, 1817.

MINA BIRD. See MYNA BIRD.

MINÆ′ANS. A Yemenite people who played an important part in the early history of Arabia. The native name was *Ma'in;* hence the Greek Μειναῖοι or Μιναῖοι. It is possible that the name was originally *Ma'ān*, which has been identified by some scholars with *Magān*, a country southeast of Babylonia, referred to as early as the inscriptions of Naram Sin of Agade in the fourth millennium B.C. and Gudea of Lagash c.3000 B.C. But the identification is doubtful. There is good reason for supposing that the Minæans are mentioned in Judges x. 12; in I. Chron. iv. 41, in connection with the Amalekites against whom the tribe of Simeon made a raid in the time of Hezekiah; in II. Chron. xx. 1 among the enemies of Jehoshaphat; in II. Chron. xxvi. 7 in connection with Philistines and Arabs in the days of Uzziah; and in Job ii. 11, where the Greek rendering suggests that Zophar was a Minæan. While there are many references in the Assyrian inscriptions to Kedar, Nebayoth, Aribi, and Sheba (q.v.), there is no mention of a kingdom of *Ma'in*. Among classical writers, Eratosthenes (c.275-195 B.C.), Agatharchides (c.120 B.C.), Strabo (died c.24 A.D.), Pliny (A.D. 23-79), the *Periplus Maris Erythræi* (c.56-57 A.D.), and Ptolemy (second century A.D.), speak of the Minæans as one of many peoples in Southwest Arabia, but have no knowledge concerning the earlier history of this nation. The fact that there was an extensive and flourishing Minæan kingdom in Arabia is known only through the native inscriptions. These have been secured chiefly through the personal efforts of Halévy, Doughty, Euting, and Glaser. Many of these inscriptions still remain unpublished. Most of them are very brief and are readily interpreted, but a few of the longer ones present considerable difficulty. As to the period from which these inscriptions come there was practical unanimity among scholars until 1889. It seemed impossible that they could be older than the earliest Sabæan inscriptions (see SABÆANS), and it was supposed that the Minæan and Sabæan kingdoms flourished side by side. Such eminent scholars as D. H. Müller, Mordtmann, Hartmann, and Eduard Meyer still adhere to this view, granting that some may be as old as the sixth century B.C., but maintaining that the bulk of them were written nearer the era that begins in B.C. 115. They point out that while the earlier inscriptions of the Sabæan officials known as *mukarrib* are written boustrophedon, there is no Minæan inscription thus running both ways; that in the famous inscription, Halévy 535, there seems to be a reference to the Medes which would place it in the sixth century; that Eratosthenes apparently knows of Minæan kings reigning at Karna, and that the name Ptolemy occurs in a Minæan inscription on an Egyptian sarcophagus. Glaser, however, in 1889, presented strong reasons for believing that the Minæan kingdom preceded the Sabæan; and Hommel, Winckler, Schmidt, Derenbourg, Margoliouth, and Weber have advanced arguments in favor of his position. The silence of the Sabæan inscriptions concerning a Minæan kingdom would be very strange, if these nations were for a long time powerful rivals; and the casual references to Sheba in Minæan inscriptions do not seem to harmonize with the position of this power in the centuries preceding B.C. 115. That the Assyrians make no mention of *Ma'in*, while they are frequently occupied with Sheba, apparently indicates the decline of the former and the rising importance of the latter. In its most flourishing period the Minæan kingdom extended far to the north, as is evident not only from the inscriptions found at El-Oela, but also from the mention of the *Ma'inu Muzran* in Halévy 535. So extensive a kingdom with its centre in the South Arabian Jauf, where its great cities Ma'in, Karnawu, and Yathil were, can scarcely have existed side by side with a strong Sabæan kingdom with the neighboring Marib for its capital. A long inscription found at Sirwah, unfortunately not yet published, according to competent testimony, describes the destruction of the Minæan kingdom by a Sabæan makrib about B.C. 550. Sargon's (B.C. 721-705) contemporary Itamar is not yet designated as king. As Müller has clearly proved that the *mukarrib* preceded the kings of Sheba, the inference seems necessary that the Minæan kingdom flourished before the Sabæan mukarrib period and fell before the rise of the Sabæan kingdom. The Minæan system of writing shows in many respects a closer affinity to the earlier rather than the later Sabæan script; and the oldest Sabæan inscriptions indicate a long period of development of the South Arabian system of writing. Hence the fact that the earliest Sabæan inscriptions are written boustrophedon does not show that this script has been recently introduced. A comparison of the language clearly manifests the higher age of the Minæan which has preserved the *s* in the causative and in the pronominal suffixes against the *h* in the Sabæan. The identification of the Madhay as Medes is extremely doubtful. That the Minæans continued to exist as a people long after their power in Arabia had passed to others is evident from the Greek writers. Whether Eratosthenes drew upon older sources accessible to him in Alexandria, was imperfectly informed, or actually knew of petty kings reigning in Karna in his day, no scholar would seriously maintain that the power reflected in the Minæan inscriptions could have been exercised from Karna in the third century B.C. If the sarcophagus inscription is really Minæan rather than Hadramautian and Talmith is Ptolemy, its content shows not more clearly the survival of ancient forms, along with some very late ones, among the Minæans of the period than the absence of any important Minæan kingdom at that time. It therefore seems exceedingly probable that the twenty-six kings of *Ma'in* known from the inscriptions reigned before there was any Sabæan king in Marib. As it is scarcely credible that chance should have given us the name of all Minæan kings or that the twenty-six names represent an unbroken succession, it would be hazardous to infer that the earliest of them cannot have reigned more than four or five centuries before the last. There may have been more than one dynasty. As among the Sabæans, so in the kingdom of *Ma'in* each year seems to have been named after two *mukarrib* or high officials, like the *limmi* in Assyria, the archons in Athens, the ephors in Sparta, or the consuls in Rome. The absolute age of the Minæan kingdom cannot be determined. The early occurrence of numerous place-names in Southern Syria and Northwestern Arabia which seem to have been transferred from Yemen, the raids of Minæans upon Palestine in the period of the Judges, and the essentially Yemenite character of the traditions brought by clans afterwards forming a part of the people of Israel, from the North Arabian Muzri (see PLAGUES OF EGYPT) to Canaan, render it probable that kings of *Ma'in* extended their power to the borders of Palestine as early as the thirteenth century B.C. The Minæans were to a large extent a settled people living in cities, cultivating the soil, worshiping in sanctuaries. Their chief gods were a male deity, Athtar (see ISHTAR), the solar goddess Shamsi, Wadd, and Ankarih. They had priests and priestesses, hierodules and sacred prostitutes, a sacrificial cult, and many rules of taboo. A deeper religious sense is apparent than in the period of skepticism and syncretism preceding Mohammed.

The language of the Minæans is only dialectically different from the Katabanian, Hadramautian, and Sabæan, and is closely akin to the Ethiopic (q.v.) and the classical Arabic. As to the origin of the system of writing used by the South Arabian peoples, it is supposed by Halévy and Lidzbarski to have been formed from the Phœnician alphabet by a modification of certain signs to denote kindred sounds and by changes rendering the signs generally symmetrical. There is indeed good reason to suppose that many new signs were added in Arabia by slight changes in those already existing, and that the characters were given a squarer form. But there are some letters that are so different from those of the Phœnician alphabet as to raise the question whether other extraneous influences may not have been at work. Whatever the relations of the various Egypto-Libyan, Mycenæan, and Anatolian alphabets, the contact of the Minæans with Egypt and the Philistine coast makes it probable that it was in the northwest rather than on the Persian Gulf that this alphabet grew up. A tablet found at Lachish shows that not only cuneiform signs, but also the Mycenæan signary was to some extent used in the Philistine cities in the fourteenth century B.C. Signs have been found on Egyptian pottery that can scarcely have originated in the hieroglyphs that gave rise to the hieratic script. It may have been from Gaza that the Minæans brought the prototype signs of their alphabet. As our oldest inscriptions in the Phœnician alphabet, dating from the ninth century, show that this system of writing must have been long in use, so our earliest Minæan inscriptions indicate that the South Arabian alphabet already had a long and as yet quite obscure history of development.

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MINAEFF, mė-nä′ĕf, DMITRI (1835-89). A Russian poet, born at Simbirsk. He was educated in a military school, and, after brief service as secretary in the Department of the Interior, from which he resigned in 1857, devoted himself to literature. His most important work was as a translator of parts of Dante's *Inferno*, and of some of the works of Victor Hugo, and, among English poets, of Shelley, Byron, and Marlowe. His original works include poetry, especially satire, and a comedy which won a prize from the Saint Petersburg Academy.

MIN′AHAS′SAS. The natives of the Province of Minahassa in Northern Celebes, called by some authorities Alfuros. A mixture of types certainly exists. Semi-Papuan somatic features have been detected among some of the less civilized tribes, while in many of the villages the Malay type of Celebes prevails. In this province, particularly in the Tondano district, the so-called 'Indonesian' type is to be seen, and infiltrations from Borneo and the Philippines are suspected. The Malayan language proper has in recent years made considerable inroad upon the native dialects. Among the Minahassas women are on an equal footing with men, although from Mohammedan influences some modifications have been made upon the ancient monogamy of this people. The best account of the Minahassas in English is in Hickson, *A Naturalist in North Celebes* (London, 1889).

MINAMOTO YOSHITSUNE, mē′nȧ-mō′tȯ yō′shė-tso͞o′nȧ (1158-1189). A Japanese chieftain. Japanese history in the eleventh and twelfth centuries A.D. is concerned with the struggles of the Taira and the Minamoto clans. In 1159 Yoshitomo, the head of the Minamoto, was killed and his clan defeated. His three sons escaped, and after years of adventure defeated the Taira finally in 1185. Yoshitsune, the youngest of the three, was the lieutenant of his elder brother Yoritomo, and the most efficient warrior in his army. Yoshitsune was in command when the last battle was fought, but his success excited the jealousy of his brother, who sought his death. Escaping with eleven comrades, Yoshitsune was pursued, and committed suicide in 1189. His history, with its adventures, triumphs, and tragic end, is the favorite theme of romance, poetry, and drama. In one form of the story the hero escaped with his life, and found refuge among the Aino in Yeso, where he is still worshiped as a god. Another legend represents him as going to the continent of Asia and identifies him with Genghis Khan.

MIN′ARET. The tower of a mosque (q.v.), corresponding to the bell-tower or campanile of Christian churches, and so called ('light-tower') because on feast days it was illuminated at night. The Mohammedan call to prayer is not by bell, but by the voice of the official termed *muezzin* who at stated times (five times daily) mounts to the summit of the minaret and summons the people from its upper balcony with the prescribed formula. Each mosque has one or more minarets. The normal number for the largest Djami mosques is four, one at each angle of the inclosure. Some have as many as six, e.g. the Ahmed mosque at Constantinople. The mosque at Mecca has the exceptional number of seven.

The usual type is a slender polygonal and cylindrical structure of stone or brick, often rising from a square base and consisting of several stories marked by balconies, either projecting on stalactite supports, or with a receding story above; it is crowned by a pinnacle or small dome. The summit is reached by a winding inner stairway; only the old stone minaret of Tulun at Cairo has an external winding staircase.

The earliest mosques had no minarets. They were first built during the seventh century, the Khalif Omar being said to have erected two at

Kufa and Medina. Those earlier than the twelfth century were usually heavy square structures of stuccoed brick or stone without much ornament. This type is preserved at the mosque of Sidi Okba at Kairwan in Tunis. Among the finest groups of the middle period is that of Cairo—the mosques of Ibn Tulun, Hassan, Barkuk, Kalaun, Bordeï, and Kait Bey. The Tulun mosque had a stone minaret in the centre of one of the sides on a square plan passing first to a cylindrical and then to an octagonal shape. The Hassan mosque has two minarets; that of Kait Bey only one.

The minarets of Egypt, Spain, Syria, India, Persia, and Turkey built between the thirteenth and sixteenth centuries are among the most original and graceful works of Eastern architecture. The Giralda at Seville shows that the Spanish moors maintained the early square type with added delicacy and richness; generally the circular and octagonal types prevail. The old heavy simplicity has been replaced by a wealth of surface decoration in relief and color and by great slenderness. Stalactite corbels support the balconies, arabesques and colonnettes break up the surfaces, and glazed tiles, especially in Persia, add a brilliant coloring. Damascus and Bagdad preserve some of their mediæval examples. The minarets of Ahmedabad rival those of Cairo; those of Delhi and Agra are hardly less interesting. Those of the Constantinople mosques, such as Saint Sophia, Ahmed, etc., are exceedingly graceful. Sometimes the colleges or madrasah had minarets of similar style to those of the mosques, as in that of Sultan Husein at Ispahan, where the towers are similar to those of the great mosque of Ispahan. The height varies exceedingly; among the highest are those of Kalaun (193 feet) and Hassan (280 feet) at Cairo, and the Kutub Minar near Delhi (242 feet). Consult the bibliography of MOHAMMEDAN ART.

MINAS, mē′nȧsh, more properly BELLO HORIZONTE, bĕl′lō ō′rē-zōn′tȧ. The capital of the State of Minas Geraes, Brazil. It is situated on a plateau 60 miles northwest of the late capital, Ouro Preto (q.v.). Though founded as late as 1894, it has now grown into a large and flourishing city of 30,000 inhabitants, with broad streets, public gardens, fine public buildings, and official residences. It is lighted by electricity, and has an excellent supply of pure spring water. It is connected by a branch line with the Central Railroad of the State.

MINAS, mē′nȧs. Capital of the department of the same name in Uruguay. It is picturesquely situated 55 miles northeast of Montevideo, with which it is connected by rail (Map: Uruguay, G 10). It is surrounded by well-cultivated grain-producing lands, and there are quarries of marble and granite in the neighborhood. Population, about 5000.

MINAS DE RIO TINTO, mē′nȧs dȧ rē′ō tēn′to. An important mining town in Southern Spain, in the Province of Huelva, situated among the mountains, 32 miles northeast of the city of Huelva (Map: Spain, B 4). The surrounding country contains almost inexhaustible deposits of copper ore, which were exploited by the ancient Phœnicians. In 1873 the mines were taken over by a London company, and the methods of obtaining the ore revolutionized. The mines now employ 10,000 workers; in 1900 the quantity of ore produced amounted to 1,894,000 tons, from which 21,120 tons of pure copper were derived. The town, which in 1845 had a population of only 800, numbered in 1900, 9956.

MINAS GERAES, mē′nȧsh zhȧ-rīsh′. An eastern State of Brazil, bounded by Bahia on the north, Espirito Santo on the east, Rio de Janeiro and São Paulo on the south, and Goyaz on the west (Map: Brazil, H 7). Area, 221,890 square miles. The State lies wholly in the Brazilian Plateau, with an average elevation of 2000 feet, and is traversed by a number of mountain ranges, which, although the highest in Brazil, are not very prominent, owing to the general elevation of the surrounding country. The principal ranges are the Serra da Mantiqueira along the southern frontier, and the Serra do Espinhaço, running north and south through the centre of the State. At their junction is Mount Itatiaia, about 9000 feet high and the highest point in Brazil. Only the mountain ranges and the river valleys are forested; between them are extensive steppes covered only with grass and scanty shrubbery. Minas Geraes is watered by numerous rivers, including the São Francisco (with its numerous tributaries which take in the larger portion of the State), the headstreams of the Paraná, and the Doce. Of these only the São Francisco is navigable, but it does not afford direct communication with the Atlantic owing to its numerous rapids. The climate differs according to the formation of the surface. It is very hot in the thickly wooded valleys, but moderate and not unhealthful in the more elevated portions, where the temperature may even reach the freezing point during the night. In former years the chief economic interest of Minas Geraes was centred in its gold and diamond mines. At present, however, mining is in a state of decline. Iron ore is found in great quantities; and gold is still mined to some extent, but the diamond mines are well-nigh abandoned. The chief industries are in connection with agriculture and stock-raising, the leading agricultural products being coffee, sugar, corn, beans, and potatoes. Stock-raising is carried on extensively, and cheese is produced in large quantities. The chief manufactures are those of cotton, textiles, and cigars. Railway lines traverse the southern portion of the State and are connected with the Rio de Janeiro lines. Minas Geraes had a population of 3,184,099 in 1890. The inhabitants are largely of mixed origin, and the number of aborigines is still considerable; negroes are also numerous. Minas Geraes was settled at the end of the sixteenth century, immigrants being attracted there by the gold and diamond deposits of the region. It was separated from Rio de Janeiro in 1709 and several times rose in revolt against the central government. Up to 1894 the capital was Ouro Preto (q.v.), but the seat of government was then removed to Bello Horizonte or Minas (q.v.).

MINBU, mĭn′bo͞o. A division of Upper Burma comprising the districts of Minbu, Magwe, Pakokku, and Thayetmyo. Area, 17,170 square miles; population, in 1891, 996,873; in 1901, 1,077,978. Capital, Minbu. See BURMA.

MINCH. The channel which separates the island of Lewes in the Hebrides from the northwest of Scotland (Map: Scotland, C 1). Its shores are exceedingly irregular, and its average width is about 30 miles. It connects with the Sea of the Hebrides to the south by the Little Minch, which is about 15 miles wide, and which separates the island of Skye from that of North Uist and the neighboring islands in the outer Hebrides.

MINCIO, mēn′chō. A left affluent of the River Po, Italy, which it joins near Governalo, ten miles southeast of Mantua, after a southeastern course of about 120 miles. Its source is at Pescheria, where it flows from Lake Garda. It is the ancient Mincius, and during the Austro-Italian wars was an important strategical base, several battles being fought along its banks.

MINCKWITZ, mĭnk′vĭts, Johannes (1812-85). A German poet and classical scholar, born at Lückersdorf. He was educated at Leipzig, was appointed professor there in 1861, and in 1883 removed to Heidelberg. He first gained fame by his translations into German of Homer, Æschylus, Sophocles, Euripides, Aristophanes, Pindar, and Lucien. He also wrote *Vorschule zum Homer* (1863). In the field of German criticism, Minckwitz wrote *Platen als Mensch und Dichter* (1836) and *Leben Platens* (1838), and edited Platen's posthumous papers (1852); and he also published: *Lehrbuch der deutschen Verskunst* (1844); a play, *Der Prinzenraub* (1839); and a volume of popular poems (1847).

MINCOPIES. The native inhabitants of the Andaman Islands. They are in general of very low stature, averaging 1.49 meters, and are subbrachycephalic with an index of 82.6. They have a very low grade of civilization, living in huts called 'chongs,' which consist merely of a roof on four stakes, and going naked. They live by hunting and use a peculiar bow in the shape of an S, which presents a curious analogue to certain Eskimo bows and also to the bows of some Bantu tribes in East Africa. Consult Man, "Aborigines of the Andaman Islands," in the *Journal of the Anthropological Institute*, vol. xi. (London, 1882); Deniker, *Races of Man* (ib., 1901). See Andamans.

MIND (AS. *gemynd*, Icel. *minni*, Goth. *gamunds*, memory, from AS. *munan*, Icel. *muna*, Goth. *gamunan*, to remember; ultimately connected with Lat. *mens*, Gk. *μένος*, *menos*, mind. Skt. *man*, to think). The collective term for the subject-matter of psychology (q.v.). The common-sense view of mind makes it a mind-substance, a spiritual agent, a real, simple, and unitary being, sharply opposed to material substance as 'thought' is opposed to 'extension,' yet interacting with the physical universe under some form of the causal law. This conception of mind has its root in primitive reflection upon the phenomena of sleep, dreams, trance, and death. It received philosophical treatment at the hands of the scholastic psychologists; and, in its current form, is practically a legacy from Descartes. It is doubtless kept alive by its emotional value; it satisfies human aspirations, and accords well with the natural anthropocentric notion of the world at large. It is still held by some psychologists: Ladd openly accepts it, and James, while rejecting it for his psychology, yet admits that, for his personal thinking, it appears "the line of least logical resistance." Nevertheless, such a view of mind is wholly foreign to the spirit and to the requirements of modern psychology. In the first place, it is unsupported by psychological evidence. Had there been the same emotional temptation to reject minds as there has been to posit them, we may be sure that the arguments ordinarily urged in their favor would have received but scant attention. Secondly, the assumption of a real mind is superfluous. "The substantialist view of the soul," says James, "is at all events needless for expressing the actual subjective phenomena of consciousness as they appear:" "the substantial soul explains nothing and guarantees nothing."

In so far, then, as this theory of mind is concerned, modern psychology is what Lange, the historian of materialism, named it: a psychology without a mind, a *Psychologie ohne Seele*. Even the few writers who still cling to the substantialist view make no use of the assumption in their actual presentation of psychological facts and laws: it is only in their concluding remarks, at the point of transition from psychology proper to metaphysics, that mind, the 'unit being,' is introduced. At the same time, it would be entirely erroneous to apply Lange's phrase, without qualification, to mental science. A psychology without some sort of mind would be impossible. The new psychology keeps the term mind, but defines it as the sum-total of an individual's mental experience. Just as a 'plant' is the organized whole of root, stem, leaves, and flowers, and not something above and behind these 'parts,' so is mind the organized whole of our mental processes (q.v.), the interwoven totality of thoughts, feelings, desires, volitions, etc., and not something above and behind these 'manifestations' of mentality.

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MIND, mĭnt, Gottfried (1768-1814). A Swiss painter, born at Bern. He was educated at Pestalozzi's charity school, and studied under Freudenberger. Naturally eccentric, and subject to a deformity, he studiously avoided society. He was fond of cats, his pictures of which are his most characteristic works. He was also successful in the delineation of bears. Although he died poor, some of his pictures have since been sold at very high rates, and have been frequently lithographed. Consult Wiedemann, *Der Katzenraffael* (2d ed., Leipzig, 1887).

MINDANAO, mēn′dä-nä′ō. The second in importance and, according to the latest official estimate, the first in size of the Philippine Islands. It is the southernmost of the large islands of the archipelago, between latitude 5° 21′ and 9° 50′ N., and between longitude 121° 53′ and 126° 28′ E., about 220 miles northeast of Borneo and 270 miles north of Celebes (Map: Philippine Islands, J 12). It is bounded on the north by the channels and seas separating it from the islands of Leyte, Bohol, Cebú, and Negros, the narrowest of these channels being the Strait of Surigao, 7 miles wide, separating the northeastern extremity of the island from Leyte. On the east Mindanao is bounded by the Pacific Ocean, on the south by the Celebes Sea, and on the west by the Sulu Sea.

Area and Configuration. As Mindanao has never been thoroughly surveyed, its area can only be given approximately. It has been estimated as low as 36,237 square miles, including its dependent islands. The official estimate of 1902, however, gives as the area of the mainland, 45,559 square miles, which is larger than that for Luzon (q.v.), and of the 264 dependent islands, 1162 square miles, making a total of 46,721, which, even excluding the dependent islands, is larger than that of the State of Pennsylvania. Mindanao, like Luzon, is very irregular in outline. It consists of a main body about 300 miles long from north to south and 150 miles broad, with a long, irregular peninsula stretching in a semicircle for 180 miles from the centre of the western coast, where it is connected by an isthmus between the Bay of Iligan on the north, and the Bay of Illana on the south. There are numerous other large and small bays on all sides of the island, among which the large and deep Bay of Dávao indenting the south coast is one of the finest and largest of the archipelago. Of the dependent islands the principal (with their areas in square miles) are the following: Camiguín (65) off the north coast, Dinágat (258) and Siargao (176) on the northeast, Sámal (178) in the Bay of Dávao, Balut (42) and Sarangani (25) to the southeast, Olutanga (36) south of the western peninsula, and Basilan (304) forming with about 50 small islets a separate province at the extreme southwestern end.

Topography. The coasts as a rule consist of sandy beaches interrupted by numerous rocky headlands. Almost everywhere the forest-covered mountains approach close to the shores, and the interior is in general very mountainous, containing the highest peaks in the Philippines, such as Mount Malindang, 8697 feet high, in the northwestern part, and the volcano of Apo, 10,312 feet, west of Dávao Bay. The mountain system consists of a number of irregular, broken, and roughly parallel chains traversing the island from north to south, and inclosing between them large and fertile river valleys. The configuration of the mountains in many places bears evidence of having been influenced and even originated by volcanic action. There are several active and a number of extinct volcanoes, while plains of volcanic matter as well as sulphur and hot springs occur, and the island is subject to frequent and violent earthquakes. Very little, however, is known of the geology of Mindanao.

Hydrography. The two principal river systems lie on either side of the central mountain range, both of them running almost the entire length of the island. On the east is the Agusan, running northward into the Bay of Butúan; on the west is the Rio Grande de Mindoro, running south, then west into the Bay of Illana, and rivaling in size the Cagayán of Luzon. Both of these systems include several large lakes. Owing to the proximity of the mountains to the coasts, most of the remaining rivers of Mindanao are short and torrential.

Climate. Being situated at the southern end of the archipelago, within 10° of the equator, and being less exposed to cooling winds than the northern islands, Mindanao has a hot and humid climate. The warm and moisture-laden south winds are particularly enervating, though the land breezes from the mountains are cool and refreshing. The climate is more equable than that of Luzon, and the island is seldom touched by the typhoons, which rage only among the northern islands. The rainfall is very heavy, often exceeding 100 inches, and reaching sometimes 140 inches in a year. Several parts of the island are subject to destructive inundations.

Flora and Fauna (for general description see Philippines). The vegetation of Mindanao, even compared with the rest of the archipelago, is remarkably luxuriant. Almost the whole island is covered with forests so interwoven with canes and vines as to form in many places an impenetrable jungle. The flora partakes of the character of that of Celebes and the Moluccas; cinnamon, nutmeg, and other spices, and betelnuts grow wild, and the forests abound in the most valuable building timber and cabinet woods.

The animal life is equally abundant and varied, including, besides the species common to all the islands, many species peculiar to Mindanao. Monkeys are very numerous, and especially characteristic is the white monkey (*Macacus Philippinensis*). Reptiles, including venomous snakes, abound, and the rivers are infested with crocodiles. Consult: *Mindanao, su historia y geografía* (Madrid, 1894); Gonzalez Parrado, *Memoria acerca de Mindanao* (Manila, 1893). See Philippine Islands.

MIND CURE. See Hypnotism; Mesmerism; Suggestion.

MIN'DELEFF, Cosmos (1863—). An American archæologist, of Russian parentage. From 1882, when he was attached to the United States Bureau of Ethnology, he devoted himself to the study of the aboriginal habitations of New Mexico and Arizona. He became specially skilled in the modeling of these, and wrote articles upon "The Influence of Geographic Environment" (*Bulletin of the American Geographical Society*, xxix., 1897), and a series upon "Pueblo Arts and Sciences" (*Scientific American*, 1898). He and his brother, Victor Mindeleff, prepared the first exhaustive report on Pueblo architecture, and Cosmos made plans (1891) for the restoration of the Casa Grande cliff dwellings in Arizona.

MIN'DEN. An ancient town in the Province of Westphalia, Prussia, situated on the left bank of the navigable Weser, 39 miles by rail west-southwest of Hanover (Map: Prussia, C 2). It is an old-fashioned town with modern suburbs laid out on the site of the fortifications demolished in 1873. Its public buildings include the thirteenth century cathedral, a fine early Gothic structure with valuable works of art in its treasury; the town hall; the government buildings; and the gymnasium, having an aula decorated with fine paintings. Minden manufactures cigars, glassware, chemicals, chicory, iron products, etc. The trade is quite active. Minden is supposed to be of Roman origin. Charlemagne made it the seat of a bishopric, which was converted into a secular principality in 1648, and united with Brandenburg. Population, in 1890, 20,223; in 1900, 24,327, chiefly Protestants.

MINDEN. A city and the county-seat of Kearney County, Neb., 128 miles west by south of Lincoln; on the Chicago, Burlington and

Quincy Railroad (Map: Nebraska, F 3). It is the centre of a farming and stock-raising district, and has some manufactures. There is a public school library of 3000 volumes. Population, in 1890, 1380; in 1900, 1238.

MINDORO, mēn-dō'rō. One of the Philippine Islands, among which it ranks seventh in size. It is situated south of the main body of Luzon, from which it is separated by a sea channel, 7½ miles wide (Map: Philippine Islands, E 6). Its extreme length from northwest to southeast is 110 miles, and its greatest width is 58 miles. The area of the mainland is 4040, and of the 26 dependent islands 68 square miles, making a total of 4108 square miles. The island has an oval shape with no large indentations, though there are a number of small bays and several almost land-locked harbors. The coasts, though generally having deep water close to shore, are lined, especially along the west side, with submarine reefs. Mindoro is, next to Mindanao, the most elevated of the Philippine Islands. The whole interior forms a mountainous plateau, reaching in Mount Halcón the height of 8860 feet. Almost the whole of the island, from the mountain summits to high-water mark, is covered with unbroken virgin forests, though in the narrow strip of lowland along the western coast there are some prairie and marshy regions. The rivers are all short and simple streams running down from the edge of the plateau on all sides, there being no large river-system. The climate is more variable than that prevailing in the southern islands, and Mindoro is especially exposed to the monsoons. The proximity of the forests to the coast towns renders these unhealthful and subject to intermittent and typhoid fevers.

In spite of the fertility and natural wealth of the island, its economic conditions are in a very backward state. A very small portion of it is cultivated, and the yield of agricultural products is scarcely enough for home consumption. The cultivation of sugar, cotton, and hemp is increasing, and a little of the latter is exported. The mineral wealth is believed to be considerable, but only the coal-beds and sulphur springs have begun to be exploited. The principal exports are forest products, such as timber and pitch, and the forests also are the basis of the principal industries—wood-cutting and rattan-splitting. Communication is almost exclusively carried on in coasting vessels, the interior being a rough and pathless wilderness.

The population of Mindoro was estimated in 1901 at 106,000, including some 30,000 savages inhabiting the interior. The inhabitants are chiefly Malayans, with a few Visayans, and the languages spoken are Visayan, Manguiano, and Tagálog. By the act of the Philippine Commission of June 23, 1902, Mindoro was incorporated in the Province of Marinduque, with the capital at Bóac, situated on the island of Marinduque (q.v.). See PHILIPPINE ISLANDS.

MIND-READING. See MUSCLE-READING; TELEPATHY.

MIND-STUFF THEORY. A metaphysical theory which explains the relation of matter and mind by affirming their identity under the form of atoms of mind-stuff. These atoms are of a nature between physical atoms and psychical monads, representing an indivisible element, as the former, but being qualitatively rather than quantitatively determined, as the latter. Mind and matter, according to this theory, are but forms of composition of the atoms of mind-stuff; only under the most rarely favorable conditions does this composition result in intelligence, as in the higher animals, but at the same time no matter is to be conceived as 'dead' matter, since it is built up of elements whose essential character is psychical. The theory was propounded by W. K. Clifford, in *Mind* (old series), vol. iii.

MINE, SUBMARINE. See TORPEDO.

MINE GAS. An explosive gas encountered in coal mines, also known as fire-damp. It consists principally of marsh gas (CH_4), which is the combustible element, but it contains also small proportions of nitrogen and carbon dioxide. Owing to its light specific gravity—about one-half that of air—it is always found in the upper portions of the workings. The explosive qualities are first shown when the gas is mixed with from four to five volumes of air; when free from air it will not take fire. The danger resulting from the presence of this gas in coal mines has largely been removed, in recent years, by the use of the safety lamp (q.v.) and by improved methods of ventilation. See COAL.

MINEO, mē-nā'ō. A town in the Province of Catania, Sicily, 27 miles southwest of Catania (Map: Italy, J 10). It occupies the site of the ancient Menæ, founded by Ducetius, 459 B.C., and captured by the Saracens in 840. In the vicinity is the famous Lago de' Palici, the *Lacus Palicorum* of volcanic origin. Population, in 1901, of commune, 9828.

MI'NER, ALONZO AMES (1814-95). A Universalist minister. He was born at Lempster, N. H. He received an academical education, and after teaching for several years was ordained to the Universalist ministry in 1839, and served as pastor to churches in Methuen, Lowell, and Boston, Mass. He was president of Tufts College, Medford, Mass., from 1862 to 1874, when he returned to his former pastorate of the Second Universalist Church, Boston. He was appointed a member of the Board of Overseers of Harvard University in 1863; was a member of the State Board of Education of Massachusetts from 1869, serving twenty-four years, and chairman of the Board of Visitors to the State Normal School from 1873; was for twenty-one years president of the Massachusetts State Temperance Alliance, and was the Prohibition candidate for Governor in 1878. He was the original projector of the Universalist Publishing House in Boston, and was prominent in the anti-slavery agitation. He edited the journal, *The Star of Bethlehem*, contributed to periodicals, and published *Bible Exercises* (1854); *Old Forts Taken* (1878); and *Doctrines of Universalism*. His *Life* has been published by Emerson (Boston, 1896).

MINER, CHARLES (1780-1865). An American author, born at Norwich, Conn. When nineteen years old he removed with his family to the Wyoming Valley in Pennsylvania, where he became interested in various newspapers. He was a member of Congress from 1825 till 1829. The most important of his publications is a *History of Wyoming* (1845), which contains a description of the Wyoming massacre given by eye-witnesses.

MINERAL ACID (in Medicine). An acid not of animal or vegetable origin. The ordinary mineral acids are sulphuric (oil of vitriol), nitric (aqua fortis), hydrochloric (muriatic), nitrohydrochloric, and phosphoric. In their medicinal action they have many properties in common.

The strong acids are escharotic, abstracting the waters of the tissues, combining with the albumin and other bases, and destroying the protoplasm. They are very diffusible. Sulphuric and phosphoric acid have a strong affinity for water, completely decomposing tissues to which they are applied; they are therefore powerfully escharotic. Sulphuric acid makes a black eschar, while nitric and hydrochloric acid turn the tissues yellow.

These acids diluted produce a peculiar taste in the mouth and a sensation of roughness on the teeth. They stimulate the flow of saliva from the parotid and submaxillary glands. They promote the alkaline secretions of the intestines and of glandular organs (bile, etc.), but check the secretions of acid fluids, as the gastric juice. Given before meals, in small doses, they relieve undue acidity of the stomach by checking the production of the acid gastric juice. At first they aid digestion, being helpful to the action of pepsin, but if continued they impair digestion by lessening the production of the gastric juice. They check fermentation and constipate the bowels, except nitric acid, which relaxes them. They are all astringent to the tissues, hydrochloric being the weakest and sulphuric the strongest in this respect.

Antidotes for poisoning by these acids are: alkalies, such as bicarbonate of soda, lime water, or plaster from a wall mixed with water to neutralize the acid; oil, albumin, and milk to protect the mucous membranes. For stimulants, opium and ammonia (intravenously) may be used to counteract the resulting depression of the vital powers.

All these mineral acids, if well diluted, are useful in fevers, especially in typhoid. Hydrochloric is here preferable. Nitric is the acid generally preferred as a caustic, its action being effectual and superficial; it may be applied undiluted to phagedenic ulcers and sloughs, warty growths, and indolent sores. Dilute nitric and nitrohydrochloric acids are used internally in oxaluria and lithæmia, intermittent and remittent fevers, and aphonia of singers, and in chronic hepatic disorders due to malaria. Sulphuric acid, dilute, is appropriate in cases of hemorrhage, diarrhœa, colliquative sweating, and as a prophylactic against lead-poisoning; it is used also as an acid drink in fevers and before meals in acidity of the stomach. Phosphoric acid is considered of special value in tissue waste, and it is thought to diminish the growth of osseous tumors, and to dissolve phosphatic deposits. All these acids act injuriously on the teeth, by attacking the enamel. They should always be administered largely diluted, taken through a straw or glass tube; and the mouth should be thoroughly rinsed at once with an alkaline wash. See NITRIC ACID; HYDROCHLORIC ACID.

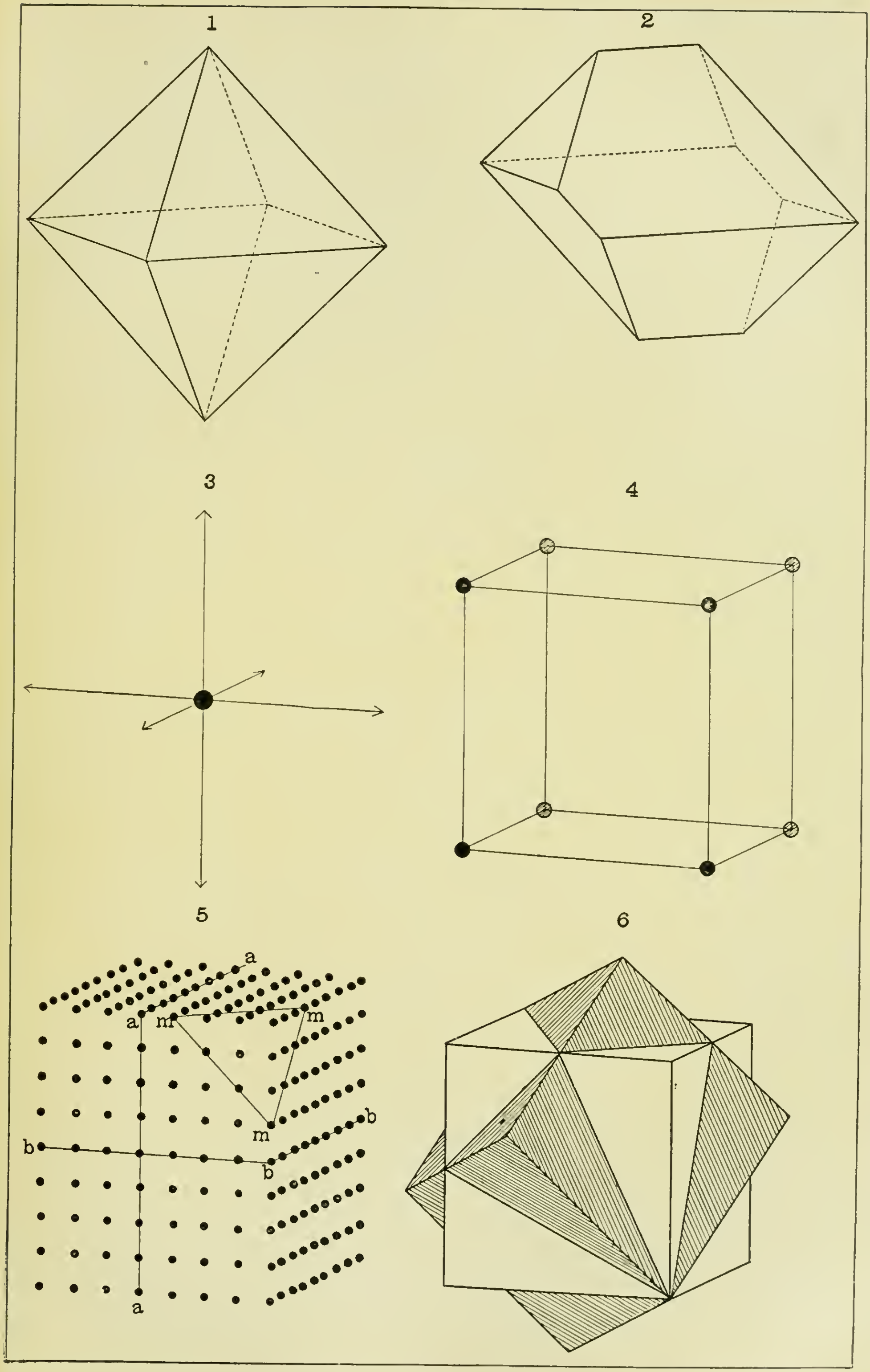
MINERAL COLORS. A term applied to a number of inorganic substances used in the manufacture of paints. The principal mineral colors include the following: *white lead*, consisting chiefly of lead carbonate; *zinc white*, or oxide of zinc; *antimony white*, or oxide of antimony; *fixed white*, or barium sulphate; *mineral white*, or calcium sulphate; *china clay*, or aluminum silicate; *whiting*, or calcium carbonate; native or artificial *yellow ochres*, i.e. earths colored by iron oxide; *massicot*, or oxide of lead; *strontian yellow*, or chromate of strontium; the chromates of cadmium, mercury, and barium; *mineral yellow*, or oxychloride of lead; *Naples yellow*, or antimonate of lead; *orpiment*, or sulphide of arsenic; *rouge*, or red oxide of iron; *vermilion* and *cinnabar*, or sulphide of mercury; *Derby red*, or basic chromate of lead; *minium* ('red lead'), or lead ortho-plumbate; *realgar*, or red sulphide of arsenic; *Brunswick green*, or oxychloride of copper; *Scheele's green*, or copper arsenite; *Schweinfurt green*, a mixture of copper acetate and Scheele's green; *cobalt green*, or cobalt and zinc oxide; *umber*, or brown silicate of iron and manganese; native or artificial *brown ochres*, i.e. earths colored by iron oxide; *Berlin blue*, or ferrocyanide or iron; *Thénard's blue*, or aluminate of cobalt; *ultramarine blue*, a compound of aluminum, sodium, silicon, oxygen, and sulphur; etc. The principal mineral colors are described in special articles or in connection with the metals or acids combined in them. See also PAINTS; PAINTERS' COLORS.

MINERAL DEPOSITS. See ORE DEPOSITS; and the articles on the different ores and minerals.

MINERALOGY (by haplology for **mineralology*, from *mineral*, OF. *mineral*, Fr. *minéral*, from ML. *minerall*, ore, from *minera*, *mineria*, *minaria*, mine, from *minerarius*, pertaining to mines, from *minare*, to mine, lead here and there, Lat., to drive, from *minari*, to threaten, from *minæ*, threats, from *minere*, to jut out + -λογία, *-logia*, account, from λεγειν, *legein*, to say). The science of those natural substances known as minerals which, together or separately, form the material of the earth's crust, and also, as far as our knowledge extends, that of other celestial bodies. A mineral is a substance of definite chemical composition which has been directly produced by the processes of inorganic nature. It must be homogeneous even when submitted to minute microscopic examination, and must possess a definite composition capable of being expressed by a chemical formula. Laboratory and furnace products, or such substances as shells and bones of animals, cannot be included in the range of mineralogy. It is the function of the mineralogist to investigate the form, properties, and composition of minerals; their genesis; their relations to one another, and to the accompanying rocks; the places where they are found; and the geological conditions under which they are formed. A knowledge of mineralogy is of importance to the geologist in his study of the rock formations, to the mining engineer in his search for metal-producing minerals, and to the metallurgist in the extraction of metals from minerals. Many of the useful arts are directly dependent for their raw materials upon minerals, while some mineral species occur in such brilliancy and beauty of color as to be highly prized as gems.

THE BRANCHES OF MINERALOGY. The general subject of mineralogy may be divided into four sections: (1) *Crystallography*, which includes the description of crystals, their character, classification, the mathematical relations of their

MINERALOGY



1. Normal crystal form developed equally in all directions.
2. Same crystal form as 1, distorted.
3. Crystal molecule showing an arrangement of attractive and repellent forces.
4. Network of molecules formed on the lines of crystallizing forces shown in 3.
5. Further development of network shown in 4 to explain cleavage.
6. Twin crystal formed by two interpenetrated cubes.

faces and the methods of expressing them graphically and symbolically. (See CRYSTALLOGRAPHY.) (2) *Physical mineralogy,* which describes the physical characters of minerals and deals with the properties related to their molecular structure. (3) *Chemical mineralogy,* which has for its object the determination of the chemical composition of each mineral species and the relation in composition between species in the same chemical group. (4) *Descriptive mineralogy,* which includes the detailed description of each mineral species with respect to its form, structure, physical properties, chemical composition, and geographical and geological occurrence. The division of physical mineralogy is replete with interesting problems of cohesion, optics, heat, and electricity, and suggests to the investigator along physical lines many fields for research. The problems connected with chemical mineralogy, while covering a narrower and less varied field than those of physical mineralogy, are none the less replete with interest. To the chemist working in the field of mineralogy belongs the task of determining the part played by the various elements which enter into the composition of the hundreds of mineral species, many of which are rare and exceedingly complex in composition; the phenomena of isomorphism and dimorphism, and the chemical alteration of mineral species under the action of natural agencies, which is known as pseudomorphism.

CRYSTALLOGRAPHY. With very few exceptions (mercury and water), minerals are limited to solid substances; that is, they are solid at the present temperature of the earth. In discussing their formation and character, we must, however, revert to the period when the mineral constituents of the earth existed in a fluid or semifluid state. When a homogeneous substance passes from a fluid to a solid condition, its particles mutually attract each other along certain definite lines and a solid is built up which shows a definite structural relation between all its integral parts, which relation finds expression in its outward form. Such a solid, formed from a nucleus by the piling up of accretions from without, is known as a crystal and is characterized by a regular polyhedral form, bounded by more or less smooth surfaces. A crystal is then the normal form of a mineral which has solidified under ideal conditions and, should its formation be uninterrupted by external agencies, its appearance would be that of a symmetrical geometric solid with smooth faces and sharp edges and angles. Such are the ideal representations, which serve to illustrate the crystallization of mineral species and which are to be found in all text-books on the subject. But inasmuch as the ideal conditions mentioned above are of comparatively rare occurrence, it is far more common to find minerals in more or less distorted forms. (See Figs. 1 and 2.) Large and well-formed crystals are, in general, produced by a slow process of crystallization, whereas a rapid cooling or concentration of a mineralizing solution tends to form aggregates often resembling the forms of animate nature; such are the frost patterns which form on window panes, the coral-like forms of calcium carbonate to be found in some caves, and many other imitative forms described in the terminology of mineralogy. Where individual crystals are entirely lacking, the mineral is said to be massive, although its structure as determined by optical and other methods may be distinctly crystalline.

Regarding the nature of the crystalline units of accretion, there is at present very little knowledge. They are without doubt extremely minute and may possibly consist of a number of chemical molecules. Whatever may be the size or shape of the crystal units or crystal molecules, it is sufficient for the purpose of discussion to regard them as points. A fuller discussion of this subject will be found under CHEMISTRY (q.v.). The crystal molecules of any chemical substance crystallizing under given conditions are believed to be identical in size and shape. They are never in contact with each other, but are held in equilibrium by attractive and repellent forces acting along lines which differ for each type of crystal molecule. A crystal molecule having these lines of crystallizing force at right angles, as shown in Fig. 3, would attract like molecules, which would arrange themselves as shown in Fig. 4. The theoretical grouping of molecules has been discussed by Sohncke, Fedorow, Schönflies, and Barlow, who have developed 230 possible groupings. These, however, divide themselves into 32 distinct groups identical with the 32 groups mentioned under CRYSTALLOGRAPHY (q.v.).

If we assume the molecules of a substance to be grouped as shown in Fig. 5, it will be readily seen that the lines of minimum cohesion will be *aa* and *bb* rather than *mm*, because the former planes are further separated from the next adjacent parallel plane. This explains in a measure the fact that crystallized substances often tend to break or cleave parallel to a primary crystallographic face. Assuming a crystal molecule of any given mineral to be held in equilibrium by forces acting in definite directions, it will be readily seen that the crystal built up from accretions of such molecules will, of necessity, present faces which are symmetrically disposed with respect to those lines of crystallizing force. Thus we have as a fundamental law of crystallization the principle that a mineral can only crystallize in forms whose symmetry is referable to one of the 32 groups mentioned in the foregoing paragraph. This is known as the law of symmetry. The number of planes possible from the grouping together of crystal molecules of a substance is invariably greater than the number occurring on any given crystal; and modifying planes are common, often running to great complexity, and under unusual conditions predominating over the commoner types. Hence we frequently find great variety of form in crystals of the same substance, as is the case with the mineral calcite (q.v.). It should, however, be noted that crystals of a mineral from a certain locality, which are presumably formed under the same conditions, show a marked similarity of type and are readily distinguishable from those of the same mineral from a different locality. This variation in type, which is known as crystal habit, is particularly noticeable in large and widely distributed species. Certain mineral species exhibit a tendency to join two crystals or two halves of the same crystal in such a manner that some crystallographic plane or axis is common to both. This juxtaposition, which is ordinarily distinguished by reëntering angles, is known as *twinning.* See Fig. 6.

It will be readily seen from the above that an accurate knowledge of the occurring crystal forms is of primary importance in the investigation of any mineral species. The identification of the faces of the crystal, which is often attended with considerable difficulty, is accomplished by measuring the interfacial angles by means of an instrument called a goniometer (q.v.) and comparing these with the calculated relations obtained from simple mathematical formulas based on spherical trigonometry. The optical properties of minerals as well as their presence and relations in rocks are determined by means of the petrographic microscope. (See MICROSCOPE.) For exhaustive study along the line of physical characters, elaborate and accurate apparatus is required, while a well-equipped chemical laboratory is almost indispensable to the mineralogical investigator.

MINERALS AND ROCKS. One of the most important phases of mineralogical study, and one which is replete with interest to the geologist, is the relation of minerals to rocks. The division known as the crystalline rocks, in particular, presents a wide and varied series of rock-forming minerals. These may be classed as essential and accessory constituents according as they give character in the rock in which they occur or are present only in insignificant proportions. Quartz, the feldspars, the micas, hornblende, augite, enstatite, hypersthene, chrysolite, garnet, leucite, serpentine, calcite, and dolomite are essential constituents of many crystalline rocks, while such minerals as gypsum, salt, limonite, hematite, siderite, kaolin, magnetite, and apatite often occur in such extensive deposits as to constitute rock masses. Among the accessory rock-forming minerals may be mentioned graphite, corundum, vesuvianite, chiastolite, cyanite, tourmaline, zircon, titanite, etc. Many geologists have made use of the mineralogical character of rocks as a basis of classification, particularly in the case of the igneous rocks, and, though open to some objection from the standpoint of geological inquiry, the system as applied to crystalline rocks has much to commend it.

MINERAL CHEMISTRY. Comparatively few elements exist in nature uncombined; the great majority of minerals occur as salts of relatively few mineral acids. Minerals crystallizing from a mineralizing fluid, whether it be a solution or a fusion, combine the elements existing in that fluid in strict accordance with the laws of chemistry. The resulting minerals may, however, be somewhat modified by the presence of elements foreign to their typical formulas, as in the case of the emerald variety of beryl, which owes its brilliant green color to the presence of a small amount of chromium not represented in the normal composition of beryl. Again, certain elements closely related in chemical character frequently replace one another in mineral composition, the relative proportions varying between limits and giving rise to a group of closely related compounds. Such is the columbite-tantalite group, which presents all the gradations from normal columbite ($FeNb_2O_6$) to normal tantalite ($FeTa_2O_6$). Minerals closely related in composition often exhibit a striking similarity in crystal form. When such isomorphous compounds are present in the same magma they are not separable in the process of crystallization, but tend to produce a mineral intermediate in composition; as when the isomorphous carbonates dolomite and siderite grade into the intermediate compound ankerite. An extremely interesting group is that of the triclinic feldspars or plagioclases which are regarded as isomorphous mixtures of the molecules of the two isomorphous species albite and anorthite. Mineralogy affords several examples of mineral species identical in chemical composition, but crystallizing in forms which are essentially different. This condition, which is known as *dimorphism*, is represented by the two calcium carbonates calcite and aragonite and by the two iron disulphides pyrite and marcasite. Titanium dioxide, which is trimorphous, occurs as rutile, octahedrite, and brookite.

CLASSIFICATION OF MINERALS. The most logical and convenient scheme of classification of minerals is that which is adopted by Dana in his *System of Mineralogy* and which is now, with slight modifications, universally used. By this method mineral species of similar composition are placed together in classes which are subdivided into divisions. These in turn are split up as far as possible into isomorphous groups. The principal classes are:

(1) Native elements.

(2) Sulphides—Sulphides, selenides, tellurides, arsenides, and antimonides.

(3) Sulpho-salts—Sulpharsenides, sulphantimonides, and sulphobismuthites.

(4) Haloids—Chlorides, bromides, iodides, and fluorides.

(5) Oxides.

(6) Oxygen Salts—Carbonates, silicates, and titanates; niobates and tantalates; phosphates, etc.; borates and uranates; sulphates, etc.; tungstates, molybdates.

(7) Salts of the organic acids.

(8) Hydrocarbons.

USES OF MINERALS. By far the most important of the uses to which minerals are put is that of producing metals from those of them which contain metal constituents in sufficient quantity to render their mining profitable. The discussion of the distribution and mode of occurrence of metallic ores involves many questions of a purely technical nature and belongs essentially to the province of ore deposits (q.v.). A few metals such as gold, platinum, copper, arsenic, and to some extent silver, antimony, bismuth, and mercury are found native, that is, uncombined with other elements. The majority of the metallic ores, however, occur as sulphides, oxides, or carbonates of the various metals, or more rarely as arsenides, tellurides, chlorides, or silicates. Association of metallic minerals in more or less intimate mixtures often gives rise to highly complex ores. Many ores which are essentially compounds of the base metals contain gold and silver in appreciable amounts and are profitably mined for the latter metals, as is the case with the argentiferous galena of Colorado, Montana, and Utah.

The non-metallic minerals, although of less importance commercially than the metallic ores, are none the less of great and increasing value in the arts. These are grouped, with reference to their application, into: (1) Substances used for chemical purposes, embracing the minerals employed in the manufacture of acids, chemicals, soda, alum, plaster of paris, etc. (2) Ceramic materials used in making pottery, bricks, tiling, paving blocks, terra-cotta, porcelain, and glass. (3) Refractory materials, used in the manufacture of fire-proofing, linings of furnaces, crucibles, and asbestos fabrics. (4) Abrasives, embracing diamonds, emery, garnet, and quartz sand. (5) Graphic materials, embracing chalk, graphite, pencil stone, lithographic limestone, etc. (6) Pigments, including minerals ground for paints, and paint adulterants. (7) Fertilizers, represented by the lime phosphates, marls, and land plaster. (8) Mineral fuels, including coal, petroleum, and natural gas. The use of certain minerals for gems is probably of very ancient origin. The extreme hardness of the diamond, sapphire, ruby, emerald, chrysoberyl, and other precious stones protects them from injury and renders them capable of being highly polished.

Synthetic Mineralogy. Almost all of the important minerals have been successfully produced artificially, and much light has been thrown upon the formation of natural minerals in this way. The methods applied to this line of research involve in the majority of cases a fusion at a high heat for a long period. In a number of instances artificial minerals have been accidentally produced in the course of various metallurgical operations, and the interiors of retorts and furnaces often furnish interesting examples of this phase of mineral genesis. In point of economic importance these experiments, though interesting, have not as yet achieved a marked degree of success in the production of gems, and although both the ruby and the diamond have been made in this way, the crystals in every case have been comparatively small.

Analysis of Minerals. The determination of minerals is largely a question of experience gained by the study of large and varied collections of specimens. The eye becomes trained by practice to recognize crystallizations even in distorted and imperfectly exposed forms, to associate certain colors, lustre, and structure with definite species, and to associate certain minerals with certain rock matrix. Several physical properties are of considerable aid in identifying questionable specimens, as, for example, the color of the powdered mineral as shown by rubbing it on unglazed porcelain, the approximate relative hardness as determined by scratching the specimen with a knife point, and the relative weight as roughly determined by weighing the specimen in the hand. These rough determinations which are of particular value as field methods may be supplemented, with the addition of some simple and portable apparatus, by determinations of solubility and fusibility. A more detailed examination of the composition of a mineral involves recourse to the blowpipe analysis. Some idea of the results obtained by this form of analysis will be gained by an examination of the accompanying plate, which shows the reactions obtained from some of the fusible metals by heating their compounds with suitable fluxes on charcoal and plaster supports. The coatings of iodides are produced by using a flux composed of two parts sulphur and one part each of potassium bisulphate and potassic iodide. Reactions for iron, copper, manganese, nickel, cobalt, chromium, and other metals are obtained by dissolving small portions of their compounds in hot beads of borax or microcosmic salt and subjecting the resulting fusion to the oxidizing and reducing action of the blowpipe flame. The color imparted to the blowpipe flame serves as a test for compounds of calcium, strontium, lithium, barium, sodium, and other elements. These tests as well as others of similar nature merely announce the presence or absence of an element; the relative amount when required must be determined by a systematic quantitative analysis.

History. Although a few mineral species were known to philosophers at an early date in the world's history, it was not until the development of chemistry from alchemy in the sixteenth century that savants approached the subject of mineralogical knowledge in the true spirit of scientific investigation. As a natural outcome of the comparatively advanced state of mathematical knowledge at the period of this scientific awakening, the subject of crystallization early developed a marked importance. In 1783 Delisle, with the aid of a primitive form of goniometer, measured the interfacial angles of a number of crystals and established the law of constancy of interfacial angles. The Abbé Haüy about the same time developed a theory correlating the internal structure of crystals with their outward form. He practically formulated the law of rational indices which constitutes the corner-stone of crystallography. Haüy was followed by Hausmann with his application of spherical trigonometry in 1803, Weiss with a development along purely mathematical lines in 1814, Mohs with a division of crystals into six systems in 1822, Naumann in 1823, and W. H. Miller in 1839. In recent years the science has made vast strides, and new methods and lines of research are being constantly developed. Our knowledge of the science of mineralogy is constantly enriched by the discovery of new species, while mining and quarrying operations are continually bringing to light new and interesting crystalline forms and varieties of well-known minerals.

Research in physical mineralogy is being extended, notably in Germany, along a number of lines, and from time to time valuable additions are made to our store of knowledge by careful and exhaustive studies of the optical, thermal, and electrical properties of certain mineral species. A method by which the symmetry of crystallized minerals may be investigated has been developed by Baumhauer, Beck, and others. This method depends upon the development of minute angular cavities upon crystal faces by means of the interrupted action of some dissolving medium. The symmetry of these pits, which are known as etch figures, conforms to the crystallographic symmetry of the mineral experimented upon. Of a similar nature in their bearing upon the question of crystal structure are the percussion figures and solution planes which have been made objects of special study by several authors.

The artificial formation of minerals opens another line of research upon which much valuable work has been done by Daubrée, Fouqué, Michel Levy, Friedel, Bourgeois, Meunier, and others.

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Valuable text-books on determinative mineralogy are: Brush, *Determinative Mineralogy and Blowpipe Analysis* (ed. by Penfield, New York, 1896); Endlich, *Manual of Qualitative Blowpipe Analysis* (New York, 1892).

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The following works are useful for reference on subjects connected with economic mineralogy: Dewey, *Preliminary Descriptive Catalogue of the Systematic Collections in Economic Geology and Metallurgy in the United States National Museum* (Bulletin 42, United States National Museum, Washington, 1891); Merrill, *Guide to the Study of the Collections in the Section of Applied Geology: The Non-Metallic Minerals* (United States National Museum, Washington, 1901); Rothwell and Struthers, *The Mineral Industry* (New York, annually, 1892 et seq.).

In addition to these the reader is referred to the volumes on *Mineral Resources of the United States*, published by the United States Geological Survey (Washington, 1882 et seq.).

MINERAL PAINTS. A term applied to mineral substances which are mined, ground, and sometimes purified for use as pigments. It includes a variety of natural materials as well as some artificial products. The essential characteristics of mineral paints are permanence of color and sufficient adhesion when applied to a surface to prevent scaling and to keep out moisture. Among the important substances included under the heading of mineral paints are *ochre*, *sienna*, and *umber*. These are clays which owe their color largely to limonite, although sienna and umber are colored in addition by manganese. Ochre occurs at a number of localities in the United States, the larger supply being obtained from Pennsylvania and Georgia. It is usually ground, washed to remove sand, and screened before shipment. Umber and sienna are found in but small quantities in the United States, and the chief supply of them is obtained from abroad. *Slate* and *shale* are ground for paint, the former being the refuse from slate quarries. The colors obtained from them are usually red, green, blue, yellow, and brown. *Barite*, or *barytes* as it is called commercially, is used as a substitute for or an adulterant of white lead in the manufacture of white pigments; for this purpose it must be free from iron, and therefore its preparation for market consists not only in grinding, but in some cases may include treatment with sulphuric acid to remove the stains. The main supply of barite is obtained from Missouri, North Carolina, Virginia, and Tennessee. It is cheaper than white lead, and does not turn yellow on exposure to the air. *Metallic paint* is a term applied to certain materials obtained by the grinding of hematite ores. The color of the paint is often changed or improved by previous roasting; the iron ore most frequently employed is that known as the Clinton ore, occurring in the Clinton division of the Silurian system of rocks. Metallic paint is mined in several States, notably New York, Pennsylvania, Wisconsin, and Tennessee; it is frequently employed for coloring mortars. *Graphite* and graphitic shale are used for making black paint, and have been found specially desirable for the coating of metallic surfaces. The main supply for this purpose is obtained from Ceylon, although small quantities are mined in the United States.

ARTIFICIAL MINERAL PAINTS. Under this heading are included Venetian red and Indian red, which are pigments obtained by roasting iron sulphate or copperas; white lead, produced by the action of acetic acid on metallic lead; red lead, formed by roasting of litharge; litharge, the reddish, partially roasted protoxide of lead; orange mineral, formed by the oxidation of white lead on the hearth of a reverberatory furnace; and zinc white, or zinc oxide, which is produced by the roasting of zinc ores.

The production of mineral paints in 1901 amounted to 232,347 short tons, valued at $18,417,068, while the imports were valued at $667,094. Consult: Jones, *Testing and Valuation of Raw Materials Used in Paint and Color Manufacture* (London, 1900). For statistics of production, consult *Mineral Resources*, issued by United States Geological Survey (Washington, annual).

MINERAL TALLOW, or HATCHETTITE. A yellowish-white, soft, flexible mineral wax or tallow that melts at 46° or 47° C., and consists of about 86 per cent. of carbon and 14 per cent. of hydrogen. It is found in the coal measures in Glamorganshire, Wales; Argyleshire, Scotland; and Moravia, Austria. See OZOKERITE.

MINERAL WATERS. The term usually applied to spring waters which have a variable quantity of solid substances in solution, and on this account may exert effects on the human body different from those of ordinary water. Mineral waters have been used as remedial agents from a very early period. The oldest Greek physicians had great faith in their curative power, and the temples erected to Æsculapius were usually close to mineral springs. We are indebted to the Romans for the discovery not only of the thermal springs in Italy, but also of some of the most important springs in other parts of Europe, as those of Aix-la-Chapelle, Baden-Baden, Bath, and Spa in Belgium. In the United States mineral springs have also attracted attention since an early period. At Saratoga Springs, for example, the High Rock Spring was known to the white people as early as 1767, and the American aborigines seem to have been acquainted with its important properties even before that date. In West Virginia and Virginia seven springs were already noted in 1831, and of these the Bath mineral spring, now

MINERALOGY

INCRUSTATIONS ON PLASTER OF PARIS SUPPORT

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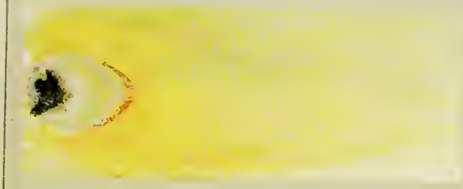
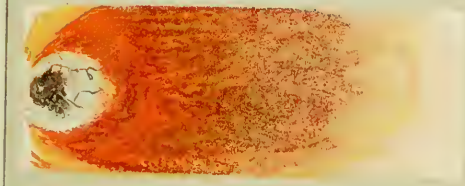


LEAD IODIDE

4



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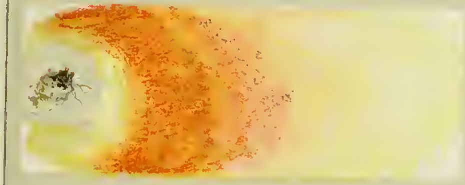

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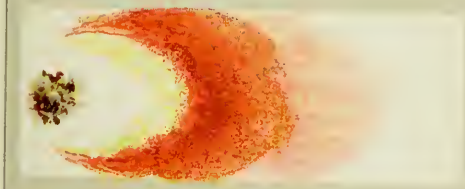

MERCURY IODIDE

INCRUSTATIONS ON CHARCOAL SUPPORT

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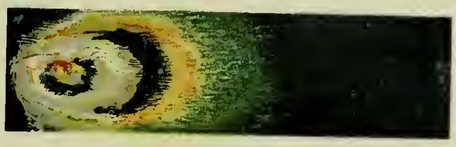

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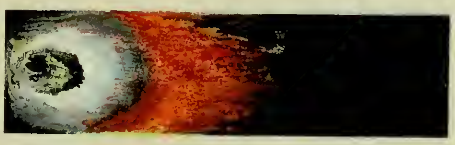

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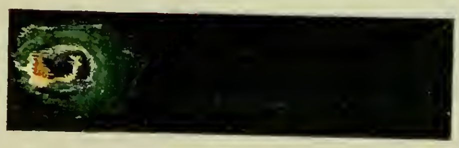

ZINC OXIDE IGNITED WITH COBALT NITRATE

7

TIN OXIDE IGNITED WITH COBALT NITRATE

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BLOWPIPE REACTIONS FOR THE FUSIBLE METALS

known as the Berkeley Spring, was visited as early as 1777, while the White Sulphur Springs were utilized in 1778. The therapeutic action of mineral waters or spas, as they are frequently termed, depends largely on their chemical composition and their temperature, although a variety of other circumstances, such as situation, elevation, climate, mean temperature, and above all the regular habits of the patient, have no doubt an important bearing on the success of the treatment.

Origin. The origin of mineral waters is often looked upon with much curiosity, and yet there is nothing unnatural about it. The rain water falling on the surface soaks down through the soil into the rocks and may slowly filter through them to a considerable depth, coming out to the surface at a lower level in the form of a spring; or again the water may reach sufficient depths to be subjected to great pressure or even heat, and coming to a fissure or being struck by an artesian-well boring, it will tend to escape to the surface through such an outlet. Many mineral springs are found along lines of faulting, since fault fissures afford a means of escape. The dissolved mineral substances no doubt are obtained from the rocks through which the water has flowed. In some cases the waters in seeping through one type of rock may take up certain acids which later react on basic elements contained in other rocks, thus producing salts. Most waters contain some carbonic acid, which greatly increases their solvent powers in the presence of lime, magnesia, and iron; while if the waters are alkaline they may take up substances which are ordinarily rather insoluble, such as silica. The attacking power of the water may be still further increased if it is hot. There seems to be some relation between hot springs and the geological structure of a region, as thermal springs are more abundant in areas where the rocks have been highly faulted or where there has been volcanic activity in comparatively recent geological times. Mineral springs commonly contain more dissolved material in regions of sedimentary rock formation than in igneous or metamorphic areas.

Temperature. Springs are commonly characterized as thermal when they have a temperature of over 70° F. If the temperature is between 70° and 98° they are called tepid, while all exceeding the latter limit are included under hot springs. The following examples will serve to show the degrees of temperature found in different thermal springs: Sweet Springs, W. Va., 74° F.; Warm Springs, French Broad River, Tenn., 95°; Washita, Ark., 140° to 156°; San Bernardino Hot Springs, Cal., 108° to 172°; Las Vegas, N. M., 110° to 140°; Sulphur Springs, Aix-les-Bains, France, 108°; Kaiserquelle, Aix-la-Chapelle, Prussia, 131°; Karlsbad (Sprudel), Bohemia, 162°.

Flow of Springs. The amount of water which a mineral spring may discharge is quite variable; thus 500 springs in Central France, which were tested, yielded 2,628,000 gallons in twenty-four hours, and the famous Orange Spring in Florida is said to discharge 5,000,000 gallons per hour. The discharge per hour of some of the principal American springs is as follows: Champion Springs, Saratoga, 2500 gallons; Roanoke Red Sulphur Springs, Va., 1278 gallons; Warm Sulphur Springs, Bath, Va., 350,000 gallons; Hot Springs, Ark., 20,100 gallons; Glen Springs, Waukesha, Wis., 45,000 gallons; Horeb, Waukesha, Wis., 1500 gallons.

Classification. A classification of mineral waters may be geographic, geologic, therapeutic, or chemical. The following scheme of classification is one adopted by A. C. Peale, a noted authority on the subject of mineral waters, and more especially those of the United States:

CLASSIFICATION OF MINERAL WATERS.

Alkaline		
Alkaline-saline	Sulphated Muriated	
Saline	Sulphated Muriated	
Acid	Sulphated Muriated Siliceous	 Sulphated Muriated

Springs included in the above groups may be either thermal or non-thermal, and they may be either free from gas or contain carbonic acid gas (carbonated springs), sulphureted hydrogen (sulphureted), nitrogen gas (azotized), and carbureted hydrogen (carbureted). The *alkaline* waters include all those containing alkaline carbonates, such as carbonates of alkalies, alkaline earths, alkaline metals, or iron. About one-half of the alkaline springs of the United States are calcic alkaline, that is, containing calcium carbonates or bicarbonates as the predominant ingredient. The water of the Hot Springs of Virginia is a hot, carbonated, calcic alkaline water. The *alkaline-saline* waters include those containing combinations of alkaline carbonates with sulphides (sulphated) or chlorides (muriated), there being in the United States one-third as many as of the saline waters. In the *saline* waters sulphides and chlorides predominate; in the United States there are about one-third more springs of this class than of the alkaline springs. Springs which are classified as purgative or aperient will fall in the subclass of sulphated salines. The salines may be sodic sulphated or muriated, or calcic sulphated or muriated; the sodic muriated constitute about 88 per cent. of the muriated saline waters of the United States. The *acid* class includes all waters containing free acid, whether silicic, sulphuric, or hydrochloric. In addition to having free acid a spring may also contain salts of the acid.

Geographical Distribution. There are at the present time between eight and ten thousand mineral springs in the United States, and of this number 659 were listed as commercial producers in 1901. Most of the mineral springs of commercial value are found in the Eastern United States and in the Mississippi Valley; west of the 101st meridian they are largely confined to the Pacific Coast. No hot springs are known in the New England States. In Maine the springs are slightly alkaline-saline and chalybeated, with a few of carbonic character. Their temperature ranges from 40° to 46° F. Chalybeated springs are abundant in Massachusetts. Many of the springs of the New England States are utilized for commercial purposes, but among the Eastern States as a whole New York stands at the head of the list of producers. The springs at Saratoga have an international reputation, and compare favorably with any of the foreign spas, the waters from the Congress, Empire, Columbia, High Rock, Hawthorne, and Geyser springs being extensively used throughout the United States.

These waters are effectual in diseases of the liver, spleen, and skin, in neuralgia, and rheumatic and dyspeptic troubles. Farther south in the Appalachians are the celebrated Hot Springs of Virginia, including the Berkeley Springs and the White Sulphur Springs. The waters of the former are used chiefly for certain forms of dyspepsia, diseases of the liver and bowels, while those of the latter are of special value in the treatment of chronic diseases, gout, rheumatism, etc. The general character of the springs of Virginia and West Virginia is saline; sulphureted waters are the most numerous, but alkaline and chalybeate and acid springs also occur. The saline springs are found in excess of all others in the South Central States, and thermal springs are few. In this region the States of Kentucky, Tennessee, and Arkansas are the chief producers of mineral waters. The Hot Springs of Arkansas are among the most important thermal springs found in the entire country, and of value for diseases of the blood. The Texas springs are peculiar from the fact that many of them show free sulphuric acid. Owing to the abundance of limestone formations in the North Central States, calcic springs are quite numerous, and in Wisconsin those of Waukesha are widely known. In the Cordilleran region the most noted occurrence of hot springs is that of the Yellowstone Park, but they are not used for medicinal purposes. In New Mexico the Las Vegas Hot Springs are often visited, and in Washington the Medical Lake is the source of one of the best known mineral waters of the Pacific Coast.

Foreign Waters. A number of foreign mineral waters are imported into the United States and find a considerable sale. Chief among these is the Apollinaris water which comes from Ahrweiler, Germany, and which is largely used as a table water, and in cases of nervous irritation attended with dyspepsia. The Friedrichshall bitterwater, from the Friedrichshall Springs, near Hildenburg, Germany, is largely used for habitual constipation, as is the Hunyadi-Janos water from Budapest, Hungary, which is a remedy also for congestive and gouty disorders. The Kissingen waters from Bavaria, the Vichy from France, and the Karlsbad Sprudel waters are extensively imported into the United States.

Production. The production of mineral waters in the United States in 1901 amounted to 55,771,188 gallons, valued at $7,586,962. The imports in the same year amounted to 2,567,323 gallons, valued at $744,392.

Chemical Analyses. The following table shows the important constituents of some of the American mineral waters:

Analyses of American Mineral Waters

CHEMICAL CONSTITUENTS	Congress Spring, Saratoga, N. Y. *Saline, carbonated*	Excelsior Spring, Saratoga, N. Y. *Saline, carbonated*	Warm Sulphur Springs, Va. *Calcic*	Hot Springs, Ark. *Thermal, carbonated*	Red Sulphur Spring, Sharon, N. Y. *Alkaline-saline, sulphureted*	Las Vegas Hot Springs, New Mexico. *Alkaline - saline*	Bethesda Spring, Waukesha, Wis. *Alkaline-calcic*
	Grains Per gallon	*Grains per gallon*	*Grains per gallon*	*Grains per gallon*	*Grains per gallon*	*Parts per 1000*	*Grains per gallon*
Sodium carbonate	....	....	......	......	......	5.00	
Sodium bicarbonate	10.77	8.75	......	......	.49	......	1.26
Sodium sulphate	....	....	......	......	......	16.27	.54
Calcium carbonate	....	....	5.22	} 3.17	......	11.41	
Magnesium carbonate	....	....	......				
Calcium bicarbonate	143.40	41.32	......	12.66	12.93	......	17.02
Magnesium bicarbonate	121.76	29.34	......	......	.69	......	12.39
Lithium bicarbonate	4.76	....	......	......	......	Trace	
Iron bicarbonate	.34	3.00	......	2.17	......	......	.04
Magnesium sulphate	....	2.15	......	......	18.96		
Potassium sulphate	.89	....	1.38	......	......	......	.46
Sodium chloride	400.44	166.81	......	......	.33	27.34	1.16
Potassium chloride	8.05						
Potassium bromide	....	1.57					
Sodium bromide	8.56						
Sodium iodide	.14	4.67					
Silica	.84	.53	1.72	.38	.45	2.51	.74
Calcium sulphate	....	....	14.53	2.54	96.64		

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MINERS, Western Federation of. A centralized association of persons working in and around mines, mills, and smelters, for the purposes of abolishing the truck system, child labor, the use of private detectives in labor disputes, 'government by injunction,' the importation of laborers under contract, and of improving generally conditions of employment with respect to wages and the hours of labor. The officers of the association consist of a president, vice-president, secretary-treasurer, and an executive board composed of these officers and one organizer from each of the six districts into which the territory covered by the Federation is divided. The executive board acts as a board of conciliation and arbitration (which are strongly recommended by the Federation), may levy assessments in case of emergency, must approve every strike and joint contract entered into by local unions, and between the annual conventions has full power to direct the workings of the Federation. The Western Federation of Miners officially indorses socialism and advocates participation of labor organizations in politics with the view of securing to the working classes the ownership and operation of the means of production. It was founded May 15, 1893, largely as an outcome of the notorious Cœur d'Alène strike of 1892. In April, 1899, it again became involved in the Cœur d'Alène strike of that year and in the later period of the strike controlled and directed it. During this conflict several persons were killed, martial law was declared, and certain county officers were impeached for failure to perform their duties in suppressing violence. A large number of miners were arrested by the temporary authorities and imprisoned in a stockade known as the 'bull pen.' Persons desirous of securing work in the mines at that time were forced to obtain a permit, which was issued only after the applicant had signed a statement denying that he had participated in the riot of April 29th, declaring his belief that it was incited and perpetrated by the miners' unions, expressing disapproval of the riot, renouncing membership in the miners' union, and pledging himself thereafter to obey the law. There are at present 189 unions affiliated with the Western Federation, the aggregate membership of which is officially estimated at 50,000 persons, residing almost exclusively in Canada and the States west of the Mississippi River. It is affiliated with the American Labor Union. The official organ is the *Miners' Magazine,* published monthly at Denver, Col.

MI'NERSVILLE. A borough in Schuylkill County, Pa., four miles west of Pottsville, with which it is connected by an electric road; on the west branch of the Schuylkill River, and on the Lehigh Valley, the Philadelphia and Reading, and a branch of the Pennsylvania railroads (Map: Pennsylvania, E 3). It is in the anthracite region, and has extensive coal-mining interests, besides several factories. Population, in 1890, 3504; in 1900, 4815.

MINER'VA (Old Lat. *Menerva,* from root in *mens,* Skt. *man-,* Gk. *μένος, menos,* strength). A Roman goddess identified with the Greek Athena. Though the two divinities have some resemblance, it will be best to treat them separately.

Greek. Athena was a universally worshiped Hellenic divinity, and there is no satisfactory evidence of a foreign origin for her cult. In the earliest literature, we find Athena already a fully developed personality, the favorite daughter of Zeus, wielder at times of his ægis, and but little inferior to him in power. In general the goddess was warlike. Hence she was worshiped in the citadel of many towns, and her sacred images, the Palladia, which were often said to have fallen from heaven, were kept with great care, for their possession made the town impregnable. She is not, however, connected with the mere lust of battle, but with military wisdom and patient strategy as well as with heroic prowess in actual conflict. Wisdom is, in fact, so prominent in the conception that later she became the patron of learning. Even in early times she is Ergane, the goddess of crafts, especially the peculiarly feminine occupations of spinning and weaving, which may have arisen from the custom of weaving for the statue of the goddess a peplus or mantle. Athena was also the goddess of smiths, and even of agriculture, so that at Athens the smiths and potters celebrated the *Chalkeia,* as a joint festival of Hephæstus and Athena. As a battle goddess, she was worshiped at Athens as Athena Nike, bearing the spear and shield, and wearing the ægis, which is commonly adorned with the Gorgon's head, of petrifying power. She also carries the spindle as Ergane, and a pomegranate as Nike. Sacred to her were also the snake and the owl, and especially the olive, which she was said to have given to Athens, her favorite city. In the Greek belief she was the pure virgin, but there are plain traces that this was not original.

Athens is for us the great centre of Athena worship, and here there were two ancient shrines, the Palladium in the lower town, the seat of an ancient court for the trial of involuntary homicide, and the Acropolis, where were the house of Erechtheus and the shrine of the Polias. Here was an ancient temple, burned by the Persians, but possibly rebuilt at least in part. Close to its site was built, near the end of the fifth century, the somewhat complicated Erechtheum (q.v.), and earlier (B.C. 437) the Acropolis was crowned by the magnificent Parthenon (q.v.), containing the gold-ivory statue of the goddess by Phidias. In her honor were celebrated the Panathenæa, and other smaller festivals, at some of which mystic rites were prominent. According to the common legend she was born from the head of Zeus, who produced her by his own power. Other versions told how Zeus had swallowed *Metis* (Wisdom) when pregnant by him of Athena. In the fullness of time Hephæstus or Prometheus or Hermes, to relieve the pains in the head of Zeus, split it with an axe, whereupon the goddess leaped forth full-armed—a scene frequent in the earlier vases. The nature of Athena is still a matter of dispute, but there is much in favor of the view that she is a goddess of the lightning.

Roman. Minerva seems to be an old Italian goddess, whose worship was also common in Etruria, but who was not originally one of the leading Roman divinities, for her name is absent from the oldest religious calendars. When the worship was introduced is not known, but it was certainly early, for Minerva is one of the Capitoline triad, and had also an ancient temple on the Aventine, which was the religious centre for the guilds of craftsmen, as whose patron the goddess appears. The festival of this temple was celebrated on March 19th, the fifth day after the Ides (whence the name Quinquatrus), and seems to have formed originally part of a festival of Mars. It was chiefly celebrated by the guilds, including physicians (whence was worshiped a Minerva Medica), and was of a distinctly popular character. On the Capitol Minerva appears in her Greek aspect as protector of the city, but this and her worship as a goddess of battle or victory seem due entirely to foreign influence. In the later Republic and the Empire, the Greek conception of Athena almost completely supplanted the earlier Italian belief.

MINERVA MED′ICA, Temple of. The name erroneously given in the seventeenth century to the ruins of a decagonal nymphæum on the Esquiline in Rome, formerly belonging to the Licinian Gardens. The name was wrongly based on that of the famous statue of Minerva in the Vatican Museum, which was not found on the Esquiline, but near the Church of Santa Maria sopra Minerva. The title medica also rests on a misconception, as the serpent at the foot of the statue is not the serpent of Æsculapius, but the protector of the olive gardens. The ten sides of the nymphæum, once adorned with mosaics and porphyry, are occupied on the lower story by a door and nine niches, with ten windows above them. It was covered by a dome which was destroyed in 1828. When the ruins were excavated in the sixteenth century, numbers of statues and architectural marbles were recovered.

MINERVA PRESS. The name of a London printing house, from which issued, late in the eighteenth and early in the nineteenth century, an immense number of sentimental and trashy novels.

MINERVINO MURGE, mē′nĕr-vē′nō mo͞or′-jȧ. A walled town in the Province of Bari, Italy, situated about 25 miles southwest of Barletta (Map: Italy, K 6). It produces fruit and vegetables. Population, in 1901, 17,353.

MINES AND MINING. See Mining.

MINES AND MINING (in Law). The law relating to mines in the United States has been almost wholly developed within the last fifty years. By the laws of England all mines of gold or silver, wherever found, belonged not to the owner of the land, but to the sovereign. There is some doubt as to whether this doctrine was ever generally adopted in the United States. It was, however, undoubtedly recognized by several Eastern States immediately after the Revolution, and in New York a statute, still in force, expressly reserves to the State the right to mines of gold and silver. In general, however, the Government of the United States was considered to reserve all mineral rights in lands conveyed or given to citizens, unless such rights were expressly granted. For a time the Government leased mineral lands on royalties, or fixed rents, but, owing to the great difficulty in ascertaining and collecting the amounts due, the policy was finally abandoned, and rights to take minerals were granted outright.

The law was in this condition when gold was discovered in California, and thousands of persons, many of them without previous experience, rushed there, and discovered and opened up mines. To avoid the frequent shedding of blood and other disagreeable consequences of disputes over the extent of each other's rights, it became the custom for the miners in a new district to meet and pass rules and regulations on every subject relating to their calling, and these were enforced by committees appointed for the purpose. Subsequently, when courts were established in California, they adopted those rules and regulations which had become so recognized and fixed in mining communities as to become in effect the common law of mines. The claims of the miners were protected upon the fiction that they had originally obtained a license from the Government, and if they followed the rules of their particular districts they were held to have a property right in their mines or claims, as they were called. These rights or claims could be conveyed, would descend to the heirs, and were in every way treated as real property. In July, 1866, Congress passed a law providing that title to public mineral lands might be acquired by payment of a small price or fee and by complying with certain prescribed formalities. This act was superseded by an act in 1873 (*Rev. Stat.*, tit. xxxii., ch. 6) which substantially incorporated the provisions of the former act, and supplemented them with others suggested by the new development in mining law.

The act of 1873 also provided for the judicial recognition of the rules and regulations then prevalent, and such as might thereafter obtain recognition in mining districts, where they were not contrary to its own provisions or the laws of the States in which such districts were situated. One of the important provisions of the last act was to prescribe the maximum limits of claims. The extent of a lode claim, that is one where the ore runs in a well-defined vein, is fixed at 300 feet on either side of the vein by 1500 feet in length; and placer claims, that is where the ore is loosely mingled with the surface earth, are not to exceed 20 acres to one individual, or 160 acres to an association of individuals. The areas of both lode and placer claims may be changed by the statutes of the various States or by the rules of a mining district, provided they do not exceed the above fixed limits. The owner of a claim may follow a well-defined vein of mineral for 3000 feet from the opening of the shaft in any direction, and he may follow a vein the general course of which is downward through its 'dips' and variations indefinitely.

The common law rule that a man owns everything beneath the surface of his land is, therefore, not followed in our modern law relating to mines. It often happens that two lodes intersect, and in such a case the one who first opened his mine is entitled to the ore at the point of intersection; but each is entitled to follow his lode farther, and each has an easement or right to cross the tunnel of the other at that point in the proper working of his mine. Owing to the great difficulty in ascertaining whether a person is trespassing in this manner, any owner of lands who has reasonable cause to suspect that another is doing so may obtain from a court of equity an 'order of inspection' to determine whether he is encroaching on the land of the complainant or not.

Rights to water, which is so essential in mining operations, vary in different jurisdictions; but in general the one who first appropriates the waters of a stream for his use in mining is conceded the right to use all that is reasonably necessary in his operations. However, when some one else locates on the same stream the first person can only continue to take the amount he was using when the second person located his claim. The owner of a mine must properly support the earth surrounding his tunnels, and is liable for any damage caused to the lands of others by settling of the earth if he is negligent in this particular. The rules and customs of the miners which were given the effect of law by the statute of 1873, and those which have since come into existence, are too numerous and complicated to be set forth in the scope of this article. However, it may be said that in the present state of the law the courts, in deciding a case involving mining law, take into consideration, in the order mentioned, the statutes of the United States, the laws of the State in which the property in question is situated, and the rules and customs above referred to.

Any citizen of the United States, or a person who has declared his intention to become such, may locate and obtain a patent for a mining claim on public lands. Before a person can acquire any rights he must have actually discovered the presence of minerals, as it is then certain he comes within the law as to mineral lands. The first step thereafter is to make a 'location' on it; that is, to perform certain acts which are deemed to constitute sufficient evidence of an intention to claim the benefits of the discovery. The United States statutes provide that a claim must be "distinctly marked on the ground so that its boundaries can be readily traced." This is usually done by setting up boundary monuments, such as posts or stones at the four corners of the claim. In most States the locator, as the prospector is called, is required to post a written notice of his claim on some object on the land. This notice consists of a description of the land thus appropriated and a declaration of his intention to occupy it for mining purposes. Such notice of claim must also be filed with a recording officer, usually the register of deeds of the county. After a miner has located his claim in the above manner he must continue his mining operations or he will be deemed to have forfeited it. The labor may consist in actual mining, or in improvements in the mine for preservation or increased convenience in working it. When a claim is forfeited by a failure to perform labor of the required value it is open to relocation by any one. However, under this statute the claim is not forfeited until the expiration of a year from the time operations ceased. A claim may also be lost by abandonment, which consists in leaving a claim with an intention not to return and work it again.

Where a mining prospector complies with all the formalities to obtain a location he has a good title against every one except the United States. In order to complete his title and make it a matter of record, the locator may obtain a patent, that is a grant, of the claim from the Federal Government, by having a survey and an abstract of his possessory title made and filing them in the United States Land Office, together with a formal application for a patent, and a certificate to the effect that he has expended at least $500 on the claim, either in improving or working it. The application consists of an affidavit to the effect that he has complied with all local mining customs and regulations as well as the statutory requirements to obtain a good possessory title. One copy of this application must be posted on the claim and a notice thereof must be published in the nearest newspaper.

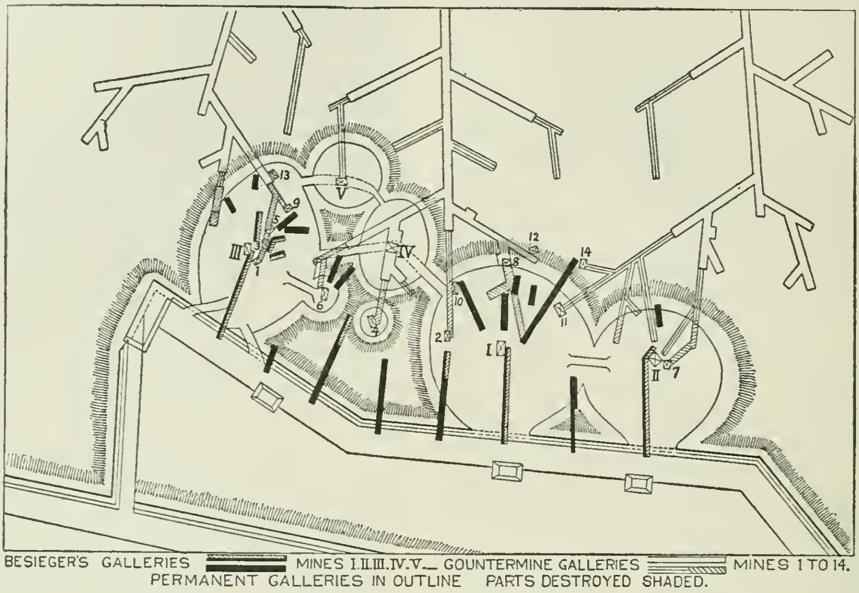
The rules of law in regard to the ownership, conveyance, and descent of real property are, in general, applicable to mining property. A lessee or owner of a life estate in lands is entitled to work open mines thereon, but cannot open new mines, unless this right is expressly given. See Land; Land Office; Real Property; Water.

Bibliography. Barringer and Adams, *Mines and Mining* (1897); Clark, Heltman, and Consaul, *Mineral Land Law Digest* (1897); Copp, *American Mining Code* (6th ed., Washington, 1891); Copp, *United States Mineral Lands* (2d ed., Washington, 1891); Lindley, *American Law of Mining* (1897); Morrison, *Mining Rights* (10th ed., Denver, 1900); Wyman, *Public Land and Mining Laws* (1898); Clark, *Miners' Manual* (1898).

MINES AND MINING, Military. The term military mining is used in two senses. The first refers to the broad subject of the placing and explosion of charges of explosive underground with a view to destroying men and material. This includes the ordinary use of mines as an obstacle to the approach of an attacking force. The other and more generally accepted use of the term is to denote one of the stages in a stubborn siege. In the discussion of siege and siege works (q.v.) it is shown that when troops are no longer able to advance in the open, progress is made by approaches and parallels, in the hope that if the besieged is not first starved, the besieger may advance close enough under the protection of his own trenches for the delivery of an assault. Occasionally the relative force and skill of the combatants are such that the besieged, by virtue of his heavier fire and skill in handling it, may be able to bring the approach of the besieger by trenches to a standstill. He may accomplish the same result by running underground tunnels and placing countermines which so threaten an overland advance as to make it impracticable. When this happens, the usual method of advance is by military mining.

From the last advanced open position he has been able to construct, the besieger proceeds underground by a system of shafts and galleries. These vary in size. In general the start is made with large galleries gradually ramifying into smaller but more numerous galleries whose heads are close together. The principal types are *great* galleries with a height of 6 feet and width of 7 feet, *common* galleries with the same height and half the width, *half* galleries with a height of 4½ feet and width of 3 feet, and *branches* with a height of 3½ feet and width of 2½ feet. The accompanying cut indicates the methods in which these branches develop. The shafts and galleries usually are lined with board casings two to four inches thick, or with heavy frames placed at intervals and holding in position thin sheeting. For the work of excavating, special tools are provided shorter than those used above ground. Provision must be made at frequent intervals for ventilating the tunnels sufficiently to permit the miners to work in them. Passage from one level to another is by shafts or by inclined slopes. Great care is taken in the preparation of a map, which is kept corrected to date, and shows the position of the various tunnels and branches, and their relations to each other, both in plan and in elevation. A similar system of tunnels is constructed by the besieged. As the two systems approach near to each other, it becomes the object of each combatant to destroy the system of the other. In doing this the besieger is usually desirous of forming a crater reaching to the ground above which he can occupy with his troops, thus obtaining new points of vantage on the surface. For similar reasons the besieged is desirous of effecting his explosions without breaking the surface of the ground.

The explosive used, in all soils, so far as known, has been gunpowder. Experiments have been conducted with guncotton and other high explosives, but they have not yet been used in mining operations in actual warfare. The quantity of powder to be used depends upon the result desired. A *common* mine is one in which the crater formed has a diameter at the surface approximately twice the depth. Mines with larger charges of powder than will produce this result are known as *overcharged* mines; with less, as *undercharged* mines. When given a charge so small that no crater is produced on the surface, they are called *camouflets.*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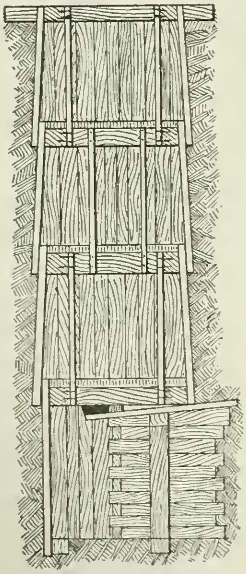
BESIEGER'S GALLERIES ▬ MINES I.II.III.IV.V.— COUNTERMINE GALLERIES ═ MINES 1 TO 14.
PERMANENT GALLERIES IN OUTLINE PARTS DESTROYED SHADED.

MINING OPERATIONS AT GRANDENZ, 1862.



SHAFT-LINING.

To produce a common mine the charge varies considerably with the nature of the soil. The general rule for them in ordinary earth is that the charge must be equal in pounds to one-tenth the cube of its distance in feet below the surface.

The last instance of mining operations upon a large scale was at the siege of Sebastopol in 1854 and 1855, where the Russians, under the lead of the accomplished engineer, General Todleben, were able to withstand the Allies a period of 349 days. Mining was carried on in the sieges of Vicksburg and Petersburg in the Civil War, but was not the predominant feature in either case. In view of the fact that in the past military mining has played such an important part at critical times, the subject is studied by military engineers, and it is quite within the range of possibility that in a form adapted to modern conditions it may at some time in the future serve to decide the fate of a war. The subject of siege works and military mining is treated in Mercur, *Attack of Fortified Places* (New York, 1894), and in the Chatham *Manuals,* especially part iv. (London, 1883). For submarine mines and torpedo defenses, see TORPEDO.

MINETTE, mē'nĕt' (Fr., diminutive of *mine,* mine, whence Rhenish Ger. *Minette,* iron ore). An igneous rock of granular or porphyritic texture, composed essentially of orthoclase feldspar and biotite. In contrast with the granites, syenites, and diorites, to which it is related, it is rich in ferro-magnesian minerals, and hence has a darker color. Minettes generally occur in dykes, and are quite susceptible to weathering agencies.

MINE WORKERS OF AMERICA, THE UNITED. The largest American labor union, whose declared object is "to unite mine employees that produce or handle coal or coke in or around the mines, and ameliorate their condition by means of conciliation, arbitration, or strikes." The officers consist of a president, vice-president, and secretary-treasurer, who, together with one delegate from each of the 25 districts into which the jurisdiction of the United Mine Workers is divided, constitute the National Executive Board, which has the power to levy assessments and to order general strikes by a two-thirds vote. The government of the union is thus highly centralized. In organization the United Mine Workers is an 'industrial union,' aiming to unite not only miners, but all skilled and unskilled laborers working about coal mines, except mine managers and top bosses. This policy of industrial organization has brought the union into conflicts with the unions of the Stationary Firemen and of the Blacksmiths. In operation the United Mine Workers is a typical 'new union' of the aggressive type. It maintains no extensive system of fraternal benefits, but devotes the greater part of its revenue to the support of strikes and the organization of new unions. Thus, out of the total expenditures of $2,080,805 in 1902, $109,017 was devoted to salaries and expenses of organizers and $1,890,201 to the relief of strikers, leaving only $81,587, less than 15 per cent., for all other purposes. The control of local strikes rests partly with the national officers. Any local union may strike provided it obtains the consent of the district officers and the national president, but in case either disapprove, an appeal for the permission "to strike may be made to the executive board. Any local union striking in violation of the above provisions shall not be sustained or recognized by the national officers." This seems to constitute the only penalty for unauthorized strikes. In the bituminous districts of Illinois, Indiana, Ohio, and Pennsylvania strikes have been practically eliminated by the annual joint conference, or collective bargaining, between the miners and operatives, in which a scale of prices for the following year is adopted and the settlement of further differences provided for by local boards of arbitration. The United Mine Workers was organized January 25, 1890, but its membership decreased rather than increased until the great bituminous coal strike of 1897, during which year the average membership was only 9731. Since that time the membership has increased by leaps and bounds, and in December, 1901, the national union had 198,090 paid up members, distributed among 25 districts and about 1200 local unions. The greatest gains were coincident with the anthracite strikes of 1900 and 1902, the latter of which, lasting more than five months and involving 147,000 workmen, is perhaps the most important strike in American history. Mr. John Mitchell was elected president of the union in 1898, and now (1903) receives a salary of $3000 per annum. The official journal is *The United Mine Worker*, published weekly at Indianapolis. See TRADE UNIONS.

MINGHETTI, mĭn-gĕt'tē, MARCO (1818-86). An Italian writer and statesman. He was born at Bologna, November 8, 1818, of a wealthy family, and after a university course in political science made a study of the institutions of France, Germany, and Great Britain. On his return to Italy he published an essay on the great commercial advantages of free trade, as existing in England, and espoused with warmth the economic views of Richard Cobden, for the assimilation of which he had been prepared by a knowledge of the teachings of the Tuscan economist Bandini. In 1846 Minghetti began his political career by starting at Bologna a journal of liberal tendencies, *Il Felsineo;* by 1847 he had made such a name for himself that he was called to Rome by Pius IX. to become a member of the *Consulta delle Finanze*, and in 1848 he became Minister of Public Works. After the Papal change of front, however, Minghetti withdrew from office and joined the army of Charles Albert in Lombardy, where he was warmly received by the King and appointed to the royal staff with the rank of captain. After the battle of Goito he was made a major, and distinguished himself in the engagement of Custozza (July 25, 1848). In the autumn of the same year Minghetti was invited to Rome by his friend Count Rossi as a member of the new constitutional Ministry. He arrived the day of Rossi's assassination, and after refusing the Pope's request that he take the place of the murdered Minister he returned to the Piedmontese army. On the disastrous conclusion of the war, Minghetti resumed his study of political economy, and gained the confidence of Cavour, by whom he was consulted during the conferences of Paris. In 1859 he became Secretary-General in the Ministry of Foreign Affairs, but resigned with Cavour upon the conclusion of the armistice of Villafranca. Minghetti became Minister of the Interior under Cavour in 1860, and after the death of Cavour held the portfolios of the Interior under Ricasoli and of Finance under Farini. In March, 1863, he became Prime Minister. He left office in 1864. He went as Ambassador to London in 1868, and was subsequently for a short time at the head of the agricultural and commercial department in the Menabrea Ministry (1869). He was Ambassador to Vienna in 1870-73. From 1873 to 1876 he was again at the head of the Cabinet, first as Minister of Finance and later as Minister of Foreign Affairs. He spent the last years of his life in study and partial retirement, and died at Rome, December 10, 1886. Among his chief writings are: *Della economia pubblica, etc.* (1859); *Opuscoli letterari ed economici* (1872); *Stato e chiesa* (1878). He was also a student of the fine arts, and, besides lecturing on Raphael and Dante, he produced a work, *Le donne italiane nelle belle arti al secolo XV. e XVI.* (1877), and a biography of Raphael (1885). His autobiography, *I miei ricordi* (Turin, 1888), appeared after his death.

MINGRE'LIA. A former independent feudal State of the Caucasus, bordering on the Black Sea, now included in the Russian Government of Kutais (q.v.) (Map: Russia, F 6). It was a vassal State of Georgia until 1414, when it became independent under its own princes, although tributary to Turkey and Persia. Russia obtained control over it in 1803, but the internal administration was left in the hands of the native chiefs until 1867, when, as a result of a series of peasant uprisings begun in 1857, it was finally annexed by Russia. The inhabitants, 229,200 in 1897, are mostly Mingrelians, closely allied to the Georgians. Mingrelia is the ancient Colchis.

MINGRE'LIANS. A tribe of the Kutais region belonging to the Georgian group of peoples of the Caucasus. (See MINGRELIA.) In stature they are above the average, and, like the Georgians proper, many of them are of great physical beauty. The Mingrelian language varies considerably from the Georgian prototype. Of the character of the Mingrelians many investigators have entertained no high opinions, setting them down as lazy and unprogressive. The Mingrelians, as are the other Georgians, are more or less Christian. They have a folk-literature, consisting of legends, songs, etc., the people being fond of music, the dance, etc. Consult: Erckert, *Der Kaukasus und seine Völker* (Leipzig, 1887); Telfer, *The Crimea and Transcaucasia* (London, 1876); Chantre, *Recherches anthropologiques dans le Caucase* (Paris, 1885-87); Bryce, *Transcaucasia and Ararat* (London, 1897). See Georgians.

MINHO, mē′nyō. A river of the Iberian Peninsula. See Miño.

MINHO. A Province of Portugal. See Entre-Douro-e-Minho.

MINIATURE PAINTING. A late development of the art of manuscript illumination applied to portraiture. (See Manuscripts, Illumination of.) The illuminators of the latter part of the sixteenth century, headed by Giulio Clovio, had made the art in its dying days far more transparent in coloring, more cameo-like. Effects in *grisaille* and *camaieu* led the way to miniatures. When there were no longer any manuscripts to illuminate, the art turned to minute detached and framed pictures still painted on vellum, and related to these were minute paintings on copper, especially by the Dutch School. The new branch of minute portraiture was essentially a creation of North European art of the seventeenth, and especially the eighteenth, century. It was foreign to Italy, Spain, and Southern France and flourished in Germany, England, Northern France, and the Netherlands. It was especially suited to portraying the Court costumes of the times of Louis XIV. and XV.

The miniature portraits were usually of oval shape and only two to four inches high; they were usually painted on vellum or ivory, but sometimes on heavy glazed paper, wood, enamel, or porcelain. The forerunners of the true miniaturists had often painted in oils on copper or silver; vellum was the favorite material of the seventeenth century, and ivory was largely introduced during the eighteenth century.

The normal method was to use opaque body-colors on the vellum, that is, colors mixed with white and other opaque pigments; but when ivory came into use, transparent colors were used largely on faces and all other nude parts, the opaque colors being confined to the draperies, hair, and accessories. Transparent effects gradually passed from the flesh tints even to the other parts of the picture, so that but little that was opaque remained. The practice up to about 1750 was first to lay the colors on in broad flat tones and then to work over with dotting or stippling until an exquisite but somewhat finical jewel-like effect was attained. But, toward 1760, a Swede named Hall utilized the natural tones of the newly popular ivory ground in favor of new transparent effects and textures, using *gouache* water-color effects with a manner at once bold and tender. Afterwards, the breadth of possible effects was increased by the use of hatching as a method.

Among miniaturists, Isaac Oliver and his son Peter Oliver were among the earliest in England, and were followed, later in the seventeenth century, by Samuel Cooper, whose reputation spread to France and Holland. Blaerenberghe, of the Dutch School, was prominent under Louis XV. Rosabela Carriera, Isabey, some pupils of Massé, like Lebrun, Prevot, and Cherlier, made his delicate style popular, until François Dumont in the time of Marie Antoinette combined it with the more transparent and free style of Hall and so set a new fashion. The name of Angelica Kaufman is popularly well known in this connection. After a period of almost complete extinction during the greater part of the nineteenth century, the art has lately been revived with success. Museums have made collections; there are over two hundred in the Dresden Gallery. But private individuals own by far the larger number of extant miniatures.

Consult: Bradley, *Dictionary of Miniaturists* (London, 1887-89); Proport, *History of Miniature Art* (ib., 1887); Williamson, *Portrait Miniatures from Holbein to Ross* (ib., 1897). See also the authorities referred to under Manuscripts, Illumination of.

MINIÉ, mē′nyā′, Claude Etienne (1814-79). A French soldier, ordnance expert, and inventor. He was born in Paris, entered the army as a volunteer, and served in Algeria during several campaigns. He became captain in 1849, and superintendent of the school of ordnance at Vincennes in 1852. In 1858 he was employed by the Egyptian Government to superintend a manufactory of arms, and a school of gunnery at Cairo. He invented the Minié rifle, which was brought out in 1849, and adopted by the French Government, and is especially noteworthy in that it was the first practical introduction of the principle of expansion in the manufacture of projectiles, and gave a precision and range previously unknown. The Minié bullet was a conical projectile of lead, hollowed out at the base. When fired the base of the ball expanded, to take the rifling. See Small Arms.

MINIM (in music). See Mensurable Music.

MIN′IMITES (Lat. *fratres minimi*, least brethren, so called, in token of still greater humility, by contrast with the *fratres minores*, lesser brethren, the original name of the Franciscans). A Roman Catholic religious Order, founded by Saint Francis of Paola (q.v.). Devout hermits began to gather round him as early as 1435, and in 1454 a community life was begun. The Order received Papal confirmation in 1474. It spread first into France, when the founder was summoned thither by Louis XI. In Paris they were commonly known as *Bons hommes*, from the popular name of an older community to whose house at Vincennes they succeeded; and in Spain, to which they next spread, they got the name of Fathers of Victory, from the fact that the recovery of Malaga from the Moors was ascribed to their prayers. The Emperor Maximilian invited them to Germany in 1497. Their first definite rule was not drawn up by the founder until 1493; it was exceedingly austere, forbidding the use not only of meat, but of all animal products, such as butter, eggs, cheese, and milk. The Order at one time numbered 450 houses, but later fell into decay and is now represented only by a few convents in Italy. The superior of a convent has the title of corrector, the head of the whole Order being the corrector-general. Francis also founded an Order for women which never had more than fourteen convents and is now almost extinct, and a third Order (see TERTIARY), for persons living in the world. Consult d'Attichy, *Histoire générale de l'ordre sacré de Minimes* (2 vols., Paris, 1824).

MINIMUM DEVIATION, ANGLE OF. See LIGHT.

MINING. The art of obtaining from the earth the metallic ores and other useful minerals in an economical and profitable manner. The earliest metals employed by man were those found in the native state. Gold is the most widely distributed of these, and has been mined and utilized from very remote times. Meteoric iron was also known and utilized by many ancient peoples, and the native copper of Lake Superior was extensively mined and utilized by the aborigines of America. As, however, the knowledge of metals increased and civilization advanced, the ores, or metals in combination, were recognized and utilized and mining proper began. Reference is made to mining in the Bible, and other ancient records prove that the Phœnicians navigated the seas as far as Cornwall, England, in order to obtain tin ores for the manufacture of bronze. The Romans had extensive mines for iron ore in the island of Elba that are still in operation. They also worked the great copper veins at the Rio Tinto, Spain, and the timbering left by them is still visible. The mines at Laurium, Greece, were famous in ancient times for their yield of silver. From the old mining districts of Cornwall and from the Erzgebirge (Ore Mountains) and the Harz Mountains in Germany miners have gone all over the world, and under their tuition the mining practice of to-day has grown up in all the newer districts.

Problems in mining to-day may be grouped into those relating to: (1) mining geology; (2) mining engineering; (3) mechanical engineering; and (4) metallurgy. The problems of each group overlap to some extent those of the other groups, but the division adopted serves for a general consideration of the subject of mining. In this article particular attention will be devoted to mining as involving the problems of mining engineering and mechanical engineering. These problems embrace the operations of discovering and locating mineral deposits, of opening the earth and excavating the ores, of transporting the ores to the surface, and of handling mechanically the ores during their metallurgical treatment. As, however, the handling of the ores preparatory to and during the processes involved in extracting the metals is of a different nature than mining proper and is frequently done at places far from the mines, these operations are considered in the article on ORE-DRESSING and in the section devoted to Metallurgy in the articles on the various metals and the adjunct articles there mentioned.

PROSPECTING. The search for and location of deposits or veins of metal-bearing ores is called prospecting, and the men who perform this kind of work are called prospectors. The first procedure in prospecting a tract of land suspected to contain mineral wealth is thoroughly to traverse it and to note carefully the familiar indications of the presence of minerals. These indications are often numerous in kind for each mineral and they also vary for different minerals. Generally speaking, coal, gypsum, salt, and similar minerals occur in unaltered deposits, that is, in rocks which have not undergone metamorphism, while the metallic minerals are found in rocks that have undergone more or less metamorphism. These are among the broad indications of the presence or absence of certain minerals. The geological age of the rocks is in respect to certain minerals a pretty certain indication whether these minerals are likely to be found or not. For example, the bulk of the coal deposits of the world has been found in rocks of the Carboniferous age; they exist in rocks of subsequent ages, but almost never in rocks of preceding ages. Referring to specific indications, the prospector for coal will search for traces of smut or coal dust in the streams and water-worn banks, and for the presence of outcropping seams.

The presence of iron is indicated by mineral springs and rust-like stains of earth and rock. The presence or absence of vegetation may also indicate the existence of minerals; for example, a bed of phosphate rock is commonly indicated by a line of luxuriant vegetation and the outcrop of a mineral deposit by a lack of vegetation. Beds of magnetic iron are frequently located by their attraction for the magnetic needle. Placers are fragmental deposits from water in which the heavier minerals have been concentrated in certain portions, usually next the underlying or bed rock. When prospecting for placers the prospector examines the country for the presence of any existing or ancient watercourses in which deposits of placer material are likely to have been formed. Metallic gold and precious stones occur frequently in placers. In prospecting for petroleum, natural gas, and bitumen, the surface indications looked for are springs of petroleum oil and naphtha; porous rocks saturated with bitumen or cracks in slate and other rocks filled with the same material; springs, pools, or creeks showing bubbles of escaping gas or an iridescent coating of oil.

The presence of a mineral deposit having been established, the next procedure is to determine its extent and richness. The richness of the ore is determined by assaying average samples. (See ASSAYING.) To determine the thickness of the veins or beds and their lateral extent, borings are sunk at more or less close intervals and records taken of the continued presence of the ore vein and of its thickness. These coupled with a geological survey of the region give fairly reliable data as to the quantity of ore and its location with respect to the ground surface. Upon these data the miner estimates the value of the deposit and decides whether it will pay to work it or not.

If the deposit is located on Government land, a 'claim' of variable size, according to the laws of the country or district, is staked out, and when this is opened up sufficiently to have necessitated the expenditure of a certain specified sum of money, a permanent title can be obtained. In the Western States of the United States claims usually extend 1500 feet along the vein, and either 150 feet or 300 feet on each side of it. The owner can then follow the vein where it leads him between the vertical planes of his end lines. The outcrop is called the apex. As, however, veins are so irregular and obscure underground, great uncertainty may arise as to title, and expensive litigation may ensue. For these reasons many authorities consider it better practice to adopt square claims, say 1500 feet on each side, conveying the rights to all the ore lying vertically beneath them. This is the practice in Western Canada and is practically so in most Eastern States of the United States, where title to the land, unless special reservations are made, carries title to the mineral rights. In some States, notably New York, and in many foreign countries, the State claims peculiar and special proprietary rights to deposits of useful minerals. Much variety also prevails in America in the size of claims other than for deep mines. Gold-bearing placers, for instance, have special sizes depending on local regulations; they may be very small in rich diggings or of great extent where large hydraulic enterprises are necessary.

MINING. The methods of mining differ according to the form and geological relations of the mass of ore or other minerals to be won. If the mass is of considerable size and extent and lies on the surface, one method is necessary; if it is a relatively flat and very widely extended bed, as in the case of most coal seams, another must be adopted; and if a steeply inclined, but relatively thin, and extended, tabular sheet of ore is to be removed, it may be to great depths, still a third. A mine resembles a huge well, and it is in the keeping of it free from water, in the support of the walls when the ore has been removed, in the ventilation, and in the cheap and quick removal of the broken rock and ore, that the difficult problems arise. They often demand the highest grade of engineering skill and courage. The development of modern hoisting machinery, of rock drills operated usually by compressed air, of high explosives, especially dynamite, and of cheap and efficient means of transportation both on and under the surface, has been the cause of our great modern advances and has made possible operations beyond the reach of our forefathers. Electricity is finding one of its principal fields in mining to-day, and as it proves a very cheap and convenient method of transmitting power down the shafts and through devious passages, it has great possibilities. Water-power, even at a distance from the mine, can often be employed to generate it, and notable economy introduced.

The methods of mining will be briefly outlined under the topics—A. Surface deposits; B. Underground deposits: (1) Flat; (2) Highly inclined or vertical.

SURFACE DEPOSITS. When a mass of some useful material, metalliferous or otherwise, is found on or near the surface, the first step is to uncover it. This is technically known as *stripping*, and the overlying worthless material is called the *burden*. If the burden is soft earth or gravel, it is removed with the pick, shovel, and wheelbarrow or by a steam-shovel and small tram-cars, operated by horses, mules, or locomotives. In quarries of building stone, the decomposed rock is blasted off and removed. When the useful mineral is exposed, its most favorable position is on a hillside, because then the pit or open cut will drain itself, and the ore or rock will have the grade favoring its transportation in removal. If the pit is in level or depressed ground, pumping usually becomes an immediate and heavy charge on the work. In either case the operations of extraction are carried on by benches or terraces. A slice of convenient thickness is taken off by the first party or machines, and when they have advanced far enough a second is started, and so on as many as there may be room for. The outcrops of many large but inclined veins of ore have been worked in this way in their early development, but it places subsequent underground operations at a disadvantage, because it exposes them to the weather. Open cuts are the simplest form of excavation, but, as just stated, the men and machinery are subjected to all the inclemency of the seasons, and usually in winter have to cease work entirely. One form of surface mining remains to be mentioned, and that is the method which has been developed, especially in California, for working auriferous gravels. (See GOLD.) Water is brought often from a great distance and with heavy fall, and is then directed through large nozzles, called 'giants,' against the bank to be removed. This is washed away and the gold is separated from the moving rock material. The destructive power of a swift and large stream of water directed against a bank is almost beyond belief until seen. The method is economical where the topography favors it, and profit is realized when the gold averages but a few cents per cubic yard.

UNDERGROUND DEPOSITS. In the winning of the useful minerals from underground deposits complications are introduced which are not met in open cuts. The overlying rock is always to be supported as long as that portion of the mine is being operated or is used as a passageway. This may require the leaving of much of the useful mineral as pillars to support the overhanging wall or roof, or the use of heavy timbering or even of masonry. Ventilation also becomes an important item, and all these charges, it must be appreciated, have to be borne by the product before any profit is realized.

The mining of metallic ores and minerals occurring in flat or slightly inclined beds or deposits does not differ materially from the methods pursued in the mining of coal (q.v.).

Almost all metal mining is concerned with steeply inclined beds, veins, and irregular masses. In the past history of the earth, especially in mountainous regions, and where eruptive rocks have come up from the depths below, cracks of greater or less size have been formed in the solid rocks, and often in numbers. Up through these have come waters, as a rule at elevated temperatures and charged with minerals. Where they have brought in metallic ores they have often deposited them in the fissures, along with more or less barren material called gangue, and in this way have produced 'veins' or 'lodes.' Where, coming through a crack as a channel of supply, they have met some soluble rock like limestone, they have often replaced it with valuable ore, the limestone acting like a precipitant upon the dissolved metals. If a porous rock has been met the solutions have at times impregnated it with ore. Ore bodies of great size and of more or less irregular character have thus resulted, and problems of varying degrees of complexity are met by the mining engineer in developing them. The ore is seldom uniformly distributed throughout a vein or other deposit, but, on the contrary, occurs in rich portions called chutes or bonanzas, with intervening spaces of barren ground. It is advisable therefore to keep the mine well opened up ahead of actual extraction of ore, so as to average the rich and lean portions and make the enterprise a permanent one. Veins often fork and send off stringers into the walls; they pinch and swell along their length and depth. They usually run out at their ends into small ramifications and finally cease. They may be cut off sharply by other cross-fractures and disturbances. They extend to considerable depths, having been followed in some cases as deep as 3000 feet or more.

As a typical case by which to illustrate the usual methods of procedure, we may assume that a vein has been located on the surface, that it extends a considerable distance, say a half-mile or mile, and dips at 60 degrees into the earth. Test pits and shallow shafts have indicated its value. The engineer, in opening a new deposit like this, would select as suitable a place as possible for his surface works, such as engine house, ore bins, and dump for waste rock, all in connection with a spot where the vein showed good ore. He would then sink a shaft or slope on the vein, and if it held good, would start drifts or levels at each 60 to 100 feet of descent. As soon as a level had advanced some distance from the shaft, say 100 feet or more, another party would be started near the shaft, working on the vein in the roof of the level. At first propped up on timbers, they would excavate a space, and clear away a working face, so that while the level was being driven ahead they could follow a short distance back, taking off a slice. Now in order that the loose rock and ore that are blasted down should not block the passageway, timbers would be set across the top of the level as at first run. The timbers called stulls would fit into sockets in the walls and on them would be laid rough plank or lagging, with taps or little hatchways at intervals for tapping out into cars the ore that would be blasted down upon them. This method is called 'overhand stoping,' and is the one usually adopted. When the first party of stopers had advanced far enough to warrant it, a second, and later a third, would be set at work following them up on other and higher slices. As soon as the levels had gone some distance, another shaft would be sunk to connect with them, not alone for hoisting, but to afford ventilation after blasting and for a safe line of escape for the men in case of accident.

Another method somewhat different from overhand stoping is sometimes adopted that is called underhand stoping. Suppose levels one and two had advanced some distance from the shaft, a small connecting shaft is then cut between them called a winze. It may be opened by sinking from the upper level or by an upraise from the lower. After it is cut, a party may begin on the upper level, and drilling in its floor may blast away the vein into the winze and allow it to fall to the level below to be removed. They may take off a vertical slice of the vein in this way, and gradually work each way from the winze. The upper level must then be kept passable with a floor of timber.

As these inclined shafts deepen and the vein is found to be rich and permanent, it is often advantageous no longer to use the inclined shaft, but rather to go out from the vein into the hanging wall on the surface, and sink a vertical shaft that will intersect the vein at some desirable depth. Above this point connections are made with the levels by cross-cuts through the hanging wall, and below it by cross-cuts through the footwall. Vertical shafts are always to be preferred, on account of the greater ease and speed of hoisting, but in a new enterprise the safer rule is to follow the ore until its quantity is proved. Variations on the above simple methods are introduced by the character of the wall-rock and the size of the ore body. If the wall-rock is bad, and tends to scale off and impede the workings, it must be propped up with heavy timbering. If the vein is thick, the timbers are built up either rough or squared, and so mortised at the ends that they fit together like the edges of a cube, six feet on the side. Others fit in with them, each stick entering into the four adjacent cubes, and in the end a framework of timber of great strength is built up. As soon as possible this is filled in with waste rock, which finally settles down and is practically as solid as the original vein. Unless precautions are observed in connection with keeping the walls firm and immovable, they may settle and do great damage both to surface buildings and underground workings.

In the Lake Superior iron mines producing soft ore, that lies under a too heavy burden of gravel to warrant stripping, a system has been adopted called the 'caving system.' The ores of this character on Lake Superior lie in great troughs or elongated basins. A shaft is sunk in the rock beyond the limits of the ore and drifts at various levels are run out into it. From the uppermost level upraises are made to the top of the ore and minor drifts extended to its outer limits. Light timbering and lagging protect the miner, who then at these outer limits begins to mine out the ore on each side of the end of his drift, letting the burden gradually cave in to the place whence the ore is taken. By multiplying these drifts in every direction all the ore is removed, and the burden, closing in all the time, keeps the mine shut and the miners protected from the weather. In the end a great pit results, sunk in the natural surface.

In small mines no particular system of timbering or taking out the ore is necessary, especially if the wall-rock is firm. Beyond the general plan of shafts and levels the workings follow the ore, and, without much systematic exploration, blast it and remove it to the surface. The objection to this method is that when the known rich spots are exhausted, further operations until more ore is located are all dead work, yielding no return and often causing the enterprise to shut down. In large mines where the wall-rock is firm, great excavations may be made with no timbering whatever.

If the vein or series of veins outcrop on a hillside, either parallel with its surface or crossing the neighboring valley, the ore may be won by adits or tunnels run in on a slight up grade. Such a tunnel will automatically drain all the portions of the vein above it and will make it an easy matter to take out the ore, which is merely loosened and sent down to the tunnel in winzes and shoots. But the portions below the tunnel will of necessity be reached by shafts from it and will require pumping. For this reason, unless the advantages of a tunnel are very great, most engineers prefer a vertical shaft at as early a stage in the mine as possible, because it is so easy and convenient to handle ore quickly and cheaply by vertical hoisting. Nevertheless some long and famous tunnels have been excavated in former years to drain important veins.

In the handling and transportation of ore underground, important problems are met in large works. It is accomplished in the levels by small cars, usually built of boiler plate to withstand the pounding that they receive, and these are pushed along by men on light tracks to the shaft. The operation is called tramming. If the shaft is vertical the cars are run directly on the cage, and hoisted to the surface, where they are dumped and returned. Large mines may have cages with two or even three decks, bringing thus two or three tram-cars at a trip. If the shaft is inclined, the tram-cars are dumped at the landing of the level into a car in the shaft that is open at the end instead of at the top. This is called a skip and its track is the skipway. The skip dumps automatically at the top of the shaft. In small mines an iron bucket is used instead of a skip or cage, but as soon as the output becomes at all large, buckets have to be abandoned. The transportation of the miners up and down deep shafts is also an important matter. They may, and as a rule do, ride on the skips, cages, or buckets used for the ore, special trips being made for them. Ladders, except for shallow depths, are no longer used in good practice unless in emergencies, as the climbing is too slow and exhausting.

In all mines one of the most dreaded things is fire. The forests of underground timber in many old workings make it a very dangerous accident, and even when in shaft houses at the entrances it often entails disastrous consequences on the men below. In coal mines there is the added danger of explosions and even of combustion of the coal. It is more and more customary, therefore, to locate boilers and engines in separate buildings from shaft houses, and to use every precaution against an outbreak.

In the organization of the force of miners the relations of employer and employed in mines are somewhat different from those of operations on the surface. The men are distributed as individuals and small parties in places more or less scattered and beyond regular superintendence. It is therefore often customary to let out work by contract rather than by day wages. A fair price is offered, based on experience, and usually estimated by the cubic yard or fathom of ore or rock excavated, and a party of miners organize and assume the contract. Active and energetic men do well under these circumstances, but as a rule the prices soon adjust themselves to about a fair average. The company furnishes supplies of explosives, drills, timber, etc., to the men at rates agreed upon. It also has a mine foreman, with subordinates to see that the work goes on satisfactorily, and at the end of each month the surveyor or engineer or superintendent measures up the work. In case the owners lack capital, or the vein is pockety and not adapted to systematic work in the large way, the 'tribute' system may be adopted. The parties of men then lease a certain block of ground and mine at their own expense and risk, paying to the owners a graded percentage of the value of the ore. If the men strike rich ore they realize high returns, but if it proves lean and low-grade they may actually lose. Old miners who know a mine thoroughly may often thus work to a great advantage. Owners of small capital sometimes get a new mine developed by leasing it to a party of practical miners for a percentage of the ore values for a limited time period. In this way the ore body is opened up without expense to the owners, but the leasers, who take the risks, naturally reap the lion's share of the profits. The relations of employers to men in remote settlements are also peculiarly close. The mining company of necessity furnishes houses, supplies, and all necessaries of life.

The production of the metals and useful minerals the world over has increased remarkably. Nowhere has the advance been more pronounced than in the United States, which is the foremost of mining nations, leading, in 1902, in the production of iron and steel, copper, gold, silver, mercury, coal, salt, and petroleum. Of the other more prominent metals and minerals, Spain is the chief producer of lead, Germany of zinc, and Russia of platinum.

For statistics and further information, consult the separate articles on the various metals.

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MINING CLAIM. The claim of a person to the exclusive right to work land in which he supposes he has discovered deposits of a precious metal; hence, the parcel of land supposed to contain the metallic deposits. The term is specifically used to designate the area of such metalliferous land which may be held under one location under the statutes of the United States, in which case the claim and location are identical if there is but one location; but if the miner acquires two or more locations the claim is usually used to designate the whole tract of land.

A mining claim is real estate, and descends to the heir, and is subject to taxation, execution, etc., as is any other real estate, and may also, in like manner, be protected by the action of ejectment. See further under Mining.

MINING ENGINEERS, American Institute of. A society founded in 1871, for the promotion of the arts and sciences connected with the economical production of minerals and metals, the discussion of professional papers, and the circulation of information connected with mining interests. It had a membership at the close of 1902 of 3300, made up of honorary, elected, and associate members. The annual meeting of the Institute is held in February, with other meetings during the year as authorized by the council. The Institute publishes a volume of *Transactions* each year, besides the papers read before the Institute and accepted. The headquarters of the Institute are in New York.

MINING LOCOMOTIVES. See ELECTRIC RAILWAYS; LOCOMOTIVES; COMPRESSED AIR; ENGINE.

MINISTER (Lat., servant). A public functionary who has the chief direction of any department in a State. (See MINISTRY.) Also the delegate or representative of a sovereign at a foreign court to treat of affairs of state. Every independent State has a right to send public ministers to, and receive them from, any other sovereign State with which it desires to preserve relations of amity. Semi-sovereign States have generally been considered not to possess the *jus legationis*, unless when delegated to them by the State on which they are dependent. The right of confederated States to send public ministers to each other, or to foreign States, depends on the nature and constitution of the union by which they are bound together. The Constitution of the United Provinces of the Low Countries and of the old German Empire preserved this right to the individual States or princes, as do the present constitutions of the German Empire and Swiss confederation. The Constitution of the United States either greatly modifies or entirely takes away the *jus legationis* of each individual State. Every sovereign State has a right to receive public ministers from other powers, unless where obligations to the contrary have been entered into by treaty. The diplomatic usage of Europe recognizes three orders of ministers. Ministers of the first order possess the representative character in the highest degree, representing the State or sovereign sending them not only in the particular affairs with which they are charged, but in other matters; they may claim the same honors as would belong to their sovereigns, if present. A principle of reciprocity is recognized in the class of diplomatic agents sent. States enjoying the honors of royalty send to each other ministers of the first class; so also in some cases do those States which do not enjoy them; but it is said that no State enjoying such honors can receive ministers of the first class from those who are not possessed of them.

Besides these orders of ministers, there are other diplomatic agents occasionally recognized —as deputies sent to a congress or confederacy of States, and commissioners sent to settle territorial limits or disputes concerning jurisdiction. These are generally considered to enjoy the privileges of ministers of the second and third orders. Ministers-mediators are ministers sent by two powers between which a dispute has arisen to a foreign court or congress where a third power, or several powers, have, with the consent of the two powers at variance, offered to mediate between them.

Ministers sent to a congress or diet have usually no credentials, but merely a full power, of which an authenticated copy is delivered into the hands of a directing minister, or minister-mediator.

The title 'excellency' has since the peace of Westphalia been accorded to all diplomatic agents of the first class; and in some courts it is extended to ministers of the second class, or at least to those sent by the Great Powers.

By the American system ministers to exercise diplomatic functions at foreign courts are appointed by the President and confirmed by the Senate. See AMBASSADOR; ENVOY; CONSUL; DIPLOMACY; DIPLOMATIC AGENTS; INVIOLABILITY. See also CABINET. Consult the authorities referred to under the last three of these titles.

MINISTERIAL OFFICER. An officer whose functions consist in executing the command of a superior, or in performing a duty definitely prescribed by law. Its propriety is not left to his judgment or discretion. He is legally bound to perform it; and for a failure to do his duty he is liable in damages to the person in whose favor the duty was to be discharged. A policeman, sheriff, or marshal having a writ for the arrest of a designated person is liable for false imprisonment if he arrests any other person than the one named. Or, he may have arrested the wrong person, because of mistaken information, yet having acted with due caution in making his inquiries. In both cases he is liable. As a rule, the ministerial officer acts at his peril. Perhaps the harshest application of this rule is seen when he enforces legal process under an unconstitutional statute. If, on appeal, the statute is declared unconstitutional by the highest court of the State, the judges of the lower court are not civilly responsible for their blunder, but the sheriff who seized and sold property under the execution must respond to the owner for its value.

Oftentimes a judicial officer or a legislative body is required to act in a ministerial or executive capacity. Generally speaking, a judge acts ministerially when an application for a writ of *habeas corpus* is made to him. The law does not leave the granting or withholding of this writ to his discretion. A justice of the peace who has rendered judgment in a case before him is under a peremptory duty to issue an execution thereon at the request of the judgment creditor. In issuing or refusing it he acts ministerially, not judicially. If a statute charges a county judge with the duty of selecting jurors for the various courts sitting in the county, his acts under the statute are ministerial. Whether an act required by law of an officer is judicial or ministerial depends upon its character, and not on the rank of the actor. See OFFICE, and consult the authorities there referred to.

MINISTER'S WOOING, THE. A story by Harriet Beecher Stowe, published as a serial in the *Atlantic Monthly* (1859). The scene is New England in the Revolution, when Mary Scudder's lover is supposed to have been drowned, and the girl is persuaded to marry old Dr. Hopkins, the minister. The lover returns, Mary is true to her promise, but the minister frees her at the suggestion of Miss Diamond.

MINISTRY. A body consisting usually of the heads of the chief executive or administrative departments of a government, and constituting an advisory council of the sovereign. In several European countries there is a chief minister who has a certain precedence in rank and authority over his colleagues, and who is known as the premier or prime minister. In several others, the chief minister bears the title of minister-president, and enjoys a certain precedence in dignity over his colleagues, but exercises no authority over them. Everywhere, the right of selecting the members of the ministry belongs to the chief executive. In those countries, like England, where the Crown is only the nominal executive, the head of the State selects only the prime minister, and intrusts the selection of the others to him. In the German Empire, the Kingdom of Prussia, the Empire of Japan, and the American republics, where the ministers are not responsible to the legislature for their political policy, they are all appointed directly by the chief executive without being restricted to acknowledged party leaders. It is a general rule in European countries that members of Parliament may, with the approval of their constituents, serve as ministers. But whether members of Parliament or not, ministers are entitled to sit in either House, and to participate freely in the discussion of measures in which they are interested.

In general, the term 'ministry' is synonymous with the term 'cabinet' (q.v.), but there are exceptions. Thus, in Great Britain, the 'ministry' includes in addition to members of the cabinet, all those political under-secretaries who have seats in Parliament (at present about forty in number), and who are expected to resign when their policy is defeated in the House of Commons, while the 'cabinet' consists of a certain number of ministers (at present nineteen) who control the policy of the government and preside over the chief administrative departments. Thus, it will be seen that not all the ministers are members of the cabinet. On the other hand, it may happen that some members of the cabinet will have no administrative duties. Such members are known as ministers without portfolios. Departments of adminstration over which ministers are generally placed are: foreign affairs, war, finance, justice, public education, public worship, navy, commerce, post and telegraphs, and colonies. In those countries where ministers are responsible to the chief executive, they act independently of one another in the conduct of their administrative departments, and their responsibility is individual rather than collective.

MINITARI, mē′nė̂-tä′rė̂, or HIDATSA, hė̂-dät′sȧ. A tribe of Siouan stock (q.v.), originally a part of the Crow, whose language they speak, but from whom, for some petty traditional quarrel, they long since separated. Since known to the whites they have resided nearly in their present position on the Missouri River in North Dakota in close alliance with the Mandan and Arikara (q.v.). They call themselves *Hidatsa*, their popular name being of Sioux or Mandan origin, and said to signify 'people who have crossed over the water.' Both they and a detached band of Arapaho were known to the French as *Gros Ventres* (q.v.). They occupied permanent stockaded villages of circular earth-covered log houses along the bluffs of the Missouri, where they had fields of corn, pumpkins, and sunflowers, and made periodic excursions into the open plains to hunt the buffalo, at which times they lived in tepees. Like their allied tribes, they had elaborate ceremonials and social organization. They have been uniformly friendly to the whites. In 1804 they were estimated at 2500, but have decreased rapidly, first from the smallpox of 1837, and later from the diminished food supply consequent upon the destruction of the buffalo. They number now about 460, and live with the Mandan and Arikara, upon the reservation at Fort Berthold. The population of the three tribes for some years has remained about stationary. The Minitari are the most industrious of the three, having the largest herds and earning more than the other two together. Consult Matthew, *Ethnology and Philology of the Hidatsa Indians.*

MIN′IUM, or RED LEAD. A beautifully scarlet crystalline substance consisting chiefly of lead ortho-plumbate, $2PbO.PbO_2$. It is made by cautiously heating massicot or white lead in a reverberatory furnace or in special barrel-shaped ovens open at both ends. If heated, minium gradually changes its color, becoming violet and ultimately black; but it regains its original color on cooling. If ignited in the air, minium is converted into the monoxide of lead. Minium is used as a mineral color, yielding a fine paint. It is also employed in the manufacture of flint-glass. The commercial product usually contains more or less litharge and is often found adulterated with iron oxide, brick-dust, red bole, powdered heavy spar, etc., the most objectionable adulterant being iron. Minium has also been found native in certain localities in Great Britain, Russia, etc.

MIN′IVET. One of a group of about twenty species of small shrike-like birds of the Oriental region. The males are, in general, black and rose, while the females are gray and saffron. Consult Blythe, *Mammals and Birds of Burma* (London, 1875); and other authorities on Oriental ornithology cited under BIRD.

MINK (probably from Swed. *mänk*, mink). Any of several species of weasel-like animals of the genus Putorius, family Mustelidæ, distinguished from the martens, stoats, etc., by their semi-aquatic habits and certain peculiarities of dentition. The American mink (*Putorius vison*) is found throughout North America, but especially in the northern and mountainous parts. The European mink (*Putorius lutreola*), usually called 'norz' or 'mänk,' occurs in Finland, Poland, Scandinavia, and Russia, and formerly extended as far west as Central Germany. The mink of Siberia (*Putorius Sibirica*) is a quite distinct but little known species. The American mink is somewhat larger than the European species (15 to 18 inches long, besides the tail, 9 inches), and is further distinguished by the black upper lip; in the European mink the upper lip is white.

Minks are inhabitants of well-watered areas, haunting the banks of streams and borders of ponds in search of their food, and making their homes in burrows, which open near the water. They are excellent swimmers, having the feet partially webbed, and spend much time in the water. Although, like other Mustelidæ, they eat birds, small mammals, and eggs, the principal food of minks comes from the water; thus fish, frogs, salamanders, crayfish, and even mollusks, form their chief diet, and muskrats and other water-loving mammals also fall prey to their voracity. The fur of the mink is of great value commercially, though the price varies much with color and quality. (See Fur and the Fur Trade.) Minks are usually brown, sometimes rather light, but more often very dark, especially along the mid-dorsal line. The darker the animal the more valuable it is. The fur is made up of a dense undercoat and an outer coat of long, shining hairs, and the skins from the coldest regions are usually the most valuable. Like all its near relatives, the mink is bloodthirsty and cruel. It is very courageous, and when cornered is savage. The young are born in the early spring, usually in a hole in the bank of some body of water, where plenty of food is easily obtained. The number of young is about six in a litter. The mink is second only to the skunk in the strength, penetrating power, and nauseousness of the odor of the secretion in the anal glands, but fortunately it is only when the animal is greatly enraged that the odor becomes very disagreeable. Minks are said to be easily tamed if taken young, and to enjoy being petted, but their temper is capricious, and as they grow old they become dangerous. Civilization seems to have little effect upon them, there being few districts so completely cleared or densely settled as not to afford them refuge.

Consult: Audubon and Bachman, *Quadrupeds of North America* (New York. 1851); Coues, *Furbearing Animals* (Washington, 1879); Stone and Cram, *American Animals* (New York, 1902). See Fur-Bearing Animals.

MINK-FROG, or Hoosier-Frog. A small frog (*Rana septentrionalis*) of the Northwestern United States. It is 2¼ inches long from nose to vent, dark olive green above, with sooty brown bars and blotches, and pure white underneath. Its hazel iris, minky color, and quiet solitary habits, distinguish it from others. A detailed account of its features and ecology was given by J. H. Garnier in *The American Naturalist*, vol. xvii. (Philadelphia, 1883).

MIN'KOPIS, or **MINCOPIES**. See Andamans.

MINNA VON BARNHELM, mĭn'nȧ fôn bärn'hĕlm. A comedy by Lessing, produced at Hamburg in 1767. The action occupies part of a single day, and the scene throughout is an inn. The plot rests on the ruse employed by the heroine to overcome the false sense of honor of her fiancé, Major von Tellheim, who refuses to bind her to him, because of his poverty.

MIN'NEAP'OLIS. A city and the county-seat of Ottawa County, Kan., 127 miles west of Topeka: on the Solomon River, and on the Union Pacific and the Atchison, Topeka and Santa Fe railroads (Map: Kansas, E 2). It derives considerable trade from the adjacent farming and stock-raising country, and has grain elevators, flour mills, carriage shops, a foundry, etc. Building stone is quarried in the vicinity. There is a public-school library of 3000 volumes. Population, in 1890, 1756; 1900, 1727.

MINNEAPOLIS. The largest city of Minnesota, and the county-seat of Hennepin County, situated at the Falls of Saint Anthony, on the Mississippi River, above Saint Paul, the suburbs of which join those of Minneapolis, the two municipalities being termed 'Twin Cities.' The river, which divides the city into unequal portions, the main portion being on the right bank, is crossed by a number of massive highway and railroad bridges. The Falls of Saint Anthony are in the heart of the manufacturing district.

Minneapolis stands on a gently undulating plateau, 800 feet above sea-level, in a picturesque lake region much frequented as a place of resort. There are several lakes within the city limits, and of others in the immediate vicinity, Lake Minnetonka is the largest and most popular. The city is about 10 miles long by 6 in width, and has an area of 53 square miles. Its streets are broad and regular. An extensive park system has been developed. There are some twenty parks, comprising a proportionately large area of 1581 acres. Attractive driveways, of which the Kenwood Boulevard (150 feet wide) is an example, skirt the lakes, constituting a picturesque feature of the park system. Loring Park, in the centre of the city, contains a fine lake and Fjelde's statue of Ole Bull. Minnehaha Park, of 133 acres, is a picturesque tract, embracing the Falls of Minnehaha, 50 feet in height, which have beeen immortalized by Longfellow's *Hiawatha*. Adjoining the park are the beautiful grounds of the State Soldiers' Home, occupying 60 acres. Minneapolis has many handsome edifices, both public and private. The Court House and City Hall was completed at a cost of more than $3,000,000 in 1902. It is built of Minnesota granite, and is 300 feet square, inclosing a large open court. The tower commands a superb view of the city from its height of 345 feet. The post-office and the public library are fine Romanesque structures. The latter contains a collection of 12,000 volumes, an art gallery and school of art, and the Museum of the Minnesota Academy of Natural Sciences. The Guaranty Building, 12 stories high, is conspicuous among the office buildings of the city. Other prominent structures are the New York Life Insurance Building, Masonic Temple, West Hotel, Chamber of Commerce, Andrus Building, and the Lumber Exchange. Minneapolis is the seat of the University of Minnesota (q.v.), on the grounds of which is a statue of ex-Governor John S. Pillsbury, by French. Other educational institutions are Augsburg Seminary (Lutheran), established in 1869; the medical department of Hamline University (Saint Paul), the Northwestern Conservatory of Music, Morgan Hall, and Stanley Hall. There are numerous private and public charitable institutions, and a bureau of associated charities which is organized for coöperation and general superintendence.

Commerce and Industry. The conditions which have contributed most to the industrial development of Minneapolis are the advantages afforded by the Falls of Saint Anthony and their convenient location in relation to the abundant grain and timber of the Northwest. Excellent transportation facilities give the city command over these supplies and over the markets of the country. Twenty-two lines of railway, operated under ten systems, enter the city. With these advantages, Minneapolis has developed into the foremost city of the Northwest, being noted particularly for its manufacturing and wholesale interests. The first manufactory in the State was established at the Falls of Saint Anthony. It was used first as a saw-mill and then as a flour-mill. The power afforded by the Falls has been utilized more and more, until Minneapolis has become the largest flour and lumber market in the world. The water power at the Falls of Saint Anthony was developed, previous to 1879, to yield 30,000 horse power, and in 1897 a new dam, giving 10,000 horse power, was completed. The United States Government is (1903) constructing a system of locks and dams below the Falls which will add 10,000 horse power. For a number of years the lumber industry was most important, but after the introduction of improved processes of flour-milling in the seventies, the latter industry surpassed lumber manufacturing, and has since rapidly outstripped it. This relation, undoubtedly, will continue to exist, as the tributary grain-producing area is constantly increasing, while the timber supply is diminishing. The lumber cut by Minneapolis mills increased from 118,223,113 feet in 1870, to 343,583,762 feet in 1890, and 578,113,000 in 1901. The production of flour increased from 940,786 barrels in 1878 to 6,988,630 barrels in 1890, and 15,921,880 in 1901. The daily capacity of the mills in 1901 was 80,516 barrels, and one mill alone had a capacity of 15,000 barrels. Other prominent industries are the manufacture of foundry and machine-shop products, malt liquors, and linseed oil.

Among the railroads that contribute to the high commercial and industrial rank of Minneapolis are: the Chicago and Northwestern; the Burlington Route; the Chicago, Milwaukee and Saint Paul; the Chicago, Rock Island and Pacific; the Northern Pacific; the Great Northern; the Minneapolis, Saint Paul and Sault Saint Marie; the Chicago Great Western; and the Saint Paul and Duluth. The Mississippi River is navigable to Minneapolis, but vessels practically go no higher than Saint Paul. In the crop year 1891 there were received in Minneapolis 81,961,600 bushels of wheat, 9,266,300 bushels of corn, 12,909,710 bushels of oats, 5,348,940 bushels of barley, and 7,180,060 bushels of flax. In 1901, 118,650,000 feet of lumber, lath, and shingles were received, and 465,405,000 feet were shipped.

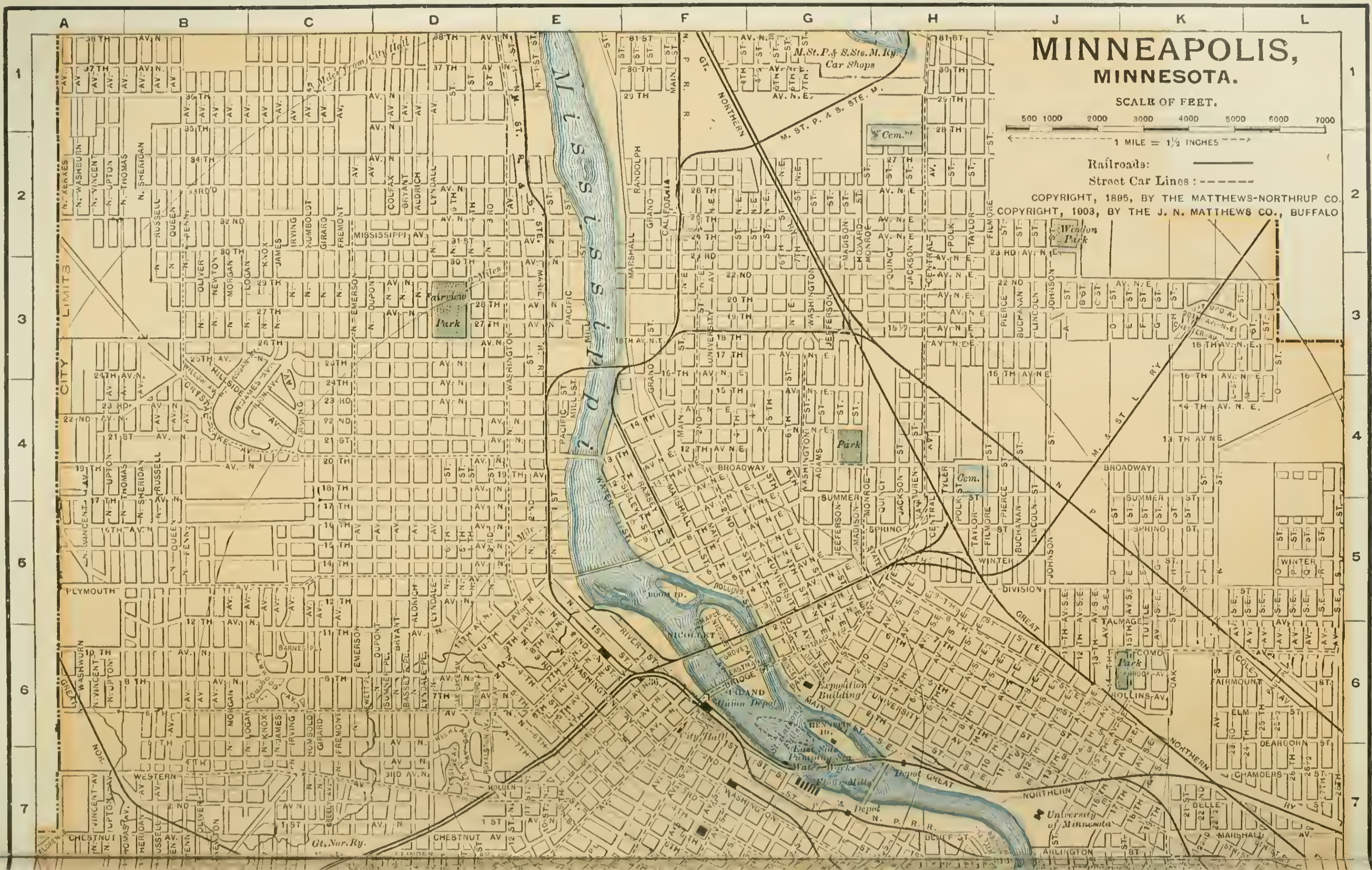
Government. Minneapolis is governed under a charter of 1872, granted at the consolidation of Minneapolis with Saint Anthony. This charter has been frequently amended by the Legislature. The city, through a commission consisting of fifteen resident freeholders appointed by the district court, now has the power to draft a new charter and amend it, subject to ratification by the people. The main elective officers of the city are the mayor, treasurer, comptroller, two municipal judges, and the members of the city council, twenty-six in number, two from each ward elected for four years, one being chosen in each ward at every biennial election. The council is a unicameral body. The mayor, treasurer, and comptroller are elected for two years. The mayor's veto may be overridden by a two-thirds vote of the council. There are also the following elective boards: Library board, park board, and board of education. The police department is under the control of the mayor, who appoints the superintendent and all members of the police force, the appointment of the superintendent, however, requiring confirmation by the city council. The mayor is ex-officio member of the park board, the library board, the board of sinking-fund commissioners, and the board of charities and corrections. The last-named board consists of five members, the other four being appointed by the mayor.

Finance. The city had in 1902 a funded debt of $8,269,000, which was partially covered by a sinking fund of $1,634,331. The charter limits the municipal debt to 5 per cent. of the assessed valuation. The assessed valuation of real and personal property in 1902 was $121,279,537. The legal basis for assessment of property is 100 per cent., or the full market value, but in practice the basis is about 60 per cent. The tax rate for 1903 was 2.533 per cent. The total receipts in 1902 were $4,559,505. The expenditures for maintenance and operation were $2,944,208; the main items being: for schools, $805,289; for the fire department, $346,999; for interest on debt, $310,085; for the police department, $224,999. Minneapolis owns and operates its water-works, which represent an outlay of $4,602,708.

Population. Minneapolis is the largest of the American cities which have developed wholly since the middle of the nineteenth century. Its population by decades has been as follows: 1860, 2564; 1870, 13,066; 1880, 46,887; 1890, 164,738; 1900, 202,718. The total population in 1900 included more than 61,000 persons of foreign birth, or 30.1 per cent., while the persons of foreign parentage represented 69 per cent. of the total. Scandinavians compose the majority of the foreign-born element. The negroes numbered 1548.

History. Father Hennepin visited the Falls of Saint Anthony in 1680 and gave them their name. Though the United States Government in 1819 built Fort Snelling at the mouth of the Minnesota, and in 1822 erected a large mill within the present limits of Minneapolis (then included in the 'Military Reservation of Fort Snelling'), no real settlement on the west side of the river was made until 1850, when Colonel J. H. Stevens established a claim overlooking the falls. Owing largely to the uncertainty of land titles, few settlers came until after 1855, when Congress first granted a right of preëmption. The settlement, having previously borne several names in succession, was incorporated in 1856 as the town, and in 1867 as the city of Minneapolis. In 1872 the city of Saint Anthony, directly across the river, which had been settled in 1837, and incorporated in 1855, was annexed. After 1860 the growth of the city was exceedingly rapid. From 1886 to 1893 a large Industrial Exposition was held here, and in 1892 the Republican National Convention met in the Exposition Building. On September 23, 1891, there was a notable 'Harvest Festival' to celebrate the return of agricultural prosperity in the Northwest after a period of poor crops and general depression. Consult Atwater, *History of the City of Minneapolis* (New York, 1893).

MIN'NEDO'SA. A town of Marquette County, Manitoba, Canada, on the Little Saskatchewan River, and on the Manitoba and Northwestern Railway, 135 miles northwest of Winnipeg (Map: Manitoba, J 4). A branch line also connects it with Rapid City, 15 miles south. It


MINNEAPOLIS,
MINNESOTA.
SCALE OF FEET.
500 1000 2000 3000 4000 5000 6000 7000
1 MILE = 1½ INCHES
Railroads:
Street Car Lines:
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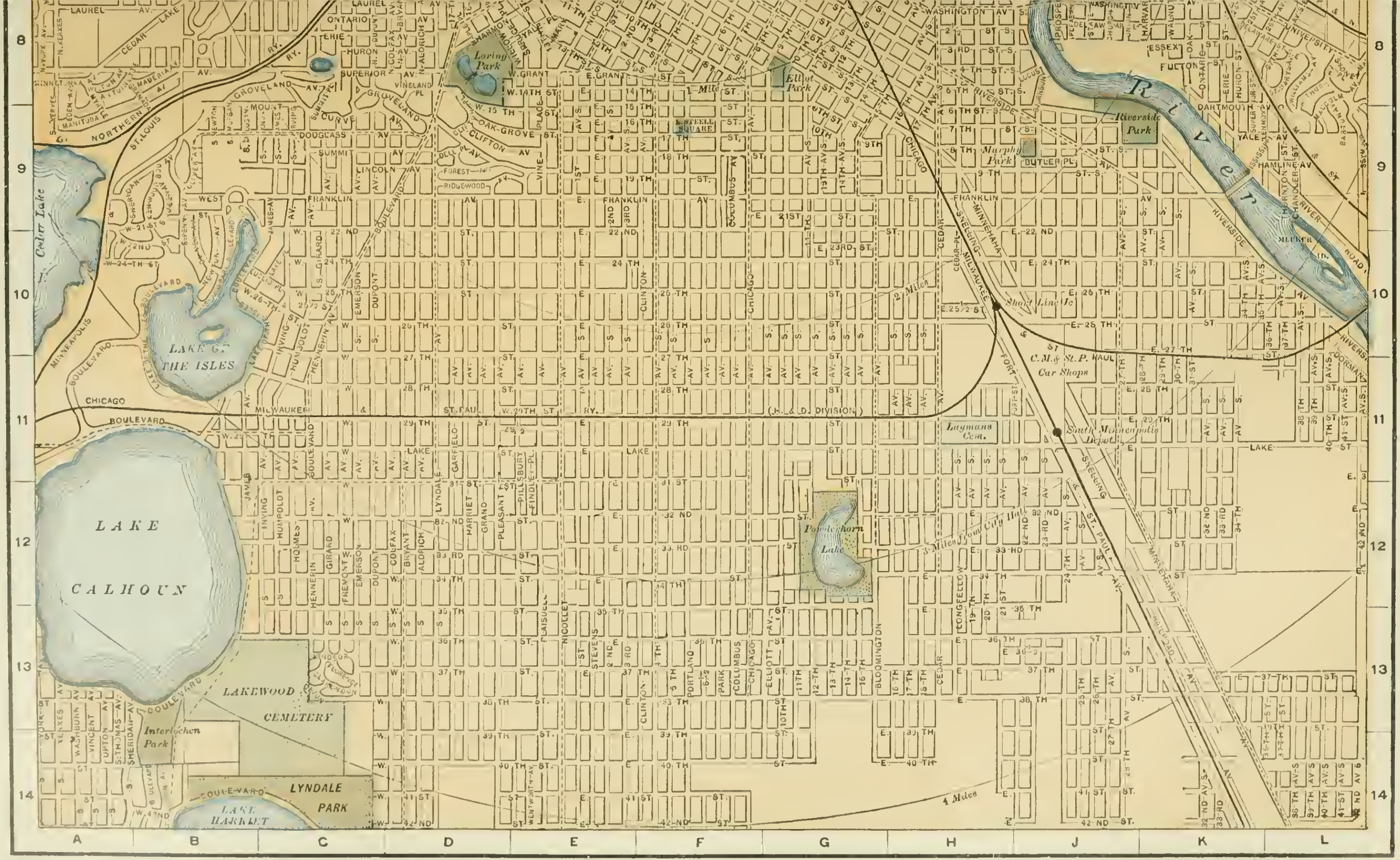
Mississippi
M. St. P. & S. Ste. M. Ry. Car Shops
Windom Park
Fairview Park
Park
Cem.
Boom Id.
Nicollet
Union Depot
Exposition Building
City Hall
Hennepin Id.
East Side Pumping Sta.
Water Works
Flour Mills
Depot
University of Minnesota
Gt. Nor. Ry.
CITY LIMITS
PLYMOUTH
BROADWAY
WASHINGTON
UNIVERSITY
DIVISION
GREAT NORTHERN
N. P. R. R.
M. ST. P. & S. STE. M.



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is the busy centre of a rapidly colonizing agricultural region. Population, in 1891, 614; 1901, 1052.

MINNEHAHA, mĭn′nē̇-hä′hȧ. The heroine of Longfellow's Indian poem, *Hiawatha*, and represented as the daughter of an old arrow-maker. The name Minnehaha (Sioux *Mini-haha*, 'laughing water) is borne by a picturesque cascade, about 50 feet high, in the Minnehaha River, a small stream emptying into the Mississippi at Minneapolis, Minn. It may be mentioned that in Longfellow's work the hero has an Iroquois name, the heroine a Sioux name, while the poem itself is based upon the Ojibwa legends published in Schoolcraft's *Algic Researches*.

MIN′NESING′ER. The common name for those German poets who flourished at the various feudal courts of Germany in the twelfth and thirteenth centuries. The themes of the minnesingers are first epic, then mainly religious in inspiration. They also described the beauties of nature. More often than the troubadours they were of noble birth, but, like the troubadours, they roved from court to court. Minnepoetry has three epochs. In the first, a little after 1150, lyric poetry begins to free itself from the epic; the second is its brilliant period; the third, beginning about 1300, marks its decline and the rise of the meistergesang, cultivated by the meistersinger (q.v.). The minnesingers employ either the verse with four beats, or the long line with rhymes in pairs, and often their songs are only a strophe long. Remnants of old German poetry show that the chanted long line and the rhymed verse with a regular beat were collaterally employed. The former was better suited to heroic songs or narrative; the latter, being lively, fitted the lyric. The oldest extant love songs in German are in rhymed verses with fourfold arsis, or they are in the long line. Not seldom variety was obtained by the introduction of an 'orphan' or rhymeless verse, or by having long and short lines in one and the same strophe. The ditties of early singers such as Dietmar von Aist, von Kürenberg, Meinloh von Seveningen, and the burgraves of Regensburg and Rietenburg, are marked by simplicity of thought, by absence of repining, and by the use of assonance. The minnesingers, like the troubadours (q.v.), throve in the heyday of chivalry. How deeply each of the minnesingers was influenced by the troubadours, and to what degree they drew upon the traditions and customs of their own land, or finally to what extent they imitated once genuine emotions or spoke from their hearts, is often extremely problematical. Certainly, the oldest poems utter true experience, though we must allow for the fiction which presents the lover and his lady in colloquy. Some of the most ancient German poems are put into woman's mouth, but we can scarcely conclude that women were therefore among the minnesingers, though several ladies, as, for instance, the Countess of Dia, wrote love poems in Provençal.

With the more artful verses of the Burgrave Rietenburg, Provençal influence becomes clear. To all people *minne* meant love, but to the lordlier poets or to those who sang in their halls *minne* had an exalted significance. Platonic love had ousted the older and far more genuine sentiment between men and women. We shall find that the minnesingers were merely doing what had been done a little sooner by the troubadours, but the minnesong was not so brilliant, though it was almost as artificial as the poems written in the best period (1100-1260) of Provençal literature (q.v.). The Germans cultivated such forms as were popular in Southern France, as the love-poem proper, the *sirventes* (q.v.) and the *tenzon* (q.v.). Like the troubadour, the minnesinger sang the praises of his lady, who was often his patron's wife. Of her he made an earthly angel, and whatsoever boon she might grant him was his bliss. The minnesingers whose dialect puts them on the western boundary of Germany first show French influence. Provençal influence is earliest perceptible in Friedrich von Hausen, a Franconian from the Rhine. The dactylic rhythm bears witness also to a romantic origin. Minnesingers who used it were, besides Friedrich von Hausen, Heinrich von Veldeke, Heinrich von Morungen, Hartmann von Aue, Walther von der Vogelweide, Hildbold von Schwangau, and Ulrich von Liechtenstein.

With Friedrich von Hausen we first meet the Crusading song. Walther von der Vogelweide gave the fullest utterance to the minnesong. In him we find both courtly and popular elements. Walther also modeled poems after romantic patterns. Austria was the centre of court poetry. There Reinmar had lived and there Walther had learned his art. Neidhart had first composed for peasants songs and dances, but his ambitious tendencies displeased them and he turned to the Court. With Walther and Neidhart the road goes in twain, and each had his followers. Princes had been among the troubadours. So it was in Germany, where Henry VI. and Conradin were singing in the south, while farther north were Duke Henry II. of Anhalt, Margrave Otho IV. of Brandenburg, and Henry III. of Meissen.

Consult: Pfaff, *Der Minnesang des 12. bis 14. Jahrhunderts* (Stuttgart, no date); Uhland, "Der Meistergesang," in *Schriften zur Geschichte der Dichtung und Sage*, vol. v. (Stuttgart, 1870); Scherer, *Deutsche Studien* (Vienna, 1870, 1874); Burdach, *Reinmar der Alte und Walther von der Vogelweide* (Leipzig, 1880); Lyon, *Minne- und Meistergesang* (ib., 1883); Lechleitner, *Der deutsche Minnegesang* (Wolfenbüttel, 1893); Grimm, *Geschichte der Minnesinger* (Paderborn, 1897). For the history of the German gnomic poetry consult Roethe's edition of the *Gedichte Reinmars von Zweter* (Leipzig, 1887). For a general collection consult von der Hagen, *Minnesinger* (ib., 1838); for a selection consult Bartsch, *Deutsche Liederdichter des 12. bis 14. Jahrhunderts* (3d ed., Stuttgart, 1893).

MIN′NESO′TA (Indian, sky-tinted water). One of the North-Central States of the American Union. It lies around the head waters of the Mississippi River, between 43° 30′ and 49° 25′ north latitude, and between 89° 29′ and 97° 5′ west longitude. It is bounded on the north by the Canadian provinces of Ontario and Manitoba, on the east by Lake Superior and the State of Wisconsin, on the south by Iowa, and on the west by the Dakotas. It has an extreme length north and south of about 400 miles, and east and west of 380 miles, averaging 240 miles in width, and comprising an area of 83,365 square miles, of which 4160 square miles are water. It ranks tenth in size among the States.

Topography. Northern Minnesota is an extension of the Laurentian highlands—ancient rocks smoothed down to moderate relief. The surface here is rolling, is densely covered with pine forests, except in the western part, and abounds in lakes and swamps. Southern Minnesota is largely prairie, wide expanses of gently rolling, grassy, and generally treeless plains of boulder-clay, belted with moraines. The greater part of the surface is young, the plains are as yet undissected, and lakes still remain in the moraines. In the southeastern and southwestern corners of the State the old surface was not covered over by the later Wisconsin glacial sheet, and here we find the surface has weathered smooth and the lakes have disappeared. The surface of the State has as its central feature, in the north-central part, an elevated plateau, which rises 1750 feet above the level of the sea. From this plateau the country slopes off north, south, east, and west, reaching, however, 2200 feet in the northeast in the Mesabi Mountains north of Lake Superior, and after a considerable decline rising again in the southwest corner of the State to 1800 feet in the Coteau des Prairies. The average elevation is 1200 feet, or 600 feet above the level of Lake Superior. The surface is unbroken by any sudden uplifts, and the slope from the central plateau in each direction is very gradual. The lowest portions of the State are the region around the head of Lake Superior, and the southeast section of the State where the land falls to an elevation of about 600 feet.

The rivers of Minnesota radiate in all directions from the central plateau mentioned above. The two principal drainage systems are those of the Mississippi and the Red River of the North. The Mississippi rises in the Itascan lake group, and with its two large tributaries, the Saint Croix on the eastern boundary, and the Minnesota in the west, drains more than one-half the State. The Red River of the North, which drains the western slope, flows northward on the western boundary through a flat lacustrine basin to Lake Winnipeg. The northern and northeastern slopes are small in area and drained by short streams flowing into the Rainy River and Lake system on the northern boundary, and into Lake Superior. The largest of these streams is the Saint Louis River, which flows into the western extremity of Lake Superior. The Mississippi River alone is used for navigation; the Minnesota and the Red River are reported 'navigable,' but are little used. The direction of the rivers, as well as the position and formation of the innumerable lakes dotting the surface of the State, have been determined by glacial action. In the north the lakes are usually cut out of the old rock and display bold tortuous shores. In the south the lakes are often broad and shallow. Three-fourths of the lakes of the State are those occupying the undrained hollows in the morainal deposits, which cover the greater portion of the surface of the State; others, such as Lakes Pepin, Traverse, and Big Stone, are river expansions. The lakes vary in size from mere ponds up to Red Lake, with an area of 340 square miles. The other more important lakes are Leech and Winnebigoshish in the plateau region: Mille Lac; and Minnetonka, a popular summer resort for Minneapolis and Saint Paul.

The most important lacustrine feature of Minnesota is the extinct Lake Agassiz. An incident in the recession of the Pleistocene ice was the ponding of the marginal drainage of the ice sheet in the valley of the Red River as fast as it was uncovered by the melting ice. A great lake was formed which has been called Lake Agassiz. At its largest stage it has a maximum width of nearly 700 miles, and drained through the Minnesota River into the Gulf of Mexico. On the disappearance of the ice, and the draining out of Lake Agassiz by the Nelson River, its bed was left as a level alluvial plain.

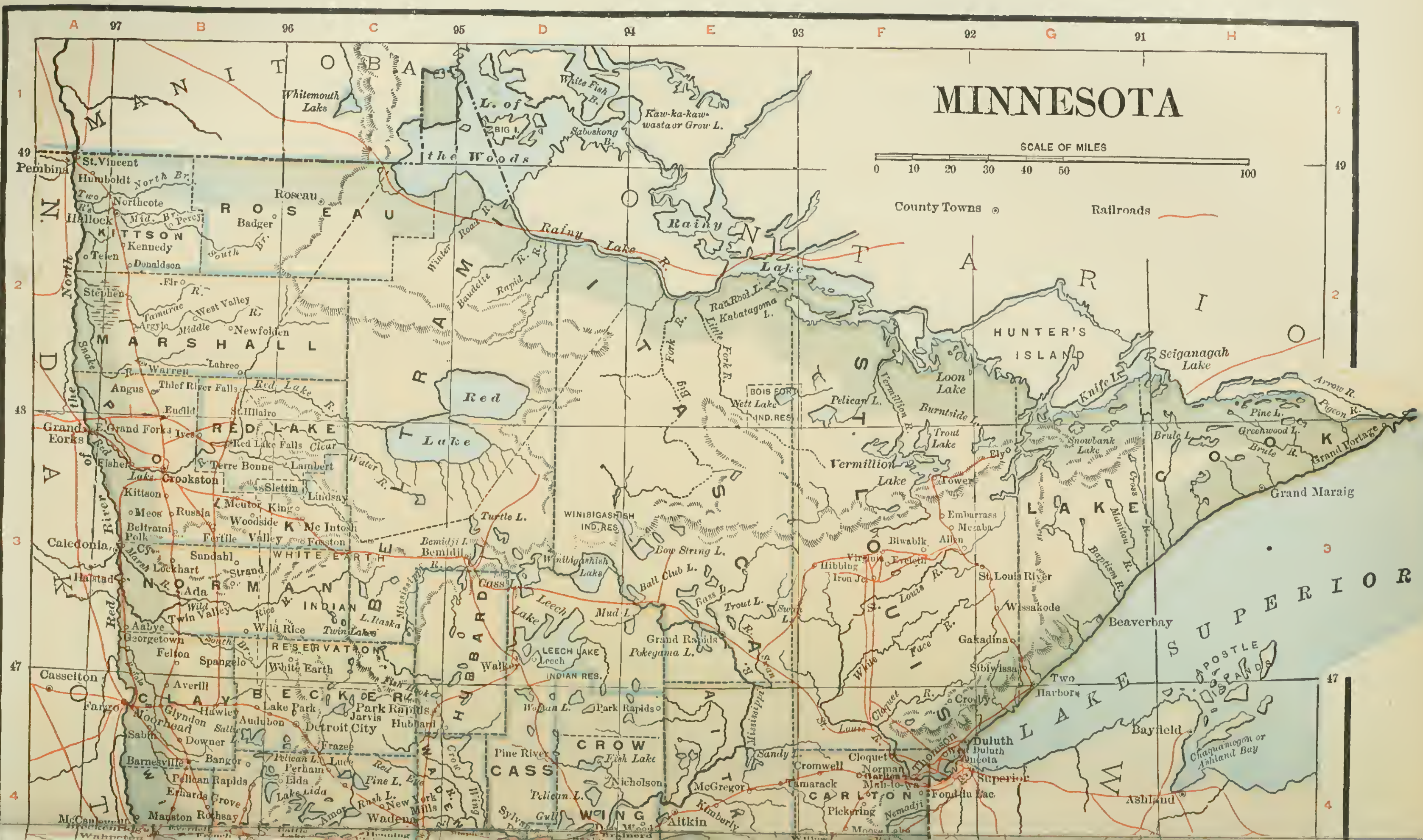
Climate and Soil. Minnesota lies in the middle of the north temperate zone, and in the geographical centre of the continent. This gives it a continental climate, with marked extremes of temperature. The average temperatures for January are 15° F. at the southeastern corner, and at the northwestern corner only 1° or 2° F. For July it is 70° F. in the south and 65° F. in the north. Maximum shade temperatures rise above 100° F. over all the State west of Duluth, while the minima are 40° F. below zero in the southern and northeastern counties and 50° F. below in the extreme northwestern, thus giving a range of 150° degrees or over for Red River Valley. The annual rainfall ranges from 20 inches in the northwest to over 30 inches in the southeast. The rainfall is characterized by a scant precipitation in the winter season, and moderately heavy rains during the crop season. There is an average annual snowfall of 20 inches in the southwestern part of the State, which increases gradually to 80 inches at Pigeon Point. The southern counties have an average annual relative humidity of less than 70 per cent., rising steadily northward to 75 per cent. in the northwestern counties. The average velocity of the wind is 8 miles per hour in the east, and almost 11 miles per hour at Crookston, which is the highest inland average velocity recorded in America. The average path of the northwest cyclones passes through the southern counties. Between 300 and 350 such storms occur in ten years. The prevailing wind is west in the northern half and southwest in the southern half. The climate on the whole is rigorous in winter, though mild and even occasionally hot in the southern counties in summer. But the nights are always cool, and the air dry, making the whole State a favorite summer resort.

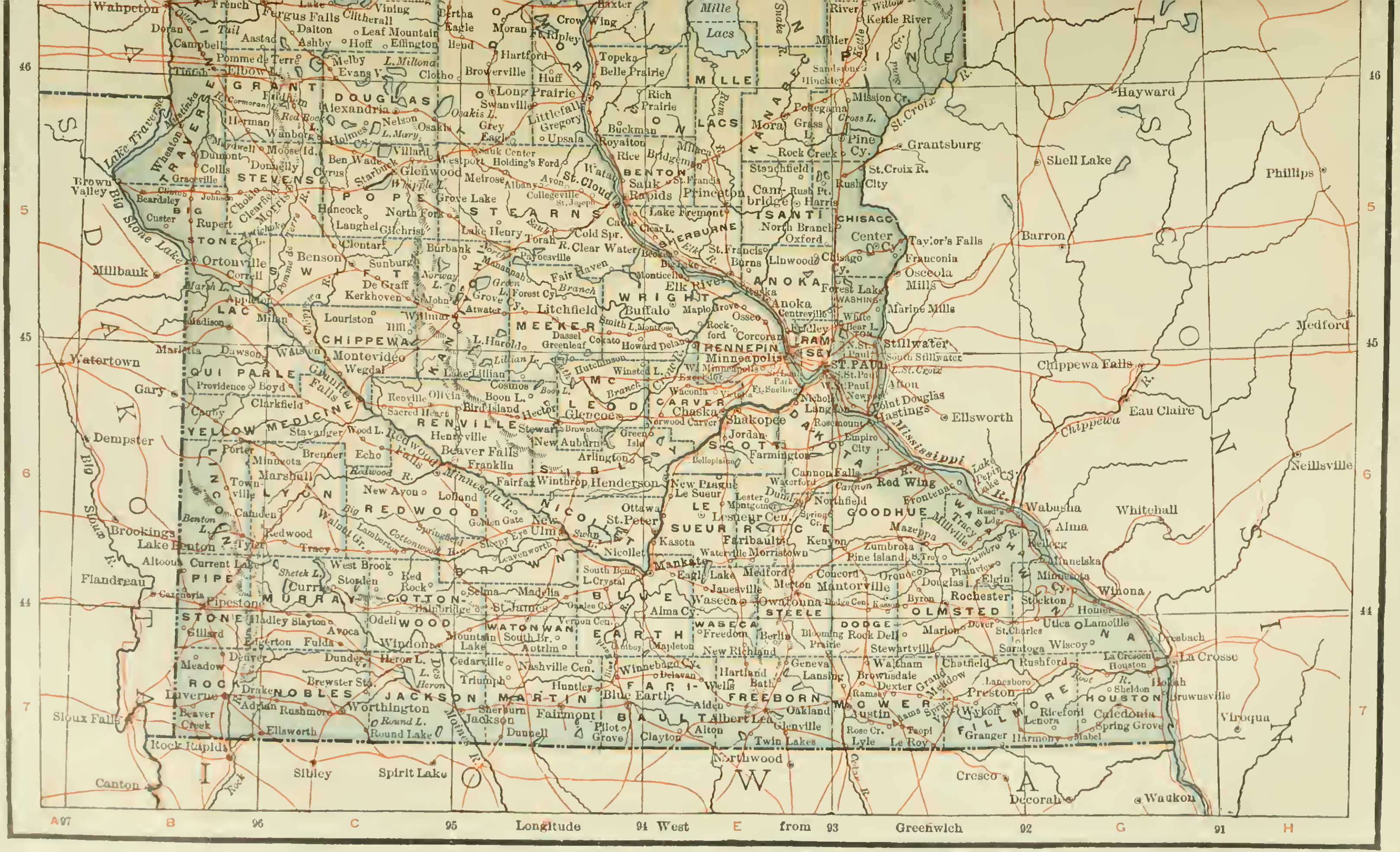
The soils of the State are wholly glacial, and since the outcropping stratified rock is largely limestone, most of the soil derived from this source is extremely rich—a black and finely comminuted loam. On the older drift in the southeastern counties, for 30 to 40 miles back from the Mississippi River, there is a coating of loess, an extremely fine black loam of great fertility. Where the Cambrian sandstone outcrops in the east central part of the State, considerable areas are covered with a light sandy soil, not at all encouraging for agriculture. In the old land of the northeast and north central counties there are large areas almost denuded of soil, or covered with a scanty coating of granitic drift. In the Valley of the Red River the silts of the extinct Lake Agassiz occur, a fine black soil of almost incomparable richness, constituting some of the best wheat lands in the world.

Geology. The northwestern corner of the State formed a part of the old Archæan continent, and its east central portion was in Archæan times occupied by a large island. These areas now

AREA AND POPULATION OF MINNESOTA BY COUNTIES.

County.	Map Index.	County Seat.	Area in square miles.	Population.	
				1890.	1900.
Aitkin	E 4	Aitkin	1,869	2,462	6.743
Anoka	E 5	Anoka	447	9.884	11.313
Becker	C 4	Detroit City	1,389	9,401	14.375
Beltrami	C 3	Bemidji	4.680	312	11.030
Benton	D 5	Sauk Rapids	397	6.284	9.912
Big Stone	B 5	Ortonville	484	5,722	8.731
Blue Earth	D 6	Mankato	756	29,210	32.263
Brown	D 6	New Ulm	611	15.817	19.787
Carlton	F 4	Carlton	856	5,272	10.017
Carver	E 6	Chaska	360	16.532	17.544
Cass	D 4	Walker	2,977	1,247	7.777
Chippewa	C 5	Montevideo	583	8.555	12.499
Chisago	F 5	Center City	440	10.359	13,248
Clay	B 4	Moorhead	1,022	11.517	17,942
Cook	H 3	Grand Marais	1,490	98	810
Cottonwood	C 6	Windom	634	7 412	12,069
Crow Wing	D 4	Brainerd	508	8,852	14.250
Dakota	E 6	Hastings	604	20.240	21,733
Dodge	F 7	Mantorville	432	10.864	13.340
Douglas	C 5	Alexandria	685	14.006	17,964
Faribault	D 7	Blue Earth City	720	16,708	22,055
Fillmore	F 7	Preston	825	25,966	28,238
Freeborn	E 7	Albert Lea	720	17.962	21,838
Goodhue	F 6	Red Wing	744	28.806	31,137
Grant	B 5	Elbow Lake	555	6.875	8,935
Hennepin	E 5	Minneapolis	573	185,294	228,340
Houston	G 7	Caledonia	561	14.653	15.400
Hubbard	D 4	Park Rapids	547	1,412	6.578
Isanti	E 5	Cambridge	446	7.607	11.675
Itasca	E 2	Grand Rapids	5,575	743	4.573
Jackson	C 7	Jackson	720	8.924	14.793
Kanabec	E 5	Mora	536	1,579	4.614
Kandiyohi	C 6	Willmar	814	13.997	18,416
Kittson	A 1	Hallock	1,059	5,387	7,889
Lac qui Parle	B 5	Madison	763	10.382	14,289
Lake	G 3	Two Harbors	2,122	1.299	4,654
Lesueur	E 6	Lesueur Center	475	19.057	20,234
Lincoln	B 6	Lake Benton	528	5.691	8.966
Lyon	C 6	Marshall	714	9.501	14,591
McLeod	D 6	Glencoe	504	17.026	19.595
Marshall	A 2	Warren	1,784	9.130	15.698
Martin	D 7	Fairmont	732	9.403	16.936
Meeker	D 5	Litchfield	613	15,456	17.753
Millelacs	E 4	Princeton	576	2.845	8.066
Morrison	D 4	Littlefalls	1,126	13.325	22.891
Mower	F 7	Austin	700	18,019	22,335
Murray	C 6	Slayton	705	6.692	11,911
Nicollet	D 6	Saint Peter	452	13.382	14,774
Nobles	C 7	Worthington	720	7.958	14.932
Norman	B 3	Ada	1,425	10.618	15.045
Olmsted	F 6	Rochester	644	19.806	23.119
Ottertail	B 4	Fergus Falls	2,127	34,232	45.375
Pine	F 4	Pine City	1,425	4.052	11.546
Pipestone	B 6	Pipestone	460	5.132	9.264
Polk	B 3	Crookston	1,893	30,192	35,429
Pope	C 5	Glenwood	700	10,032	12.577
Ramsey	B 1	St. Paul	172	139,796	170.554
Red Lake	B 3	Redlake Falls	1,116	....	12.195
Redwood	C 6	Redwood Falls	870	9,386	17,261
Renville	C 6	Beaverfalls	989	17,099	23.693
Rice	E 6	Faribault	497	23.968	26.080
Rock	B 7	Luverne	490	6.817	9,668
Roseau	A 1	Roseau	1,692	......	6.994
St. Louis	F 2	Duluth	5,532	44,862	82.932
Scott	E 6	Shakopee	360	13.831	15,147
Sherburne	E 5	Elk River	446	5.908	7.281
Sibley	D 6	Henderson	588	15,199	16,862
Stearns	D 5	Saint Cloud	1,310	34,844	44.464
Steele	E 6	Owatonna	426	13.232	16.524
Stevens	B 5	Morris	557	5,251	8,721
Swift	C 5	Benson	740	10,161	13 503
Todd	D 5	Long Prairie	967	12,930	22.214
Traverse	B 5	Wheaton	545	4,516	7.573
Wabasha	F 6	Wabasha	531	16,972	18,924
Wadena	C 4	Wadena	532	4.053	7.921
Waseca	E 7	Waseca	420	13.313	14.760
Washington	F 5	Stillwater	402	25,992	27.808
Watonwan	D 7	Saint James	432	7.746	11.496
Wilkin	B 4	Breckenridge	720	4,346	8.080
Winona	G 6	Winona	630	33.797	35.686
Wright	D 5	Buffalo	680	24.164	29.157
Yellow Medicine	B 6	Granite Falls	741	9,854	14.602
White Earth Indian Reservation	C 3		....	......	3.486


MINNESOTA
SCALE OF MILES
0 10 20 30 40 50 100
County Towns ◎
Railroads
A 97 B 96 C 95 D 94 E 93 F 92 G 91 H
1 2 3 4
49 48 47
MANITOBA
ONTARIO
N. DAKOTA
W
LAKE SUPERIOR
APOSTLE ISLANDS
Chaquamegon or Ashland Bay
HUNTER'S ISLAND
L. of the Woods
BIG I.
Whitemouth Lakes
White Fish B.
Sabaskong B.
Kaw-ka-kaw-wasta or Grow L.
Rainy Lake
Rainy Lake R.
Rat Root L.
Kabatagoma L.
Little Fork R.
Big Fork R.
BOIS FORT IND. RES.
Nett Lake
Pelican L.
Vermillion R.
Vermillion Lake
Loon Lake
Burntside L.
Trout Lake
Knife L.
Sciganagah Lake
Arrow R.
Pigeon R.
Pine L.
Greenwood L.
Brule L.
Brule R.
Snowbank Lake
Cross R.
Manitou R.
Baptism R.
Grand Portage
Grand Maraig
COOK
LAKE
ST. LOUIS
Ely
Tower
Embarrass
Mesaba
Biwabik
Allen
Virginia
Eveleth
Hibbing
Iron Jc.
St. Louis River
Wissakode
Gakadina
Sibiwissa
Beaverbay
Two Harbors
Crosby
Duluth
Duluth
Dakota
Superior
Fond du Lac
Bayfield
Ashland
Cloquet
Norman
Carlton
Mah-to-wa
Cromwell
Tamarack
CARLTON
Pickering
Nemadji
Moose
Cloquet R.
St. Louis R.
White Face R.
Swan L.
Trout L.
Bass L.
Swan R.
ITASCA
Ball Club L.
Bow String L.
Grand Rapids
Pokegama L.
WINIBIGASHISH IND. RES.
Winibigoshish Lake
Mississippi R.
Sandy L.
McGregor
Kimberly
Aitkin
AITKIN
CROW WING
Fish Lake
Nicholson
Pelican L.
Gull
Sylvan
Brainerd
Wood
CASS
Pine River
Walden L.
Park Rapids
LEECH LAKE INDIAN RES.
Leech Lake
Leech
Walker
Cass L.
HUBBARD
Hubbard
Jarvis
Park Rapids
Fish Hook
Crow Wing R.
WADENA
Wadena
New York Mills
Red Eye R.
Rush L.
Pine L.
Otter Tail R.
Perham
Luce
Frazee
Pelican L.
Elda
Lake Lida
OTTER TAIL
Pelican Rapids
Erhards Grove
Rothsay
Mauston
McCauleyville
Wahpeton
Barnesville
Bangor
WILKIN
Downer
Sabin
Moorhead
Glyndon
Hawley
Sally
Audubon
Lake Park
Detroit City
BECKER
White Earth
WHITE EARTH INDIAN RESERVATION
Twin Lakes
L. Itaska
Wild Rice
Wild Rice R.
Twin Valley
Spangelo
Felton
Georgetown
Aabye
Averill
CLAY
Fargo
Casselton
Halstad
Ada
NORMAN
Lockhart
Marsh Cr.
Strand
Sundahl
Fertile
Valley
Fosston
Beltrami
Polk
Woodside
Mc Intosh
Russia
Meos
Mentor
King
Lindsay
Slettin
Kittson
Crookston
Terre Bonne
Lambert
Red Lake Falls
Clear Water R.
RED LAKE
Fisher
Ives
E. Grand Forks
Grand Forks
Euclid
St. Hillaire
POLK
Angus
Thief River Falls
Red Lake R.
Warren
Lahreo
MARSHALL
Newfolden
Argyle
Middle R.
West Valley
Tamarac R.
Fir
Stephen
Snake R.
Donaldson
Kennedy
Teien
Hallock
KITTSON
Northcote
Two Rs.
Mid. Br.
Percy
Humboldt
North Br.
St. Vincent
Pembina
Badger
Roseau
ROSEAU
South Br.
Winter Road R.
Baudette R.
Rapid R.
BELTRAMI
Red Lake
Turtle L.
Bemidji L.
Bemidji
Mississippi R.
Caledonia
Red River of the North
DAKOTA
K



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consist of granites and gneisses of the archæan basal complex, parts of which have also been uncovered along the upper valley of the Minnesota River, where there are valuable granite quarries. Shore deposits and lava flows of the Huronian age outcrop as highly metamorphosed rocks in broad zones along the margins of these Archæan old lands, cutting into the latter in deep tongues and bands, some of which contain iron-bearing beds of great wealth. The broad Huronian belt extending southwestward from the Minnesota River contains the Sioux quartzites, a most beautiful and valuable building-stone, and beds of metamorphosed red mud, the catlinite, or far-famed red pipestone of the Indians. The Lake Superior synclinal trough is occupied by Cambrian sandstones and limestones, and Ordovician rocks occur in the southeastern part of the State, consisting of the Saint Peter sandstone beds covered with Trenton limestone, a combination which has given rise to the bluffs along this part of the Mississippi, and to the Falls of Saint Anthony. Silurian rocks occur in the valley of the Red River and in some of the southeastern counties, and slight cretaceous deposits are found in various parts of the State. The Pleistocene ice invasion is most largely responsible for the present surface, the State lying in a sort of focus of glacial activity. It was entirely covered by ice in the Kansan and Iowan epochs, and in the Wisconsin epoch two great lines of invading ice met at the centre of the State, and flowed south in a great tongue into Iowa.

Mining. The prominence of Minnesota as a mining State is based principally on its iron deposits. The mineral is found in an almost pure state in the Vermilion and Mesabi ranges. Although the existence of iron in Minnesota was known as early as 1860, nothing was done toward exploitation before 1884. The State has occupied since 1894 the second position among the iron-producing States. In 1901 its output exceeded that of Michigan. Prior to 1892 the Vermilion Range was the only source of iron in the State. In that year operations were begun in the Mesabi Range, the output of which advanced from 29,245 tons in 1892, to 1,913,234 tons in 1894. Since 1895 the Mesabi Range has been the largest iron-producing range in the Lake Superior region (and probably the largest in the world). Its output advanced in 1901 to 9,303,541 tons, against 1,805,996 from the Vermilion Range, making the total output of the State for that year 11,109,537 tons, or 38 per cent. of that of the United States. The value of the output at the mines in that year amounted to $15,335,513. In the same year 10,790,953 tons of iron ore were shipped from the Vermilion and Mesabi ranges, chiefly from the ports of Two Harbors and Duluth. Minnesota has building-stone and slate, and produces cement on a small scale. The slate deposits are believed to be considerable, but they are not much exploited. The local clay is used chiefly for the manufacture of brick.

Agriculture. Although only a little over one-half (51.8 per cent.) of the land area is included in farms, the State has attained the first rank in the cultivation of certain crops. Every decade since 1850 has witnessed a large gain in the farm acreage, the largest being made from 1890 to 1900. The percentage of improved farm land has also constantly increased, reaching 70.3 per cent. in 1900. The land not included in farms is found mainly in the extensive forest areas of the northern part of the State. From 1891 to 1901 an annual average of about 375,000 acres of homestead lands were entered. The recent expansion of the farming area has been greatest in the Northwest. The formation of many large farms in that section tends to increase the average size of farms for the State, notwithstanding the division of farm holdings going on in the southern part of the State. In 1900 there were 365 farms containing each 1000 acres or more. The average size in 1900 was 169.7 acres, as compared with 139.4 acres in 1870. The rent system is becoming very common, the percentage of rented farms having increased from 9.2 in 1880 to 17.3 in 1900. About four-fifths of these were rented according to the share system. It is in this region—particularly the Red River Valley—that wheat-growing has been so extensively developed. For a number of years there was little indication that the crop would attain much prominence in the State. The processes of milling then in use could obtain only an inferior quality of flour from the 'spring wheat' such as was raised in the State. With the introduction of modern methods, however, this difficulty was obviated and the State mills became famous for the high quality of their product. The cultivation of wheat then increased rapidly, and in 1890 the State had become first in both acreage and production. From 1890 to 1900 the increase was unprecedented, the acreage for the latter year being 94.5 per cent. greater than for the former, and constituting 58.5 per cent. of the area devoted to cereals. The per acre production is high, and the State easily holds first rank in the production of this cereal. In parts of the State the sowing and harvesting of wheat are done with the large type of machinery which performs a number of processes. Oats has about a third as great an acreage as wheat, and ranks next to it in importance. It has always been a prominent crop in the State, and continues to increase in acreage. Owing principally to the shortness of the season, corn has never been a favorite crop, and in this respect the State stands in striking contrast with Iowa and most of the other Mississippi Valley States. Both corn and oats are grown most extensively in the southwestern part of the State. In barley and flaxseed raising also, the State takes a high rank, and increasing quantities of rye are produced. Hay and forage crops cover about one-half as great an acreage as is devoted to wheat. Of this, 69.6 per cent. (1900) consisted of wild, salt, and prairie grasses. Large quantities of Irish potatoes are raised, and the cultivation of the sugar beet has been introduced. Fruit culture is mainly confined to the southern part of the State and is not yet extensively developed.

The little attention given to the raising of corn is largely responsible for the poor showing of the State in the raising of stock. Most of the Mississippi Valley States far excel Minnesota in this respect. Nevertheless, every decade since 1850 shows an increase for all varieties of farm animals, except sheep, and mules, and asses, for the decade 1890-1900. The relative gain in the number of dairy cows was greatly excelled by the increase in the dairy produce. Of a total value of $16,623,460 for the year 1900, 66.9 per cent. represented the amount derived from sales. The value of poultry products for the census year 1900 amounted to $7,364,865.

The following tables show the relative importance of the leading varieties of crops and farm animals for the census years 1890 and 1900:

	1890	1900
	Acres	*Acres*
Wheat	3,372,627	6,560,707
Oats	1,579,258	2,201,325
Corn	901,690	1,441,580
Barley	358,510	877,845
Rye	62,869	118,869
Flaxseed	303,635	566,801
Hay and forage	2,709,191	3,157,690
Potatoes	....	146,659

	1890	1900
Dairy cows	593,908	753,632
Other neat cattle	779,671	1,117,693
Horses	461,509	696,469
Mules and asses	9,511	8,500
Sheep	399,049	359,328
Swine	853,715	1,440,806

Manufactures. Minnesota has won much renown by virtue of its manufacturing enterprises. The success of these is mainly attributable to the abundance of its grain and forest products, and the excellence of its water power and transportation facilities. Lake Superior, touching the State on the north, gives access to the whole system of lake transportation, while the Mississippi River and the railroad development in the south give superior advantages to that section. In but few, if any, States has the industrial development been so rapid. The value of the manufactured product in 1900—$262,655,000—was eleven times as large as in 1870. The absolute gain was greatest between 1880 and 1890. In 1900 the industry employed 77,200 wage-earners, or 4.4 per cent. of the population. This was a higher absolute figure than for 1890, but a less per cent. of the population than in 1890. The beginning of the manufacturing industry in the State was prophetic of the course of its development. In 1822 a saw-mill was erected at the Falls of Saint Anthony, and two years later was fitted up for the grinding of flour. In 1900 the value of the products of these and certain allied industries was over one-half of the total for the State, and around the Falls of Saint Anthony had grown up the twin city of Minneapolis-Saint Paul—one of the three large industrial centres located on the Mississippi River.

For a long time the flour and grist-milling industry made but little progress. About 1870 the method of reducing the grain to flour by a number of distinct processes began to replace the old method by which the flour was obtained by a single grinding, and marked a new epoch in the development of the industry. The flour now produced was of the best quality, and heavy shipments were made to home and foreign markets. The power afforded by the Falls of Saint Anthony gave the millers who utilized them a decided advantage over those of other portions of the country and tended to centralize the industry at that point. However, from 1890 to 1900, the increase in the number of mills was greatest outside of Minneapolis. The total increase in the value of products for that decade was 39.4 per cent. The capital invested in the State mills in 1900 was 11 per cent. of the total for the United States. The value of the State products was 15 per cent. of the total for the country, and nearly twice as great as that of New York, the second State in rank.

The manufacturing industry has recently taken on a much broader scope than formerly, reflecting the more diversified aspect which agriculture is now assuming in that section. The dairy industry—the manufacture of cheese, butter, and condensed milk—has attained its present large proportions almost wholly since 1880. The increase in the value of the product from 1890 to 1900 was 186.6 per cent. The slaughtering and meat-packing industry and the manufacture of malt liquors and linseed oil are also of recent development. The rate of their increase is significant of their future possibilities. These three industries are centred mainly in Minneapolis and Saint Paul.

The extensive iron-mining in the north does not benefit the State's manufacturing interests greatly, since there are no coal or limestone deposits in proximity to the ore. The latter can be exported more economically than the former can be imported. The foundries and machine shops, however, are in a flourishing condition. Other important industries are those required by the growing railroad interests of the State, the manufacture of boots and shoes, and the printing and publishing of newspapers and periodicals. The following table covers the eleven most important industries for the decade 1890-1900.

Forests and Forest Products. Minnesota is one of the richest States in forest resources, having in 1900 a woodland area of about 52,200 square miles, including stump-lands. The forest area extends well over the northern two-thirds of the State, excluding the Red River Valley. Hard-wood forests border the prairies, while farther north the white pine predominates, Norway pine and spruce being also abundant. Although the white pine has been heavily drawn upon, at the end of the nineteenth century it was estimated that there were over 12,000,000,000 feet of this variety still standing, and the merchantable forest pine was estimated to be greater than in any other State. The lumber industry of the State increased but slowly until 1880. From 1890 to 1900 the increase (see table below) in the value of the product was greater than in any other State, and it ranked third in importance. The unusual facilities for water transportation afforded by the large number of streams and lakes have been of advantage to the industry. But recently railroads are being extensively used for timber transportation, especially in the shipments to Minneapolis, where nearly half the lumber of the State is sawed. The State has displayed a greater interest in forest preservation than have most other States. The three elected town supervisors are fire wardens, and have the authority of impressing men into service to prevent forest fires. The system has worked so effectively that for a number of years the State has wholly escaped destructive fires. The State has encouraged tree-planting in the prairie region, and about $600,000 in bounties has been expended for this purpose. There is a forest reserve of 200,000 acres in Chippewa Reservation.

Transportation. Minnesota is favored with the advantages of both the Saint Lawrence and the Mississippi systems of navigation. The lat-

INDUSTRIES	Year	Number of establishments	Average number wage-earners	Value of products, including custom work and repairing
Total for selected industries for State	1900	2,500	35,862	$177,172,025
	1890	1,405	30,334	111,052,701
Increase, 1890 to 1900	......	1,095	5,528	$66,119,324
Per cent. of increase	......	77.9	18.2	59.5
Per cent. of total of all industries in State	1900	22.5	46.4	67.5
	1890	18.7	43.5	57.8
Flouring and grist-mill products	1900	512	4,086	$83,877,709
	1890	307	3,509	60,158,088
Cheese, butter, and condensed milk, factory products	1900	596	740	8,479,896
	1890	106	783	2,958,476
Slaughtering and meat packing: Total	1900	20	668	7,810,555
	1890	18	222	2,510,431
Liquors, malt	1900	78	856	4,456,928
	1890	66	548	2,206,366
Oil, linseed	1900	5	155	3,272,598
	1890	3	90	1,547,719
Foundry and machine shop products	1900	175	3,139	5,975,077
	1890	92	1,289	2,835,024
Boots and shoes, factory product	1900	16	2,025	3,615,801
	1890	8	1,099	2,032,814
Cars and general shop construction and repairs by steam railroad companies	1900	39	4,700	6,319,876
	1890	18	1,951	2,628,174
Printing and publishing, newspapers and periodicals	1900	560	2,714	5,790,148
	1890	341	2,143	4,157,026
Lumber and timber products	1900	438	15,140	43,585,161
	1890	392	16,170	25,075,132
Lumber, planing mill products, including sash, doors, and blinds	1900	61	1,639	3,988,276
	1890	54	2,530	4,943,451

ter is becoming relatively less important owing to the development of railroads, and the former is becoming rapidly more important with the industrial development of the North. The possibility of lake transportation has been largely responsible for the development of the State's mining industry, and Duluth has become one of the leading lake ports. It has immense shipments of ore, grain, and lumber. But few regions of the country are better supplied with railroads than are the southern and western parts of the State. Minneapolis-Saint Paul is the objective point of most of the great lines northwest of Chicago, and the transcontinental Great Northern and Northern Pacific crosses the State from east to west. Among the lines which have a large mileage in the State are the Chicago, Milwaukee and Saint Paul; the Chicago and Northwestern; the Chicago, Saint Paul and Omaha; the Eastern Railway of Minnesota; and the Minnesota and Saint Louis. The total mileage increased from 1092 miles in 1870 to 5545 in 1890 and 6996 in 1900. The State has a railroad and warehouse commission which hears and passes judgment upon complaints, with due notice to carriers to arrange a tariff of freight in pursuance thereof. Upon refusal of the carriers to adopt such rates the commission publishes the same.

Banks. The first banking law of Minnesota was passed in 1858, at the first session of the Legislature; the law was amended in 1878, placing the banks under the control of the public examiner, who is ex-officio superintendent of banks. The law was amended and made more stringent in 1881, 1889, and 1895. Banking business in the State was very unprofitable at first, and all the State banks organized in 1858-68 were discontinued. In 1878 there were 17 banks, and in 1898 161 banks in operation. Savings banks are regulated by the law of 1879, which placed them under the jurisdiction of the Bank Commissioner. Trust companies were authorized in 1883, but are prohibited from doing a general banking business. In 1902 there were 128 national banks, with an aggregate capital of $13,323,000; surplus, $2,952,000; cash, etc., $6,984,000; loans, $65,646,000; and deposits, $65,797,000; 238 State banks with capital of $7,360,700; surplus, $1,236,055; cash, $3,220,534; loans, $38,100,783; and deposits, $41,283,240.

Finance. The Constitution of 1857 prohibited debts for public improvement, and prohibited any State debt above $250,000. But an amendment in 1858 enabled the State to issue $5,000,000 of 7 per cent. bonds to lend to the railroads of the State under guaranty of first mortgage bonds. Less than half of these bonds were sold, the railroads defaulted the interest on their mortgage bonds, and the State acquired their property by foreclosure. Nevertheless the State was unable to meet the interest payment, and in 1860 the debt on these bonds was repudiated. The obligations were resumed in 1881, when the old bonds were exchanged for new ones at the rate of 50 per cent. This gave the State a debt of $4,253,000, which was quickly reduced in the eighties, amounting to $2,154,000 in 1890 and $2,009,000 in 1901. The original constitutional prohibition of State debts is in force and no further extension of the debt is possible. The budget rose rapidly from less than a million in 1870 to more than five millions in 1890, and in 1901 the receipts amounted to $8,901,184, and disbursements to $6,900,841, leaving a balance of $2,000,343. The receipts included the permanent school fund, $1,258,127; the general school fund, $1,906,670; the general university fund, $429,479; and the revenue fund, $4,457,708.

Population. The population of Minnesota by decades is as follows: 1850, 6077; 1860, 172,023; 1870, 439,706; 1880, 780,773; 1890, 1,301,826; 1900, 1,751,394. The rank of the State has risen every decade, standing nineteenth in 1900. The largest absolute gain was in the decade 1880-90. From 1890 to 1900 the increase amounted to 34.5

per cent., as compared with 20.7 for the United States. During that decade every county in the State shared in the increase, but it was generally greatest throughout the northern ones, where the population is still very sparse. The movement of the population turned toward Minnesota at a period when the German immigration was still great and the Scandinavian peoples were just beginning to come in large numbers. As a result these elements are heavily represented. No other State contains an equal number of Swedes and Norwegians. In 1900 the foreign-born population numbered 505,318. The colored population numbered only 14,358, of whom 4959 were negroes, 7414 Indians taxed, and 1768 Indians not taxed. As is common in newly settled States, there is a large excess of the male sex. At the last census there were 22.1 inhabitants to the square mile. The State contains the two large metropolises of the Upper Mississippi Valley—Minneapolis and Saint Paul—and the per cent. of urban population is therefore high for so new a State. In 1900 the 19 places which exceeded 4000 inhabitants each constituted 31 per cent. of the total population. The figures for the four largest cities in 1900 were as follows: Minneapolis, 202,718; Saint Paul, 163,065; Duluth, 52,969; Winona, 19,714.

RELIGION. The noteworthy characteristic of the religious situation in Minnesota is the great predominance of the Roman Catholic and the Lutheran Churches. The strongest of the other denominations represented are the Methodists, Baptists, Presbyterians, Congregationalists, and Protestant Episcopalians.

EDUCATION. The census of 1900 reported 4.1 of the population ten years of age and over as being illiterate; for the native white population alone it was only 0.8 per cent. The average length of the school year in 1900 was 169 days, which was greater than that of any other State west of the Appalachians. The State has been very zealous in building up a complete and superior system of public schools, and its success has been greatly aided by the large State endowment. Minnesota has developed a system intended both to aid and to stimulate the schools to a higher degree of efficiency. The apportionment of the current school fund is based upon the number of pupils attending school forty days in the year, and in addition to this there are State appropriations to such schools as attain a certain meritorious rank, the test of merit being the employment of teachers holding the higher certificate, and meeting the requirements of duration, of equipment, and of gradation. In 1900 additional aid was received by 115 high schools, 110 graded schools, 191 semi-graded schools, and 660 rural schools. The policy of causing the special appropriation to depend in part upon the grade of certificate held made it necessary to establish a uniform test, to secure which the State took over the examination of candidates for that grade of certificate. The counties still examine the candidates for the lower certificates. The total number of teachers in 1900 was 10,586, of whom 8,534 were females. The State provides opportunity for pedagogical training at the normal schools at Mankato, Moorhead, Saint Cloud, and Winona. The policy of supporting summer schools for the benefit of teachers has been adopted. The State University, located at Minneapolis, is one of the foremost educational institutions in the West. The enrollment has reached about 3500. There are also a number of small denominational colleges in the State. In July, 1900, the total permanent school fund amounted to $12,546,599, the principal sources of which were the sale of lands ($9,417,791) and the sale of pine timber ($2,176,673). The permanent university fund of that date amounted to $1,246,817. The apportionment for the current school fund in 1900 was $1,295,459, and the total paid to teachers amounted to $3,842,987.

CHARITABLE AND PENAL INSTITUTIONS. A law was passed in 1901 for the creation of a Board of Control, consisting of three members appointed by the Governor and Senate for the term of six years, and having full power to manage and control the State charitable and penal institutions, and authority in financial matters in certain State schools, including those for the deaf and blind. Under the new system each institution has but one head, the superintendent. To prevent nepotism, the board has ordered that superintendents or wardens cannot employ or retain any relative, or any relative of the officer to whom such an employee would be directly responsible; nor does the board itself appoint any relative of any member to office under it. A uniform system of records and accounts has been introduced, and the first report of the Board of Control shows a general decrease in expenses over the preceding year. The following table gives a summary of the institutions, with the average number of inmates, and the per capita cost of maintenance for the fiscal year ending in 1902:

INSTITUTIONS	Per capita cost	Average number of inmates
Anoka Asylum	$116.70	121.3
Hastings Asylum	137.98	133.5
Fergus Falls Hospital	125.49	1,359.1
Saint Peter Hospital	154.89	971.4
Rochester Hospital	151.71	1,101.8
School for Deaf, Faribault	192.41	257.
School for Blind, Faribault	254.48	79.4
School for Feeble-Minded, Faribault	143.27	769.
State Public School, Owatonna	152.79	228.4
State Training School, Red Wing.	138.51	390.9
Reformatory, Saint Cloud	280.70	170.7
Prison, Stillwater	48.62	547.8

The State public school is for dependent and neglected children. The Reformatory, at Saint Cloud, is for criminals within the age period of sixteen to thirty years, while the older age group is sent to the prison at Stillwater. The convicts at the State prison are worked under the piece-price and public account systems, and also manufacture supplies for the use of the public institutions.

MILITIA. In 1900 the population of militia age of the State amounted to 399,734. The aggregate strength of the militia in 1901 was 1922 men.

GOVERNMENT. The present Constitution, which is the only one the State has had, was adopted by an almost unanimous vote of the people, in October, 1857. Proposed amendments upon receiving a majority vote of both Houses must be submitted to the people at a general election, when each amendment is voted upon separately and becomes a part of the Constitution if it receives a majority of the votes cast. A two-thirds vote of each House and a majority of the popular vote are necessary to call a constitutional convention.

Voters must have resided in the State six months and in the election district thirty days and have been citizens of the United States for three months. Women may vote for school and library officers, or upon any measure pertaining to schools and libraries, and are eligible to school and library offices. Registration is required by law.

LEGISLATURE. Senatorial and Representative districts are composed of contiguous territory, and no Representative district can be divided in the formation of a Senate district. Senators serve four and Representatives two years. State elections occur on the Tuesday after the first Monday in November. The Legislature meets biennially on the Tuesday after the first Monday in January, and is limited to a session of 90 days. Except on request of the Governor no new bill can be introduced during the last twenty days of the session. Revenue bills originate in the Lower House. No law can be passed unless voted for by a majority of all the members elected to each House. The power of impeachment rests with the House, the trial of impeachment with the Senate.

EXECUTIVE. A Governor, Lieutenant-Governor, Secretary of State, Treasurer, and Attorney-General are elected for two years, and an Auditor for four years. The Governor may convene extra sessions of the Legislature; he may veto any bill or any item of an appropriation bill, but a two-thirds vote of both Houses overrides the veto.

JUDICIARY. The Supreme Court judges cannot exceed five in number, and are elected by the electors of the State at large. The State is divided into districts, in each of which one or more judges are elected for a term of six years. There is a probate court in each county, elected for two years. Justices of the peace are elected for a term of two years.

LOCAL GOVERNMENT. New counties may be organized or old ones altered (subject to their own consent), but not reduced below 400 square miles in area. Cities of 20,000 inhabitants may be organized into separate counties. Any city or village may frame a charter subject to the general limits prescribed by State laws, which must receive a four-sevenths vote of the electors voting. State laws provide for the election of county and township officers.

OTHER CONSTITUTIONAL OR STATUTORY PROVISIONS. Married women retain the same legal existence and personality as before marriage, may sue or be sued, and, with the exception of voting, receive equal protection of all their rights. The legal rate of interest is 7 per cent.; 10 is allowed by contract; the penalty for usury is forfeiture of debt if the interest is over 12 per cent. A local-option liquor law is in force, and high license obtains in places that do not prohibit. Combinations to monopolize the markets for food products, or restrict the freedom of such markets, are criminal conspiracies.

The State has nine votes in the United States Electoral College. Saint Paul is the capital.

HISTORY. The first European to visit the region now included within the State was Duluth, who, in 1678, built a fort at the mouth of the Pigeon River, on the north shore of Lake Superior. In 1680 the Falls of Saint Anthony were discovered by Louis Hennepin, a Franciscan priest. Before 1700 there were trading posts situated on Lake Pepin and on the Minnesota River. Minnesota formed a part of the extensive territory ceded by France to Great Britain in 1763. In 1766 it was explored by Capt. Jonathan Carver, of Connecticut. In 1783 it became a possession of the United States. The part of the State lying east of the Mississippi belonged in turn to the Territories of Indiana, Michigan, and Wisconsin. The region west formed part of the Territories of Louisiana, Missouri, and Iowa. In 1805 a tract of land at the mouth of the Saint Croix and another at the mouth of the Minnesota were purchased of the Indians, but the number of settlers was small. The exploring expedition of Lieutenant Pike in 1805 was followed by many others within the succeeding forty years; and with an increased knowledge of the country came the first important beginning of immigration. Fort Saint Anthony (Snelling) was built in 1819-21; in 1822 a clearing was made at the Falls of Saint Anthony, and a mill was built, and in 1823 the first steamboat ascended to the falls. The next settlements made were by a colony of Swiss, near Fort Snelling in 1827, and at Stillwater in 1843. Two years before this latter date Father Galtier had erected a log chapel a little southeast of the Falls of Saint Anthony and dedicated it to Saint Paul. This was the nucleus of the present city of that name. The Indian titles to the lands east of the Mississippi were not extinguished until the year 1838, and it was not until March 3, 1849, that the Territory of Minnesota was organized, with the Missouri River as its western boundary. In 1851 the Indian titles to the lands (except reservations) between the Mississippi and the Red River of the North were extinguished, and immigration increased rapidly. On May 11, 1858, Minnesota was admitted as a State. The excellent educational institutions for which Minnesota is noted took their rise early in the history of the Territory. Hamline University, at Hamline, was founded in 1854, and Saint John's University at Collegeville, was established three years later. In 1862 the Sioux Indians, under Little Crow, angered at the continuous inroads made upon their lands, attacked and destroyed many of the frontier settlements. Over 500 white settlers and soldiers were killed and 25,000 people were driven from their homes. The Indians were decisively defeated at Wood Lake on September 22, 1862, and after engaging in sporadic raids in 1863 were removed west of the Missouri. In spite of the horrors of Indian war, immigration continued undiminished; it was stimulated by the activity of immigration agents in the Eastern States and Europe, and was encouraged by the enactment of liberal homestead laws. From the sale of its extensive public lands, the State obtained a very large school fund, which it employed in building up an admirable school system. Legislation after the Civil War was concerned largely with the regulation of railway corporations, and the most debated question of policy for a long time was that of the redemption of $2,275,000 in bonds, which the State had issued in 1858 to aid in the construction of railways, and had repudiated in 1860. For more than twenty years a large party in the State urged the redemption of the bonds as a measure necessitated by public honor, and in 1881 the Legislature accepted the offer of the bondholders to surrender their bonds at half the face value.

Since 1860 Minnesota has been steadily Republican, save for the election of 1898, when the Democrats, Populists, and Silver Republicans elected their candidate for Governor. The following is a list of the Governors of Minnesota since its organization as a Territory:

TERRITORIAL		
Alexander Ramsey		1849-53
Willis A. Gorman		1853-57
Samuel Medary		1857-58
STATE		
Henry H. Sibley	Democrat	1858-60
Alexander Ramsey	Republican	1860-64
Stephen Miller	"	1864-66
William R. Marshall	"	1866-70
Horace Austin	"	1870-74
Cushman K. Davis	"	1874-76
John S. Pillsbury	"	1876-82
Lucius F. Hubbard	"	1882-87
Andrew R. McGill	"	1887-89
William R. Merriam	"	1889-93
Knute Nelson	"	1893-95
David M. Clough	"	1895-99
John Lind	Democrat-Populist	1899-1901
Samuel R. Van Saut	Republican	1901—

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MINNESOTA, UNIVERSITY OF. A coeducational State institution of higher learning in Minneapolis, Minn., established by an act of the Territorial Legislature in 1851 and confirmed by the State Constitution adopted in 1857. The present charter was adopted in 1868, and the first collegiate work was begun in the following year. Its government is vested in a board of thirteen regents, nine appointed by the Governor of the State and holding office for six years, and three ex-officio members, the Governor, the State Superintendent of Public Instruction, and the president of the university. By special act of the Legislature in 1895 John S. Pillsbury was made regent for life. The university comprises the following colleges, schools, and departments: (1) The graduate departments, with advanced courses in all branches except that of medicine. (2) The college of science, literature, and the arts, offering four-year courses, largely elective, leading to the degrees of bachelor of arts, science, literature, and philosophy, and including the School of Technical and Applied Chemistry. A summer school for teachers offers a six weeks' course in various university subjects. (3) The College of Engineering and the Mechanic Arts, offering four-year courses in civil, mechanical, and electrical engineering, and in science and technology, leading to the bachelor's degree. (4) The School of Mines, with a four years' course in mining and metallurgy, leading to the degrees of engineer of mines and metallurgical engineer. (5) The College of Agriculture, with a four years' course, leading to the degree of bachelor of agriculture. There is also a School of Agriculture, giving training for practical farm life and in domestic economy, and a dairy school. (6) The College of Law, giving a three years' course, leading to the degree of bachelor of laws. (7) The department of medicine, including (a) the College of Medicine and Surgery, and (b) the College of Homœopathic Medicine and Surgery, with four-year courses, leading to the degree of doctor of medicine; (c) the College of Dentistry, with a three years' course, leading to the degree of pharmaceutical chemist; and (d) the College of Pharmacy, with a two or three years' course, leading to the degree of pharmaceutical chemist. Under the control of the university authorities are also the State Agricultural Experiment Station and the Geological and Natural History Survey. The degrees conferred for graduate work are the master's degree in arts, science, laws, and pharmacy, and the doctor's degree in philosophy, civil law, medicine, and pharmacy. No honorary degrees are conferred. Students are admitted on examination or on certificate from accredited schools of the State. Tuition is free in all departments except law and medicine. In 1902 the faculty numbered 275 and the attendance was 3656, of whom 1042 were women. Of this number the College of Science, Literature, and the Arts had 1179 students. The general library contained 84,000 volumes, and there were special libraries in connection with the various departments of instruction. The laboratories are extensive and well equipped. There is a herbarium, with over 200,000 specimens, and a museum. There is no dormitory system except in connection with the department of agriculture. The university grounds comprise about forty-five acres, valued at $350,000. The buildings are eighteen in number and are valued at over $950,000, and their equipment at about $275,000. The State experimental farm consists of 250 acres between Minneapolis and Saint Paul and is valued at $300,000. The buildings and equipment of the department of agriculture are estimated at over $300,000. The university is supported by the income of its permanent endowment of national lands, a State tax of three-twentieths of a mill, and special legislative appropriations for buildings and equipment. The gross income for 1902, exclusive of special appropriations, was $400,000. The endowment was $1,368,814, and the value of all the university property $3,340,000. The president after 1884 was Cyrus Northrop.

MINNESOTA RIVER. An affluent of the Upper Mississippi (Map: Minnesota, D 6). It rises in the northeastern corner of South Dakota and flows through Big Stone Lake on the boundary between South Dakota and Minnesota, after which it traverses the latter State, first in a southeast direction to Mankato, where it makes a sharp bend, after which it flows northeast, entering the Mississippi opposite Saint Paul and just south of Minneapolis. Its valley is the dividing line between the Big Woods to the north and the prairie regions to the south. It is navigable for steamers 45 miles, and at high water small vessels can ascend it 295 miles, beyond which it is obstructed by falls and rapids. Its total length is 470 miles.

MINNEWAUKON, mĭn'nė̄-wa̤'kŏn, LAKE, or DEVIL'S LAKE. The largest lake of North Dakota, situated in the northeastern part of the State (Map: North Dakota, G 1). It is 40 miles long, and from two to twelve miles broad. It receives the Coulee Creek, but has no outlet, and its water is brackish.

MINNOW (ME. *menow*, from AS. *myne*, minnow, probably from AS. *min*, Icel. *minnr*, Goth. *minniza*, OHG. *minniro*, Ger. *minder*, Lat. *minor*, less, Gk. *μινύνθειν*, *minynthein*, to lessen, Skt. *mī*, to diminish). The name popularly applied to almost any small fish. More technically it applies to members of the family Cyprinidæ, which includes the roach, dace, carp, etc.; specifically, in England, *Leuciscus phoxinus*. This is a small fish about three inches long, abundant in gravelly bottomed streams. It is, of course, unimportant as food except for larger fishes. In the United States the name usually belongs to various small cyprinodonts, mainly of the large genus Notropis, living in the lesser streams, and frequently called 'shiners.' The largest and best known of these is the golden shiner (*Notropis Hudsonius*), which has a very small head, but is sometimes a foot in length. (See Dace.) These fishes are mostly bottom-feeders, are oviparous, carnivorous, and devour much spawn of their own and other kinds of fishes. The 'top-minnows' are of a different group, being killifishes (q.v.) of the genus Gambusia, and take their name from their surface-feeding habits. Along the eastern and southern coast the common 'minnow' of brackish water is the mummichog (q.v.). Consult Jordan, *Manual of the Vertebrates of the Northern United States* (Chicago, 5th ed. 1890). See Plates of Dace and Minnows; Killifishes and Top-Minnows.

MIÑO, or in Portuguese **MINHO**, mē̍'nyō (Lat. *Minius*). The principal river of Galicia, in the northwestern part of Spain (Map: Spain, B 1). It rises in the mountains of the Province of Lugo, and flows in a southern and southwestern direction, forming a part of the boundary between Spain and Portugal, until it enters the Atlantic through a wide estuary. Its total length is 211 miles, for the last 25 of which it is navigable for small vessels, but it is much obstructed by reefs, islands, and shifting sand banks.

MINO DA FIESOLE, mē̍'nō dȧ fyā'zō-lȧ (1431-84). A Florentine sculptor of the Early Renaissance. He was born at Poppi in the Casentino Valley. While employed as a stonemason at Florence he became the friend and pupil of Desiderio da Settignano. His home was at Florence, but there is documentary evidence to show that he was employed at Rome in 1454, 1463, and 1464. From 1475 till 1480 he was employed upon the monument to Pope Sixtus IV., of which there are fragments in the Grotte Vaticane, under Saint Peter's Church. He died at Florence, July 11, 1484. His work possesses beauty and delicate finish, but is lacking in originality. Its high reputation is due to rich decoration and to a certain naïveté of expression, especially in his numerous portrait busts, which are his best work. His chief works are in the churches of Florence, Fiesole, and Rome. His most important achievements in Florence are in the Church of La Badia: the monuments of Bernardo Giugni (1466) and of the Margrave Hugo of Tuscany (1481). In the Museo Nazionale at Florence are busts of Piero de' Medici (1453), Giuliano de' Medici, and Rinaldo della Luna (1461). One of his best, if not his most important work, belongs to his early period: the monument of Leonardo Salutate, Bishop of Fiesole (d. 1466), in the cathedral of that city; it is surmounted by a fine bust. A beautiful piece of Renaissance decoration is the Tabernacle at Santa Maria in Trastevere, Rome, in which city is also his monument of Cardinal Fonteguerra in Santa Cecilia. His other works include busts of Niccolò Strozzi, in the Museum of Berlin; San Giovannino, in the Louvre; and five reliefs in South Kensington Museum. Consult Semper and Barth, *Hervorragende Bildhauer-Architekten der Renaissance* (Dresden, 1880).

MINORIES, The. A London parish and street leading northward from the Tower to Aldgate, now forming with Houndsditch the Jewish quarter of the city. The name is derived from the nuns of Saint Clare, called Sorores Minores, or Minoresses. The Church of the Trinity, once belonging to a nunnery of the Order, still exists in the Minories.

MINOR (Lat., less). A term in music applied to intervals and modes. (1) The interval between any note and another is named according to the number of degrees between them on the scale, both notes included. The interval between C and E is called a third; that between E and G is also a third; but these intervals are unequal, the one consisting of four semitones, the other of three; the former is therefore distinguished as a major, the latter as a minor interval. (2) There are two modes in which a musical passage may be composed. Whereas the major mode makes use of but one form of scale, which is the same whether *ascending* or *descending*, the minor mode recognizes *two* forms of scale, the *harmonic* and *melodic*. Modern music conceives a mode as a system of three fundamental chords, which contain all the tones proper to the scale of that mode. These chords are the tonic, dominant, and subdominant. Arranging the tones of the *pure* minor scale as elements of these three chords we have the following:

$$\overbrace{\underbrace{d - f - a}_{\text{subdom.}} - e - \underbrace{e - g - b}_{\text{dom.}}}^{\text{tonic}},$$

where all three chords present themselves as *minor* (because having the *minor* third), just as the corresponding chords are *major* in the *major* mode. (See Major.) Arranging these tones in this diatonic order as a *descending* scale, beginning with the highest tone of the tonic chord (e), the following results: e, d, c, b, a, g, f, e. Here we have a *pure* minor scale which is identical with the Dorian mode of the Greeks. (See Greek Music.) Comparing this *descending* minor with the *ascending* major scale, we find each to be the exact opposite of the other, thus establishing the polarity of major and minor already known to Zarlino and Tartini, but fully developed only in 1853 by Hauptmann. Where the *ascending major* has the major third (on third degree) and semisteps (3-4, 7-8) the *descending minor* has the *same* in the *same place*:

$$\begin{array}{l} \text{c, d, } \overset{\frown}{\text{e, f}}\text{, g, a, } \overset{\frown}{\text{b. c}}. \\ \text{e, d, } \underset{\smile}{\text{c, b}}\text{, a, g, } \underset{\smile}{\text{f, e}}. \end{array}$$

For practical composition, however, the scale always begins with the tonic. In the progression a, b, c, d, e, f, g, a, the whole step from 7 to 8 was found unsatisfactory to the ear, which imperatively demanded a semistep. By raising g a semistep this leading tone was obtained, but the step from 6 to 7 was augmented. It was only during the nineteenth century that this form of the minor scale a, b, c, d, e, f, g♯, a, which is known as the *harmonic* minor scale, was proclaimed as the *normal* form. Before that theorists had been afraid of the augmented second from 6 to 7 (a dissonance) and had overcome the difficulty by also raising the sixth degree a semitone, so that *ascending* the minor scale had this form: a, b, c, d, e, f♯, g♯, a, while *descending* the 7th and 6th degrees were restored to their original pitch. Thus what is known as the *melodic* minor scale has two forms, one when ascending the other when descending. Now, considering the *harmonic* form as the normal minor scale, modern musical theory establishes the dominant chord of both the major and minor modes as a *major* triad. Thus the three fundamental chords of the modern minor mode present themselves as two minor triads (tonic and subdominant) and one major triad (dominant). See Interval; Modes.

MINOR. In the law, a person who has not attained the age of full legal capacity, or the age of legal capacity with respect to the performance of certain acts. The term minor belongs strictly to the civil law, in which a person of full legal capacity is called 'major;' but generally the term minor is used in English as synonymous with Infant, under which title the statement of the general law of the subject will be found. In Scots law 'minor' is sometimes specifically used of an infant above the age of a pupil (12 years for females, 14 for males), and under the full age (21 years) of majority. See Infant; Parent and Child.

MIÑOR, mē′nôr, Jakob (1855—). An Austrian scholar in Teutonic philology and literature, born at Vienna. He studied at the universities of Vienna (1874-78) and Berlin (1878-79), became a lecturer at the former (1880), in 1882-84 held a chair in the Accademia Scientifico-Letteraria of Milan, and from 1884 to 1885 was professor of the German language and literature in the University of Prague. In 1885 he was appointed professor of Teutonic philology at Vienna. His numerous publications include many editions of texts, such as volumes 73 (*Fabeldichter, Satiriker, und Popularphilosophen des achtzehnten Jahrhunderts*), 145 (*Tieck und Wackenroder*), and 151 (*Das Schicksalsdrama*), with introductory essays and annotations, in the *Deutsche National-Litteratur* series, and the Archduke Ferdinand's *Speculum Vitæ Humanæ* (1889); *Neuhochdeutsche Metrik* (1893), a valuable manual of German prosody, based on lectures given at Vienna in 1882; and important works in literary history, such as *Die Schicksalstragödie in ihren Hauptvertretern* (1883), and an uncompleted study of Schiller, *Schiller, sein Leben und seine Werke* (vols. i. and ii., 1890), ranked, so far as it extends, among the best on the subject.

MI′NOR, Lucian (1802-58). An American lawyer and author, born in Virginia. He graduated at the College of William and Mary in 1823, and five years later became Commonwealth attorney for Louisa County, Va., an office which he held until 1852. In 1855 he was appointed professor of law in William and Mary. He wrote a part of John A. G. Davis's *Guide to Justices* (1838), and contributed the notes to Daniel Call's *Virginia Reports*. A tract of his, *Reasons for Abolishing the Liquor Traffic*, had a large sale; and after his death his *Travels in New England* were edited by J. R. Lowell for appearance in the *Atlantic*.

MINOR, Robert Crannell (1840—). An American landscape painter, born in New York City. He studied under Diaz at Barbizon, France, and under Van Luppen and Boulanger in Antwerp, and traveled in Germany and Italy. He was elected to the Society of American Artists and the National Academy of Design. His pictures have been exhibited in New York, Brooklyn, Chicago, and elsewhere in this country, as well as in the Royal Academy of London and salons of Paris and Antwerp. His works include "Dawn," "Sundown," "The Stream," "October Days," "The Vale of Kennet," "Edge of the Wood," "Interior of the Forest," "Morning in June," "Sunrise on Lake Champlain," "Cradle of the Hudson," "Close of Day," and "A Mountain Path."

MINOR, Virginia Louisa (1824—). An American woman suffragist, born in Goochland County, Va. She was educated at a seminary in Charlottesville in Virginia, but in 1846 went to live in Saint Louis, Mo., three years after her marriage. She was a nurse during the Civil War, and in 1867 organized the Missouri Woman's Suffrage Association. In 1872 she appealed to the Supreme Court of the United States for woman's right to vote. She was the first woman in this country to take this question to the courts.

MINOR BARONS. The term applied in the early Middle Ages in England to those tenants-in-chief of the King who did not receive a special summons to council and to military service, but were summoned by a general proclamation of the sheriff given in the county courts. The term was not used in England after the thirteenth century.

MINOR′CA (Sp. *Menorca*). The second largest of the Balearic Islands (q.v.). It is the easternmost of the group, and lies 20 miles northeast of Majorca (Map: Spain, G 1). Area, 403 square miles. Its northern half consists of rather low, rolling hills, generally arid and covered with heath; the southern half is an undulating plateau cut by deep, fertile valleys. There are numerous bays on the northeastern coast, in one of which is the harbor of Port Mahon (q.v.), the principal town. Though minerals are found on the island, agriculture is the chief occupation, the principal products being wine, oil, grain, flax, and sweet potatoes. The island is not prosperous, and its population is declining, largely by emigration. Population, in 1887, 39,041; in 1900, 38,301. Minorca was taken by the British in 1713 and held by them, with several intermissions, until 1802, when it was finally secured by Spain by the Treaty of Amiens.

MINORCA. A class of domestic fowls resembling Leghorns, but of more length of body and heavier mold. Their flesh is good for table purposes, but their chief value is as egg-layers, in which they excel, producing very large white eggs. They are hardy, active in hunting for their food, and generally commendable. A Minorca cock should weigh eight pounds; a hen six and a half pounds. This breed should be long-bodied and stand high upon strong, slate-black legs; the comb is larger than that of the Leghorn; the wattles thin and pendulous, and the ear-lobes pure white. Two varieties are recognized—the black and the white. In each case the color must be absolutely pure; the comb, face, and wattles bright red; eyes dark hazel or red. See Colored Plate of FOWLS, under POULTRY.

MINORITY REPRESENTATION. See CUMULATIVE VOTING; REPRESENTATION.

MINOR PROPHETS. A common designation for a group of twelve prophetical books in the Hebrew canon, which in the English Bible form the close of the Old Testament. It was employed as early as the time of Augustine and Rufinus, who are careful to explain that its use is occasioned by the brevity of the books and does not characterize their merit or importance. The corresponding designation, major prophets, is applied to the longer books of Isaiah, Jeremiah, Ezekiel, and Daniel. The Hebrews called this group of writings 'the Twelve' and this nomenclature was followed by the Greeks. The first reference to the collection is in Ecclus. xlix, 10, a section probably written in the time of John Hyrcanus. (See ECCLESIASTICUS.) The books included in the collection, in the order in which they are arranged in the Hebrew Bible, are Hosea, Joel, Amos, Obadiah, Jonah, Micah, Nahum, Habakkuk, Zephaniah, Haggai, Zechariah, Malachi. This order is retained in the English Bible. In the Greek version the arrangement is as follows: Hosea, Amos, Micah, Joel, Obadiah, Jonah, Nahum, Habakkuk, Zephaniah, Haggai, Zechariah, Malachi. Both arrangements no doubt were intended to be chronological. There is a general advance from the Assyrian to the Chaldæan and Persian periods. The three prophets of the Chaldæan period (Nahum, Habakkuk, Zephaniah) and the three of the Persian period (Haggai, Zechariah, Malachi) are given in the same order. On the other hand, the earlier prophets seem to have formed two groups in the Greek, viz. Hosea, Amos, Micah, and Joel, Obadiah, Jonah. It is significant that of these six only the first group of three can be assigned to the Assyrian period in the light of modern criticism. It would appear, therefore, that the late books, Joel, Obadiah, and Jonah, once were appended to the others, but subsequently were copied after the prophets of the Assyrian period on account of the reference to Jonah in II. Kings xiv. 25. The same consideration may have led to the placing of Jonah before Micah as in the Hebrew recension. For the dates of the books and further information, consult the articles upon the individual books.

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MI'NOS (Gk. Μίνως). A legendary King of Crete, son of Zeus and Europa, and brother of Rhadamanthus and Sarpedon. In the ordinary version he appears as a just and wise ruler, giving to Crete a code of laws received from his father, Zeus. He was also a powerful monarch, establishing the first fleet and clearing the Ægean of pirates. He thus exercised a sway over the Greek coast-lands. After his death his reputation for justice led the gods to make him a judge in the lower world, where with Rhadamanthus and Æacus he passed sentence on the souls of the dead. In contradiction to this character is the group of legends which gather about the Minotaur, where he appears as at first depriving Poseidon of his due offering, the bull sent by the god from the sea in answer to his prayer. From this bull and Pasiphaë, wife of Minos, sprang the Minotaur (q.v.), for whose keeping Dædalus (q.v.) built Minos the Labyrinth. When his son Androgeos was slain by the Athenians, Minos made war upon them, and compelled them to pay the tribute of seven youths and seven maidens to be food for the Minotaur, until Theseus (q.v.) released them by killing the monster. The cruel character of Minos in this legend led later writers to distinguish two kings, the elder, a son of Zeus, who was just, and his grandson, who was cruel. The recent discoveries of a splendid palace at Cnosus and the evidences of a very powerful and splendid kingdom in Crete during the Mycenæan age warrant the belief that the story of Minos contains reminiscences of an early Cretan supremacy in the Ægean.

MI'NOT, CHARLES SEDGWICK (1852—). An American biologist, born in Roxbury, Mass. He graduated at the Massachusetts Institute of Technology in 1872, studied biology at Leipzig and Paris, and completed his studies at Harvard, where he took the degree of S.D. in 1878. In 1880 he became a lecturer in embryology in the Harvard Medical School and an instructor in oral pathology and surgery, and in 1892 was appointed professor of histology and embryology. He made important investigations and discoveries in the fields of muscular physiology, respiration, and human embryology. In 1887 he invented the automatic microtome which is now in general use. He was president of the American Society of Naturalists in 1894, and of the American Association for the Advancement of Science in 1900. In addition to many papers and monographs, his publications include *Human Embryology* (1892), which has been translated into German and is one of the most valuable works on the subject.

MINOT, George (1817-56). An American jurist, born in Haverhill, Mass. He graduated at Harvard in 1836, and at the law department of that institution in 1838, studied under Rufus Choate, and was admitted to the bar in 1839. He edited, in association with Richard Peter, Jr., eight volumes of the *U. S. Statutes at Large,* and was sole editor of that work from 1848 to 1856. He published *A Digest of the Decisions of the Supreme Court of Massachusetts* (45 vols. with supplement, 1844-52); and edited *English Admiralty Reports* (9 vols., 1853-54).

MINOT, George Richards (1758-1802). An American jurist. He was born in Boston, graduated at Harvard in 1778, and soon afterwards was admitted to the bar. From 1781 to 1791 he was clerk of the Massachusetts House of Representatives. He was secretary of the convention called to ratify the Federal Constitution. In 1792 he was appointed judge of probate for Suffolk County; in 1799 he was made Chief Justice of the Court of Common Pleas, and from 1800 until his death was judge of the Municipal Court of Boston. He published a *History of the Insurrection in Massachusetts in 1786* (1786); and a *History of Massachusetts Bay* (1798-1803). The latter work is in continuation of Hutchinson's *History of Massachusetts Bay.*

MINOT, Laurence (1300?-52?). An English lyric poet, born and bred probably in the northeast midlands of England. He was no doubt a layman. Professor Herford agrees with other scholars in thinking that Minot was probably a soldierly minstrel, who sang also at Court. Minot wrote in haste, with the warlike or political events that he describes still fresh in his mind. His style is rough. He is preëminently a war poet and a patriot, full of love for a united England, though he was himself in all likelihood of Norman origin. He wrote eleven spirited political songs (in the Northern dialect) celebrating the military events of the time. They begin with the *Battle of Halidon Hill* (1333) and close with the *Capture of Guisnes* (1352). Among the best is *How Edward Came to Brabant* (1339). They exist in only one manuscript (British Museum), discovered by Tyrwhitt. The best editions are *Laurence Minot's Lieder,* ed. William Scholle in *Quellen und Forschungen* (Strassburg, 1884), and *The Poems of Laurence Minot,* ed. by Hall (Oxford, 1887).

MIN'OTAUR (Gk. Μινώταυρος, *Minōtauros*). The bull of Minos. According to the Greek legend, son of the wife of Minos, Pasiphaë, and a bull sent by Poseidon. For it she conceived a passion which the skill of Dædalus enabled her to gratify. Her offspring, a human body with a bull's head, was shut up by Minos in the mysterious Labyrinth at Cnosus, where he was fed on human victims. Yearly (or every three or nine years, according to other versions of the story) the Athenians, who had been conquered by Minos, were compelled to send seven youths and seven maidens for this monster, till Theseus (q.v.) slew him. The origin and nature of this story have as yet received no explanation, but the frescoes of the palace at Cnosus showing men and girls performing gymnastic feats upon wild bulls suggest that the origin of the legend is to be sought in dim reminiscences of the Mycenæan bull-ring.

MINOT'S LEDGE. See Lighthouse.

MINSK, mĭnsk. A government of West Russia, in Lithuania, bounded by the Government of Vitebsk on the north, Mohilev and Tchernigov on the east, Kiev and Volhynia on the south, and Grodno and Vilna on the west (Map: Russia, C 4). Area, 18,530 quare miles. The northwestern part, about one-fifth of the entire area, is somewhat elevated. It forms the water-shed between the Dnieper and the Niemen. The remainder of the government is low, marshy, thickly wooded, and very sparsely inhabited, forming the larger portion of Poliessie (q.v.). Minsk is watered chiefly by the Beresina, the Pripet, and the Niemen; lakes abound in the southern part, and the climate is unhealthful. By the nature of its surface Minsk is not well fitted for agriculture, and the industry is in a primitive state. Stock-raising is favored by the abundance of pasture land. The forests, mostly pine, occupy over one-third of the total area and form one of the chief natural resources of the region. Large quantities of timber are floated to Prussia by the Beresina, the Pripet, and the canal which connects the Dnieper with the Bug, a tributary of the Vistula. Considerable quantities of wood for fuel are also exported to Kiev and used on the local railroads. The extent of this industry may be judged from the fact that about 70,000 people are employed annually in the transportation of the timber down the rivers. Spirits, yeast, flour, and wooden products of all kinds are the chief manufactures. The ship-building industry deserves special mention. The government is traversed by two important railways, one connecting Warsaw with Moscow, and the other running from the Baltic Provinces to Southern Russia. Population, in 1897, 2,156,123, composed chiefly of White Russians, Poles, Jews, and Lithuanians. Over 70 per cent. of the population belong to the Greek Orthodox Church. Capital, Minsk.

MINSK. The capital of the Government of Minsk, Russia, situated in a hilly region on the Svislotch, a tributary of the Beresina, 468 miles by rail southwest of Moscow (Map: Russia, C 4). It is an old and irregularly built town with two cathedrals, of which that of Saint Catharine (1611) is especially worthy of mention. Among its educational institutions are two classical gymnasia and one real gymnasium, a theological seminary, a museum, and a theatre. Minsk manufactures leather, agricultural implements, soap, spirits, tobacco products, etc. The commerce is mostly in agricultural and forest products and leather. Minsk is the seat of a Greek Orthodox and of a Roman Catholic bishop. The municipality maintains a pawn-shop. Population, in 1897, 91,494, of whom about 50,000 were Jews, 21,000 Greek Orthodox, 15,000 Roman Catholics, and over 1700 Mohammedans. The town is first mentioned in 1066 as a dependency of the princes of Podolsk. After a short existence as the capital of a separate principality, it fell at the end of the twelfth century into the hands of Lithuania. In 1499 it obtained Magdeburg rights, and in 1793 passed to Russia. During the Polish uprising in 1831 several engagements took place in the vicinity of the town.

MINSTREL (OF. *menestrel, menesterel, menestral,* Fr. *menestral,* It. *ministrello, menestrello,* from ML. *ministralis, ministrel,* retainer, Lat. *minister,* attendant, retainer, minister from *minor*, less). The term seems to have been employed at first to designate a retainer who amused his lord with music and song. It has now come to be the generic name for the poet-musician, the verse-reciter, the mountebank, merry Andrew, juggler, and acrobat of the Middle Ages, as well as for certain modern entertainers. (See below.) Before the Norman conquest, the professional poet was known in England as a *scôp* (shaper or maker). 'Maker' sometimes signified a poet in Shakespeare's time. The scôp shaped or composed his own poems, and chanted or sang them to the accompaniment of a rude harp. *Widsith* (i.e. Long-travel), perhaps the oldest of extant English poems (for it is earlier than the Angles' inroad of Britain), is an account of the scôp's wandering and reception among the Huns, Goths, Danes, and other peoples. For the tales he recited in the mead hall, the scôp was rewarded with many treasures, including golden rings and bracelets. The scôp was not commonly a wanderer. He was rather attached to the household of some chief, by whom he was maintained, and in some cases rewarded with gifts of land. The scôp was held in great honor. He composed his poems in solitude and recited them in the hall where his master feasted. The recitation was doubtless accompanied by gesture as well as by music. The scôp was first of all a poet, differing from the modern poet mainly in the fact that he not only shaped but also recited his compositions. His theme was the glorious deeds of his chieftain or of some hero of his race. To him we are indebted for our primitive and narrative poems like *Beowulf*. The spread of Christianity in England broke up the old tribal relation, and therefore the standing of the scôp was changed. In a rank much beneath the scôp were the gleemen, who, though they no doubt sometimes improvised songs and modified the matter that came to them, were satisfied for the most part to render what others had composed. They had no settled abode, but strolled far and near, earning what they could by their minstrelsy. (The accompanying illustrations, derived from mediæval manuscripts, give some notion as to the strolling minstrels' looks and demeanor.) Among their accomplishments were tumbling, rope-walking, and feats of jugglery. Some of them chewed stones or swallowed knives or fire. Others had performing animals, such as bears, goats, marmots, dogs, and monkeys.

A ROPE-WALKER AND JUGGLER.

MINSTREL WITH DRUM, FLAGEOLET, AND PERFORMING BEAR.

MINSTREL PLAYING A REBEC.

The Normans brought not a few *jongleurs* (q.v.) and *troubadours* (q.v.) to England. The minstrels of the Middle Ages were in part descendants of the Teutonic scôpas and gleemen who took root in Gaul with the invasion of the Franks, or of those who went along with the Teuton invaders into Italy, England, and elsewhere, in part of the *mimi* and *scurræ* who had once overrun the Roman Empire. With the Celtic bards they have probably no kindred. At the battle of Senlac Taillefer (q.v.) minstrel and warrior rode before the Norman chivalry, tossing his shield aloft, and stirring their courage with the Song of Roland, and there bravely met his death. By the fourteenth century the poet and the performer in England were usually distinct. The scôp and the troubadour were transformed into poets like Chaucer and Gower. True, there still survived in the structure of their tales several devices of the singers, such as the address to an audience, but the audience was wholly imaginary. The gleemen and jongleurs were then known as minstrels, of whom the more reputable were still held in great honor. At feasts and festivals they swarmed in great numbers with harps, fiddles, bagpipes, flutes, flageolets, citterns, and kettle-drums. Such an occasion is described by Chaucer in the Squire's Tale: As Cambuskan dines, the "minstralles" play "beforn him at the bord deliciously." When he goes out he is preceded by "loude ministralcye,"

> Ther as they sownen diverse instrumentz
> That it is lyk an heven for to here.

But the decline of minstrelsy had already set in, as we know from Langland's *Piers Plowman*, the best single source of information for England. Minstrels as a class Langland severely satirized, calling them prattlers and buffoons, foul and scurrilous of speech, indeed the very children of

Satan. Yet in England minstrels may have had a closer connection with genuine poets than they had on the Continent, where from the outset these sons of the Roman *mimi* and *scurræ* (compare 'scurrilous') and of the old bards of the North were abhorred by the Church. They were forbidden mass or absolution; indeed, they were under perpetual excommunication, and were assured that they would spend eternity at the bottom of hell. Nor had they—on the Continent, at all events—any standing before the secular law. Those who harmed them went unpunished; yet if a minstrel was ill handled, he had the privilege of beating the shadow of his offender.

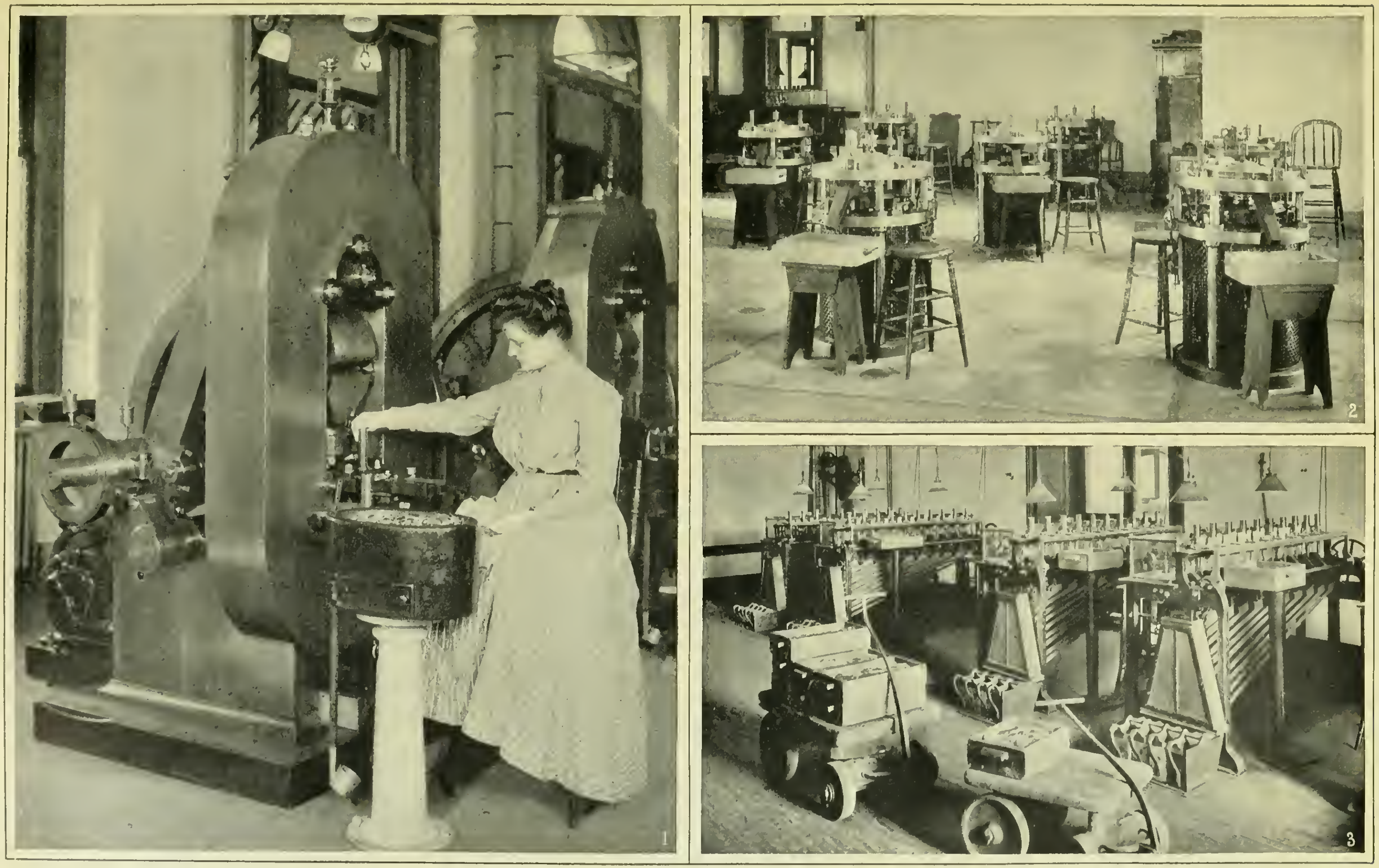
A KING MINSTREL.
Head of a minstrel troupe.

Most minstrels were itinerant; others were retained by lords as jesters. Not seldom they were women, or, at all events, women followed many a band of minstrels and lived their hard and dissolute life. The very name of minstrel was a byword, but everywhere they were welcome. After the invention of printing, there was little place for the minstrel as an intermediary between author and public. He gradually found his main occupation as a ballad-singer at street corners or at the wassails of the more ignorant barons. Musicians still continued, it is true, to be retained at Court, and ample provision was made for their maintenance. But by an act of Parliament in the thirty-ninth year of Elizabeth's reign, 'ministrels abroad' were classed as 'rogues and vagabonds,' and were ordered to be punished as such.

In spite of new social conditions, minstrelsy was slow in dying out. George the Second maintained a company of twenty-four musicians, who were employed in the service of the Chapel Royal and in rendering odes on birthdays and New Year's. Scott, as is well known, collected the minstrelsy of the Scottish border, consisting of traditional ballads that were still recited. And in the *Lay of the Last Minstrel* is described a wandering harper who is supposed to have lived at the close of the seventeenth century. Recently, too, W. B. Yeats has discovered 'the last gleeman in Ireland,' a certain Michael Moran, blind almost from birth. "He was," says Yeats, "a true gleeman, being alike poet, jester, and newsman of the people." The descendant of the old gleeman, it is said, is still not unknown in the Orkneys.

AMERICAN MINSTRELS. Toward the beginning of the nineteenth century a new type, the Southern negro, appeared on the American stage. At first he was accepted merely as a comic character, but gradually his songs and eccentricities overshadowed his personal characteristics, and he began to be looked upon as a 'feature' in the performance. Before the advent of Thomas D. Rice, the reputed founder of negro minstrelsy, there had been a score of actors, who, as negro comedians, had sung and danced their way into popular favor; but Rice was the first minstrel whose performances received universal recognition. His most famous character, 'Jim Crow,' was drawn from life, its original being an old Louisville slave. In 1836 Rice went to England, where he duplicated his American successes. Individual negro minstrels now became very numerous, and in 1843 the first company, the 'Virginia Minstrels,' was formed. It consisted of 'Dan' Emmett, 'Frank' Brower, 'Billy' Whitlock, and 'Dick' Pelham. The style of performance adopted by them has remained much the same ever since, for they danced, sang, played their instruments, and carried on a running dialogue of jokes. Among the more famous bands of minstrels may be mentioned: White's 'Kitchen Minstrels,' his 'Virginia Serenaders,' his 'New York Minstrels;' 'Christy's Minstrels,' which made a tremendous sensation; 'Bryant's Minstrels,' 'Wood's Minstrels,' and the companies formed by 'Tony' Pastor, Thatcher, Primrose, Dockstader, West, Buckley, Backus, Birch, and Bailey. Minstrel performances are usually of one general character. The performers, who are always men and who number from 15 to 40, sit in a semicircle. At either end sit the 'end men,' or 'bones,' while in the middle of the line is the 'interlocutor,' who gravely asks his companions, especially the 'end men,' such questions as shall bring out their stock of jests. Each member of the troupe takes some part in the performance. The minstrel's characteristic instruments are the guitar, the banjo, tambourine, and the 'bones,' which are two pairs of ebony sticks, about an inch wide and six inches long, and are clapped together in the performer's fingers.

Consult, in general: Wilhelm von Hertz, "Die Spielleute," an essay in his delightful *Spielmannsbuch*, second edition (Stuttgart, 1900); Percy, *Reliques of Ancient Poetry*, vol. i. (1765); Ritson, *Ancient English Metrical Romances*, vol. i. (1802); and Chappell, *National English Airs* (1838); Langland's *Piers Plowman* (The G. Text Passus i. and xvi.; and the *Prologue* of the A. Text). For the scôp, consult: Stopford Brooke, *English Literature from the Beginning to the Norman Conquest* (New York, 1898); and Henry Morley, *English Literature*, vol. ii. (New York, 1888). For the later minstrelsy, consult W. G. Courthope, "The Decay of English Minstrelsy," in *A History of*



UNITED STATES MINT AT PHILADELPHIA

1. Coining Press 2. Milling Machines 3. Automatic Weighing Machines

English Poetry, vol. i. (New York, 1895). See MINNESINGERS; SKALD; TROUBADOURS.

MINSTREL BOY, THE. A favorite song in Moore's *Irish Melodies.* The music is that of "The Moreen," an old Irish air.

MINT (AS. *mynet, mynit, mynyt,* from Lat. *moneta,* mint, epithet of Juno, whose temple at Rome was the mint, from *monere,* to warn). An establishment for making coins or metallic money. See MONEY.

The earliest regulations regarding the English mint belong to Anglo-Saxon times. An officer called a reeve is referred to in the laws of Canute as having some jurisdiction over it, and certain names which, in addition to that of the sovereign, appear on the Anglo-Saxon coins, seem to have been those of the moneyers, or principal officers of the mint. Besides the sovereign, barons, bishops, and the greater monasteries had their respective mints, where they exercised the right of coinage, a privilege enjoyed by the archbishops of Canterbury as late as the reign of Henry VIII., and by Wolsey as Bishop of Durham and Archbishop of York.

After the Norman Conquest the officers of the royal mint became to a certain extent subject to the authority of the exchequer. Both in Saxon and Norman times there existed, under control of the principal mint in London, a number of provincial mints in different towns of England; there were no fewer than thirty-eight in the time of Ethelred, and the last of them were only done away with in the reign of William III. The officers of the mint were formed into a corporation by a charter of Edward II.; they consisted of the warden, master, comptroller, assay-master, workers, coiners, and subordinates.

The seigniorage for coining at one time formed no inconsiderable item in the revenues of the Crown. It was a deduction made from the bullion coined, and comprehended both a charge for defraying the expense of coinage and the sovereign's profit in virtue of his prerogative. In the reign of Henry VI. the seigniorage amounted to 6d. in the pound; in the reign of Edward I., 1s. 2½d. The seigniorage on gold was abolished during the reign of Charles II. and has never since been exacted. The shere, or remedy, as it is now called, was an allowance for the unavoidable imperfection of the coin.

A new mint was erected on Tower Hill in 1810. In 1815 some alterations were made in the constitution of the mint, and in 1851 a complete change was introduced in the whole system of administration. The control of the mint was vested in a master and a deputy master, and comptroller. The mastership, which had in the early part of the last century become a political appointment held by an adherent of the Government, was restored to the position of a permanent office, the master being the ostensible executive head of the establishment. Further changes were made in the administration of the mint in 1869. The mastership was added to the duties of the Chancellor of the Exchequer, without any addition of salary, and the offices of deputy master and comptroller were amalgamated.

A mint was established at Sydney in 1853 and at Melbourne in 1869 to coin the gold so largely found in Australia.

The first mint in the United States was established at Philadelphia by the coinage act of April 2, 1792; the first production of the new mint was the copper cent of 1793. Silver dollars were first coined in 1794, and gold eagles in 1795. At the close of the nineteenth century there were four mints, located at Philadelphia, San Francisco, New Orleans, and Carson City, respectively. Assay offices are located at New York, Denver, Helena, Boisé, Charlotte, Saint Louis, Deadwood, and Seattle. The act of April 1, 1873, put all the mints and assay offices on the same footing as a bureau of the Treasury Department, under the superintendence of the Director of the Mint, who is appointed by the President for a term of five years and is subordinate to the Secretary of the Treasury. The Philadelphia mint has an engraver who supervises the manufacture of the dies used in all the United States mints. The description and history of the various coins in use in the United States, both during colonial times and since, is given under MONEY.

PROCESSES OF COINING. Down to the middle of the sixteenth century little or no improvement seems to have been made in the art of coining from the time of its invention. The metal was simply hammered into slips, which were afterwards cut up into squares of one size and then forged round. The required impression was given to these by placing them in turn between two dies and striking them with a hammer. As it was not easy by this method to place the dies exactly above each other, or to apply proper force, coins so made were always faulty and had the edges unfinished, which rendered them liable to be clipped. The first great step was the application of the screw, invented in 1553 by a French engraver of the name of Brucher. The plan was found expensive at first, and it was not till 1662 that it altogether superseded the hammer in the English mint. In 1882 the lever-press was introduced.

The processes required for converting the crude metal into money are: (1) Assaying; (2) refining or parting, which reduces the material into ingots or bars of standard purity; (3) reducing the bars to coinage ingots by mixing with them the proper amount of copper alloy; (4) coining, or transforming the coinage ingots into money. The gold and silver which is brought to the mint may be in a crude or manufactured condition and is of every degree of fineness. The initial process, therefore, is to assay the metal, in order both to determine its value and the subsequent minting operations necessary to refine it. This process and the succeeding one of refining are described in the metallurgical articles on GOLD and SILVER and under ASSAYING. The bullion thus purified is reduced to bars, a gold bar usually weighing 6000 ounces, worth about $8000. It is now ready to be used for industrial purposes, or for the next stage in the coinage process.

The consumption of gold and silver in the arts and industries is very great. During the year ending June 30, 1895, gold and silver bars for industrial use, in about equal ratio, were manufactured in the Philadelphia mint and in the assay office at New York to the coinage value of $17,818,581. Private refineries furnished not less than $5,000,000 more. These bars are 0.999 fine. A depositor may bring crude bullion in any quantity, of $100 or more in value, and receive either fine gold bars or coin, at his option, a charge of not more than five cents an ounce being made for assaying and refining. For the silver alloy in the gold the owner will be paid either in silver bars or silver dollars, at the market value of silver.

If the gold or silver is to be coined into money the pure bars must be mixed with copper alloy, for standard coin is composed of 100 parts of purest copper in 1000. The law allows a slight variation from this standard, but in actual practice a single gold coin rarely varies more than 0.03 per cent. from the standard, either way, and a silver coin, which is much more difficult to manage, not more than 0.1 per cent., while the average is almost exactly correct. Weighed quantities of gold and copper, or of silver and copper, are melted together in a black-lead crucible, the molten metals thoroughly stirred together, and then poured into cast-iron molds to form ingots. These vary in size according to the denomination of the coins to be made from them. The following table, compiled by William E. Morgan, Coiner of the United States Mint at Philadelphia, gives the sizes and approximate weights of gold ingots:

DENOMINATIONS	Approximate weight in ounces	Length in inches	Thickness in inches	Width in inches
Double eagles	80	12⅝	½	1½
Eagles	62	$11\frac{15}{16}$	½	$1\frac{3}{16}$
Half eagles	40	12	$\frac{7}{16}$	⅞
Quarter eagles	33	12½	$\frac{7}{16}$	$\frac{11}{16}$

The ingot for silver dollar coinage is 1⅝ inches wide, ½ inch thick, and 12½ inches long. The ingots are passed repeatedly between heavy rollers to form them into strips, a process which is called 'breaking down.' After each passage the rollers are screwed tighter, the amount of pressure being regulated exactly by a clock-dial. The strips are annealed during the process to prevent their breaking. The strips, having been greased with tallow, are finally reduced to standard thickness by drawing out in draw-benches by a process similar to that of wire-drawing. (See Wire.) Having been drawn to the required weight, which is ascertained by weighing sample blanks cut from each end, the strips are cut into planchets, by means of a steel punch, working into a matrix. (See Dies and Die-Sinking.) These planchets are now cleaned and carefully sorted, all that are not perfect or are under the standard weight being set aside to be remelted, while those that are above weight are filed down. The standard weight for gold coins is as follows: Double eagle, 516 grains; tolerance allowed by law, 0.50 grain. Eagle, .258 grains; tolerance, 0.50 grain. Half eagle, 129 grains; tolerance, 0.25 grain. Quarter eagle, 54.5 grains; tolerance, 0.25 grain.

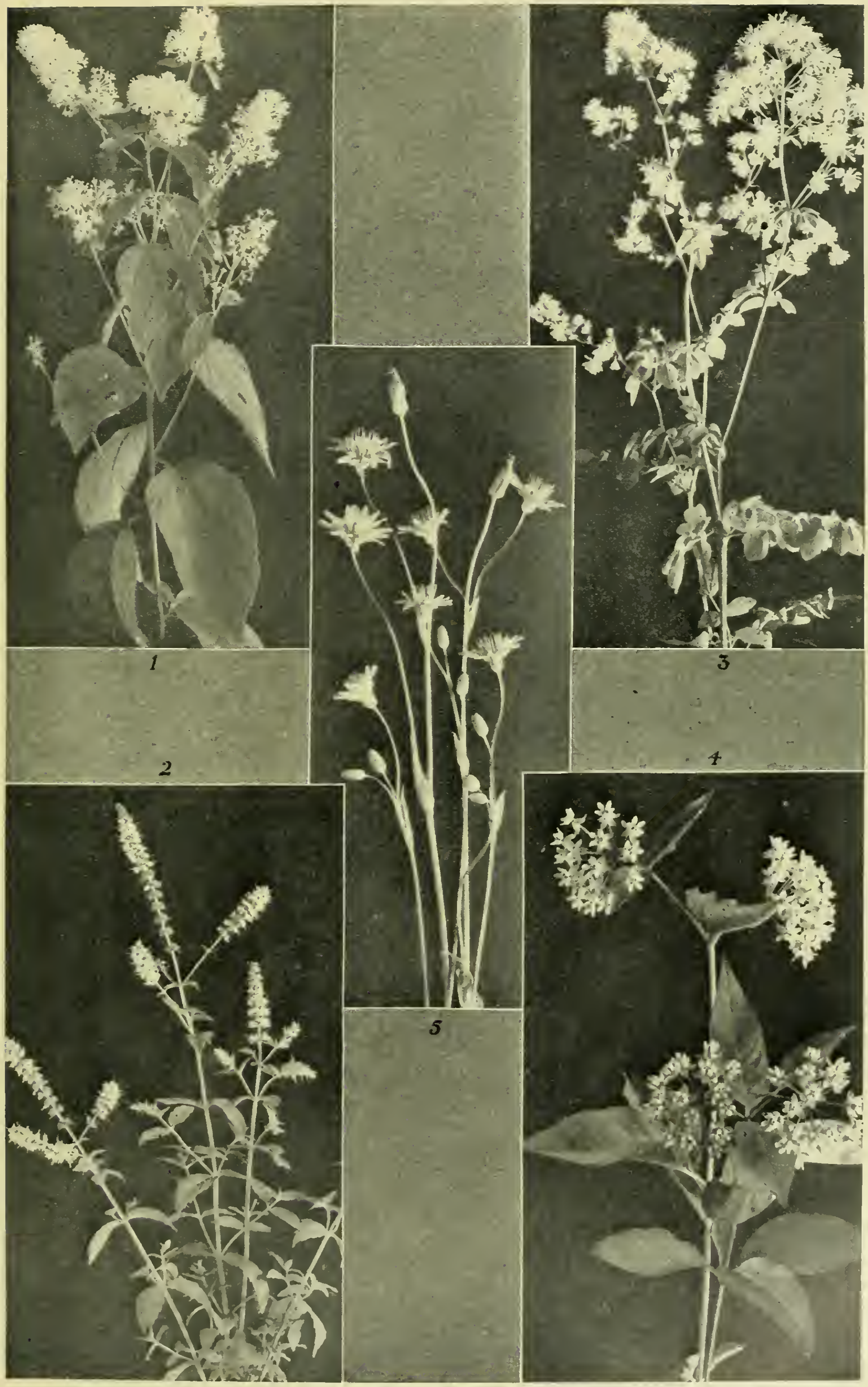
Next comes the process of milling, or producing a raised rim around the edge of the coin, to prevent abrasion. This is accomplished in a milling machine, into which the blanks are placed one by one by hand. The blanks rotate in a horizontal plane in a groove formed on one side by a revolving wheel and on the other by a fixed segment of corresponding groove. Each piece, as it passes through this narrow groove, has its edges forced up into an even rim. After annealing and cleaning, the coins are now ready for the final process of stamping. The planchet, fed to the press through a vertical tube, is automatically placed in a steel collar, whose inner surface is reeded to produce the fluted surface on the milled edge of the coin. Here it is firmly held while the dies close upon it with enormous force, producing impressions on both sides of the coin. (This process and the preparatory one of engraving and stamping the dies are described under Dies and Die-Sinking.) The pressure required to produce a clear, sharp impression on the various gold coins is as follows: Double eagle, 175 tons; eagle, 120 tons; half eagle, 75 tons; quarter eagle, 40 tons. Double eagles and eagles are struck at an average rate of 80 per minute; half eagles and quarter eagles at a rate of 100 per minute. The pressure required for stamping silver coins is: Dollar, 150 tons; half dollar, 110 tons; quarter dollar, 80 tons; dime, 40 tons. The first three are struck at an average rate of 80 per minute, and dimes at the rate of 100 per minute.

The total coinage of gold by the mints of the United States from 1792 to June 30, 1900, was $2,167,088,113, of which it is estimated that $923,653,642 is still in existence as coin in the United States, while the remainder represents

Coinage of Silver Coins, by Acts and Denominations, from 1792 to June 30, 1900
(From Circular No. 113, issued by the United States Treasury Department, July 2, 1900)

DENOMINATION	1792 to 1853	1853 to Feb. 12, 1873	Feb. 12, 1873, to June 30, 1900	Total silver
Dollars	2,506,890.00	5,524,348.00	498,496,215.00	506 527,453.00
Trade dollars	...	...	35,965,924.00	35,965,924.00
Lafayette dollars	...	...	50,000.00	50,000.00
Total dollars	2,506,890.00	5,524,348.00	534,512,139.00	542,543,377.00
Half dollars	66,280,640.50	32,666,832.50	46,041,036.00	144,988,509.00
Half dollars, Columbian	...	...	2,501,052.50	2,501,052.50
Quarter dollars	3,994,040.50	17,879,790.50	41,889,190.50	63,763,021.50
Quarter dollars, Columbian	...	...	10,005.75	10,005.75
Twenty-cent pieces	...	...	271,000.00	271,000.00
Dimes	3,890,230.10	4,908,520.00	27,133,111.10	35,931,861.20
Half dimes	1,825,126.40	3,055,093.00	...	4,880,219.40
Three-cent pieces	744,927.00	537,160.20	...	1,282,087.20
Total subsidiary	76,734,964.50	59,047,396.20	117,845,395.85	253,627,756.55
Total silver	79,241,854.50	64,571,744.20	652,357,534.85	796,171,133.55

MINT, ETC.



1. NEW JERSEY TEA (Ceanothus Americanus).
2. SPEARMINT (Mentha spicata).
3. TALL MEADOW-RUE (Thalictrum polygamum).
4. FOUR-LEAVED MILKWEED (Asclepias quadrifolia).
5. VIRGINIA GOAT'S-BEARD (Krigia Virginica).

the excess of exports over imports and the amount consumed in the arts. (See *Circular No. 113*, issued by the United States Treasury Department, July 2, 1900.) The amount of silver coinage for the same period is given in the accompanying table.

The coinage for 1900 in the mints of the United States was the largest on record, amounting to 184,373,793 pieces, of the value of $141,351,960.36. A significant feature was that the chief increase was in subsidiary coins, due probably to the unusual activity of retail trade throughout the country. The seigniorage on the coinage of silver dollars, subsidiary and minor coins during the year amounted to $10,286,302.50. (See Seigniorage.) Consult the annual reports of the Director of the Mint, and also the various pamphlets on coinage issued by the Treasury Department at Washington.

MINT (AS. *minte*, Icel. *minta*, OHG. *minza*, *munza*, Ger. *Minze*, *Münze*, from Lat. *menta*, *mentha*, from Gk. μίνθα, *mintha*, μίνθη, *minthē*, mint), *Mentha*. A genus of plants of the natural order Labiatæ; with small, funnel-shaped, 4-fid corolla, and four straight stamens. The species are perennial herbs, varying considerably in appearance, but all with creeping rootstocks. The flowers are whorled, the whorls often grouped in spikes or heads. The species are widely distributed over the world; some of them are very common. Water mint (*Mentha aquatica*) grows in wet grounds and ditches, and corn mint (*Mentha arvensis*), which abounds as a weed, in European fields and gardens. These and most of the other species have erect stems. All the species contain an aromatic essential oil, in virtue of which they are reputed more or less medicinal. The most important species are spearmint, peppermint, and pennyroyal; spearmint or green mint (*Mentha viridis* or *spicata*), a native of almost all the temperate parts of the globe, has erect, smooth stems, from one foot to two feet high, with the whorls of flowers in loose cylindrical or oblong spikes at the top; lanceolate, acute, smooth, serrated leaves, destitute of stalk, or nearly so. It has a very agreeable odor. Peppermint (*Mentha piperita*), a plant of equally wide distribution in the temperate parts of the world, is very similar to spearmint, but has stalked leaves and flowers in short spikes, the lower whorls somewhat distant from the rest. It is very readily recognized by the peculiar pungency of its odor and of its taste. Pennyroyal (*Mentha Pulegium*), also very cosmopolitan, has ovate, stalked leaves, a much-branched prostrate stem, which sends down new roots as it extends in length, and the flowers in distant globose whorls. Its smell resembles that of the other mints. All these species, in a wild state, grow in ditches or wet places. All are cultivated in gardens. Mint sauce is generally made of spearmint, which is also used for flavoring soups, etc. A kind of mint with lemon-scented leaves, called bergamot mint (*Mentha citrata*), is found in some parts of Europe, and is cultivated in gardens. Varieties of peppermint and horse-mint (*Mentha sylvestris*), with crisped or inflated rugose leaves, are much cultivated in Germany under the name of curled mint (*Krause-minze*); the leaves are dried and used as a domestic medicine, and in poultices and baths. All kinds of mint are easily propagated by parting the roots or by cuttings. It is said that mice have a great aversion to mint, and that a few leaves of it will keep them at a distance.

Peppermint, pennyroyal, and spearmint are used in medicine. The pharmacopœias contain an *aqua*, *spiritus*, and *oleum* of each of them, the officinal part being the leaves and stems, which should be collected when in flower. Peppermint is extensively used to flavor candy and mixtures to cover the taste of drugs. Nearly one-half of the oil of peppermint and spearmint now used in the world is produced and distilled in Michigan, the great seat of this industry being in Saint Joseph County.

MINT FAMILY. An order of plants. See Labiatæ.

MIN'TO, Gilbert Elliot, first Earl of (1751-1814). A British diplomatist and administrator. He was educated at Edinburgh and Oxford, and was called to the bar in 1774. In 1776 he entered Parliament as a Whig. From 1794 to 1796 he was Viceroy of Corsica. In 1797 he was created Baron Minto, and two years later became Ambassador to Vienna. On his reappearance in the House of Lords he became an advocate of the union of Ireland with England, and afterwards strenuously opposed Roman Catholic emancipation. He was Governor-General of India from 1807 to 1813, and did much to suppress internal disorder in the regions under his government. Consult *The Life and Letters of Lord Minto*, edited by the Countess of Minto, his great-niece (1874).

MINTO, William (1845-93). An English literary critic. He was born at Alford, Scotland, and graduated at Aberdeen in 1865. He edited the London *Examiner* from 1874 to 1878, and in 1880 became professor of logic and English literature at Aberdeen. He wrote three stories, *The Crack of Doom* (1886), *The Mediation of Ralph Hardelot* (1888), and *Was She Good or Bad?* (1889), but is chiefly known as a critic. In this latter field he published many well-known works, including: *Manual of English Prose Literature, Biographical and Critical* (1872); *Characteristics of English Poets from Chaucer to Shirley* (1874); and *Daniel Defoe* (for the English Men of Letters Series, 1879). There appeared posthumously *University Extension Manual on Logic* (1893); *Plain Principles of Prose Composition* (1893); and *English Literature Under the Georges* (1894). Original in method, he ably defended many novel hypotheses.

MIN'TON, Thomas (1765-1836). An English manufacturer of porcelain. He was born in Wyle Cop, Shrewsbury; studied engraving under John Turner, who is said to have invented blue printing on china; and between 1788 and 1793, after working for Spode in London, settled at Stoke and built a pottery. Joseph Poulson and William Pownall were for a time members of the firm; and afterwards (1817) Herbert Minton (1793-1858), a son of Thomas, who succeeded him in 1836. In 1883 the firm became Mintons, Ltd. Herbert Minton devised methods of making hard pottery (1849) and encaustic tiles, and produced a marble-like porcelain called 'Parian.' He was for a long time the only English manufacturer of majolica.

MINUCIUS (mĭ-nōō'shĭ-ŭs) **FE'LIX**, Marcus. The first Latin apologist for Christianity.

He was a heathen by birth and followed his profession of lawyer at Rome. His work entitled *Octavius* is in the form of a dialogue between a Christian called Octavius and a heathen called Cæcilius. Octavius defends the Christians from the calumnies which were circulated against them, charging them with crimes in their secret religious meetings, and exposes the licentious practices of the heathen. The style of the work is argumentative and pure, and much information is given concerning the manners, customs, and opinions of the period. As an apology for Christianity it compares favorably with those of Justin, Tertullian, and other early advocates of the Christian faith, and with those of Lactantius, Ambrose, and Eusebius of the fourth century. Its date has been disputed, but the best opinion now places it in the age of the Antonines, between 150 and 180. The text is in Migne, *Patrol. Lat.*, iii., and, edited by Halm, in the *Corpus Scriptorum Ecclesiasticorum Latinorum* (Vienna, 1867); Eng. trans. in the *Ante-Nicene Fathers*, vol. iv. Consult: Kühn, *Der Octavius des Minucius Felix* (Leipzig, 1882); Bahlen, *Questiones Minucianæ* (Berlin, 1894).

MIN′UET (Fr., small, diminutive of *menu*, from Lat. *minutes*, small, p.p. of *minuere*, to diminish, from *minor*, less; connected with Gk. *μινύς*, *minys*, small, Skt. *mī*, to make small, Goth. *minniza*, OHG. *minniro*, Ger. *minder*, AS., archaic Eng. *min*, less; so called because of the small steps taken in the dance). A graceful and stately dance of French origin. It is supposed to have originated in Poitou, and was introduced into Paris in 1650. The first known minuet tunes were written by Lully (q.v.) in 1653. The minuet was a favorite at the Court of Louis XIV. and was carried over into England in the reign of Charles II., where it continued popular until the time of George II. In Russia it flourished during the reigns of Peter the Great and Catharine II. At first the minuet was in three-quarter time and consisted of two eight-bar phrases, each of which was repeated. Mozart's minuet in *Don Giovanni* shows the form of the early dance. It was soon, however, extended by the addition of a second movement (written in three-part harmony and hence called Trio) and by increasing the number of bars. Bach and Handel often introduced the minuet into their suites. Those of the former are especially famous, and Handel also used it as a concluding movement for operatic and oratorio overtures. The minuet is of particular importance because of the position it still occupies in the symphony, which is an evolution of the suite. Haydn was the first to employ it in the symphony, but he changed its character by quickening the time and making it vivacious rather than stately. Mozart used Haydn's form, retaining the rapid *tempo*, but gave it a tender, graceful significance. With Beethoven its history practically ceases, for he transformed it into the *scherzo*, thus making it an integral part of the symphony. Its use by later composers, Schumann, Mendelssohn, and others, is comparatively rare. See DANCING; SUITE; SYMPHONY.

MINUIT, mĭn′ṳ̂-ĭt, **MINUITS**, or **MINNEWIT**, PETER (1580-1641). An early Governor of New Netherland. He was born in Wesel, on the Rhine; was a deacon for a time in the Protestant or Walloon Church there, removed to Holland early in the seventeenth century, and in December, 1625, received from the Dutch West India Company the appointment of Governor and Director-General of New Netherland. He reached Manhattan Island May 4, 1626, and soon afterwards purchased the island from the Indians, obtaining it for the sum of sixty guilders (about twenty-four dollars). He built Fort Amsterdam, defended with great courage and determination the claim of the Dutch to rightful possession of the island, and administered the affairs of his office judiciously and to the general satisfaction of the colony. The fact that the patroons were successful in establishing titles to enormous tracts of land became objectionable to the Dutch West India Company, who placed the responsibility on the shoulders of Minuit. In 1631 he was accordingly recalled by the company, and sailed for Holland in the following spring, but was driven into Plymouth, England, by a gale. Here he was charged with having prosecuted illegal trading within English dominions, and his vessel was attached on complaint made by the Council for New England. In May, however, his vessel was released. Minuit made every effort to reëstablish himself in the favor of the Dutch West India Company, but without success, and finally offered his services to the Government of Sweden. Through the influence of Oxenstiern, then Chancellor, a Swedish West India Company was organized, and Minuit was commissioned to establish a Swedish colony in America. He accordingly gathered together a sufficient number of Swedes and Finns for this purpose, sailed from the port of Gothenburg, Sweden, in 1637, and, early in 1638 built Fort Christiana, near where the city of Wilmington, Del., now stands. The Swedish colonization scheme was bitterly opposed by the Dutch, who threw every obstacle in the way of its success, and eventually captured the colony and annexed it to their possessions in 1655. For a biographical sketch consult Kapp, "Peter Minnewet aus Wesel," in *Historische Zeitschrift*, vol. xv. (1866); and Mickley, "Some Account of William Usselinx and Peter Minuit," in the *Delaware Historical Society Papers*, No. vi. (Wilmington, 1886).

MINULUAN, mē′nōō-lōō′än. A town of Negros, Philippines, in the Province of Western Negros. It is situated on the northwest coast of the island, five miles north of Bacolod (Map: Philippine Islands, H 9). Population, 11,340.

MINUSINSK, mē̇′nụ-sē̇nsk′. A town of Southern Siberia, in the Government of Yeniseisk, situated on the Yenisei, 300 miles southeast of Tomsk. It has a high school for girls, a good museum and library, and considerable trade in grain and cattle. Population, in 1897, 10,255.

MINUTE (OF., Fr. *minute*, from Lat. *minutum*, small portion, from *minuere*, to make small). A term applied to the 60th part of an hour and to the 60th part of a degree of a circle. In architecture the term minute is applied to the 60th part of the diameter of the shaft of a classic column, measured at the base; it is used as a measure to determine the proportions of the order.

MINUTE MEN. In American history, those civilians, in Massachusetts and several other colonies, who, on the approach of the Revolutionary

War, pledged themselves to take the field at a minute's notice. In Massachusetts they were enrolled in pursuance of an act of the Provincial Congress passed November 23, 1774.

MINUTOLI, mė-nōō′tȯ-lė, HEINRICH, Baron MENU VON (1772-1846). A Prussian officer and archæologist. He was born in Geneva of an old Italian family, early entered the Prussian army, and distinguished himself in 1793 in the Rhenish campaign against France, being severely wounded at Bitsch. Frederick William III. promoted him to be major-general, and in 1820 made him head of the Prussian archæological expedition to Egypt. His valuable Egyptian collection was bought for the Berlin Museum. Minutoli's last years were spent in retirement at Lausanne. He wrote: *Ueber antike Glasmosaik* (with Klaproth, 1814); the important *Reise zum Tempel des Jupiter Ammon und nach Oberägypten* (1824-27); and *Ueber die Anfertigung und Nutzanwendung der färbigen Gläser bei den Alten* (1837); as well as a biography of Frederick William III. (1838-44), and an account of the campaign of 1792 (1847).

MIN′YAS (Gk. *Μινύας*, *Minyas*). A legendary hero connected with the Bœotian city Orchomenos. He is called son of Poseidon in the earlier writers, but in Pausanias his father is Chryses, and he is famed for his riches, and as builder of the first great treasury—really the domed tomb of Orchomenos. His fame in legend is connected with the fate of his three daughters, Leucippe (or Leuconoë), Arsippe (or Arsinoë), and Alcathoë, who, refusing to take part with the Mænads in the orgies of Dionysus, were visited by the god with Bacchic madness, in which they tore to pieces the young son of Leucippe. Their story was acted at the festival of the Agrionia, where the priest of Dionysus, with a drawn sword, pursued women of the family of the Minyadæ. The Argonauts from Iolcos in Thessaly were also called *Minyæ*, but the original connection with Minyas is very doubtful, and the statements of the ancients are obviously mere attempts to explain the identity of name.

MIOCENE EPOCH (from Gk. *μείων*, *meiōn*, less + *καινός*, *kainos*, new). A division of geologic time following the Oligocene and preceding the Pliocene epochs of the Tertiary period. The Miocene is represented in the Atlantic and Gulf States by a series of unconsolidated sands and gravels (rarely conglomerates and limestones), which attain a thickness of from 400 to 1500 feet. In the interior region it includes the Loup Fork formation of fresh-water strata, occurring in Montana, South Dakota, and the States southward to Mexico, and the John Day beds of eastern Oregon, which are largely composed of volcanic tuffs and ashes. In Europe the Miocene strata are extensively developed. Great geographical changes were accomplished during this epoch, one of the most important being the upheaval of Central America, by which the continents of North and South America were joined. See TERTIARY SYSTEM.

MIOGA. A kind of ginger (q.v.).

MI′OHIP′PUS (from Eng. *mio-cene* + Gk. *ἵππος*, *hippos*, horse). A name sometimes used to designate the Upper Miocene stage of evolution of the horse, represented by the genus Anchitherium. See HORSE, FOSSIL.

MIOLAN, myȯ′län′, FELIX. A name sometimes used by the French singer Marie Caroline Félix Carvalho (q.v.).

MIONNET, myȯ′nȧ′, THÉODORE EDME (1770-1842). A French numismatist, born in Paris, where he studied in the Collège du Cardinal le Moine, and in the Ecole de Droit. After four years of legal practice and a short term in the army, from which he retired because of illness, he became assistant in 1800 in the numismatic cabinet in the Bibliothèque Nationale, and there began to catalogue the collections. He traveled in Italy, made many valuable numismatic finds, and in 1830 was elected to the Academy of Inscriptions. His great works, which still have a distinct scientific value, are *Déscription des médailles antiques, grecques et romaines* (1806-30, in 17 vols.) and *De la rareté et du prix des médailles romaines* (1815; 3d ed. 1847). Consult Walckenaer, *Notice historique sur la vie et les ouvrages de M. Mionnet* (Paris, 1846).

MIQUEL, mė-kĕl′, JOHANNES VON (1829-1901). A German statesman, born in Neuenhaus, Hanover, of a family of French émigrés, and educated for the bar at Heidelberg and Göttingen. In his student days he was a rabid revolutionist and something of a Socialist, but when the period of reaction set in he soon forsook his earlier sentiments. His practice in Göttingen was very successful, and in 1864 he was elected a member of the Hanoverian Diet, and in 1865 Burgomaster of Osnabrück. Removing to Berlin in 1870, he was a director of the Diskontogesellschaft until 1873, and then president of its advisory board until 1876. Then he was again made Chief Burgomaster of Osnabrück, and in 1880 of Frankfort-on-the-Main. But his greater field of usefulness was in the Prussian House of Deputies and in the Imperial Diet. There, as in the Prussian House of Lords, of which he was ex-officio a member as Burgomaster of Frankfort, he was a leader of the National Liberal Party and one of Bismarck's most able and forceful lieutenants. In 1890 he became Prussian Minister of Finance, and was hailed as the 'Emperor's man,' no doubt to reassure the country in face of its fear that the new Imperial policy was to be merely reactionary. In this office, which Miquel held up to a few months before his death, he showed himself an able financier, and a bold reformer in his attempt to liberate the Imperial Treasury from depending on the contributions of the various States. As a politician he was an opportunist driven to intrigue with any party and, above all, to any sacrifice of conviction to the policy of the Kaiser, in the hope that he might be made Chancellor. But if he was unsuccessful in his programme of Imperial finance, in his more proper sphere of Prussian finance, by playing somewhat into the hands of the Agrarian Party, he secured the adoption of a new tax system, which greatly benefited the working classes and at the same time tremendously increased the revenue. On his Prussian policy, consult: Zedlitz und Neukirch, "Miquel als Finanz- und Staatsminister," in *Preussisches Jahrbuch* (1901).

MIQUELON, mė′k'-lôn′. An island off the coast of Newfoundland. See SAINT PIERRE.

MIR, mēr (Russ., OChurch Slav. *mirŭ*, union, peace, world, Lith. *mers*, Alb. *mir*, peace). The name of the civil communities of the Russian peasants. All land is held in common and is divided, usually according to the number of males at the last census, being redistributed whenever necessary. Each family receives meadow, forest, and arable land, the meadow being sometimes kept in common and only the grass divided. The mir, or village commune, as a body is assessed for taxes by the Central Government, and the burden of taxation is distributed among the heads of families, according to the amount of land occupied by each. Each mir is self-governing with elected officers, and adjoining mirs may be grouped in volasts or small cantons. The system is very old, but is gradually changing, as a mir may now go over to private ownership of land and inheritance of property on vote of two-thirds of its members. Consult: Wallace, *Russia* (London, 1877); Keussler, *Zur Geschichte und Kritik des bäuerlichen Gemeindebesitzes in Russland* (Saint Petersburg, 1876-87).

MIRABEAU, mē'rā'bō', Gabriel Honoré Riqueti, Count de (1749-91). A French writer, orator, and statesman. He was the second son of Victor Riqueti, Marquis de Mirabeau, a celebrated economist, and was born at Bignon, near Nemours, March 9, 1749. After several years under a tutor, the young Mirabeau was placed (1767) in a fashionable military school in Paris, where he became proficient in languages and in the accomplishments of good society. In 1767 he joined the Berry cavalry regiment and the next year he received a second lieutenant's commission, but his freaks of conduct and his love affairs, one of which brought him into rivalry with his colonel, caused his imprisonment in the citadel of the island of Ré, from which he was released, at his father's instigation, in March, 1769. The condition of his release was that he should join the expedition to Corsica, and as a member of the Legion of Lorraine he served with credit in the subjugation of that island. In 1771 he was commissioned captain of dragoons, and in 1772 he was married at Aix to Marie Emilie de Covet, only daughter of the Marquis de Marignane. Of this union one son, Victor, was born in 1773, but he died in 1778. Debts, quarrels with his father and wife, and an altercation with the Marquis de Villeneuve-Monans, led to his imprisonment by *lettre de cachet* in the Castle of If in 1774, whence he was transferred to the Castle of Joux, near Pontarlier, the next year. Being at freedom to visit Pontarlier, he made the acquaintance of the Marquis de Monnier, an old man of seventy, and his twenty-two-year-old wife, Marie Thérèse Richard de Ruffey. Forgetful of his obligations to the Marquis, Mirabeau fell violently in love with the young Marquise; trouble ensued, and Mirabeau finally escaped to Switzerland, where he was joined by Sophie, as he called his mistress, and in October, 1776, they settled in Amsterdam, where Mirabeau gained a livelihood as a hack writer. In the meantime, the French courts passed sentence upon the runaway lovers, who were arrested in May, 1777, and brought to Paris, where Sophie was kept under close surveillance, while Mirabeau was imprisoned at Vincennes. For three years and a half he was kept in close confinement, but through his guard, a brother Freemason, he was able to carry on his famous correspondence with Sophie. These letters mark the culmination of Mirabeau's wild and vicious career. As a prisoner he devoted himself to the translation of numerous classics, and to the production of various original works, some of which were later published. After his release in December, 1780, he forsook Sophie, who, after another love affair, committed suicide in 1789. Then he returned to Pontarlier, secured the revocation of the death sentence, which had been passed on him for the seduction of Sophie, and later went to Aix, where, after a trial in which he ably conducted his own suit, he was legally separated from his wife in 1783.

Because of his suits at Pontarlier, he found it advisable to leave France for a few months, which he spent at Neuchâtel, where he met the Genevese Liberals Clavière and Duroveray, and where he published his *Des lettres de cachet et des prisons d'état*, the best known of his earlier writings. From September, 1783, to August, 1784, he was in Paris, where he seems to have begun his life-long intimacy with Henriette van Haren, a young woman of nineteen, known as Madame de Nehra, whose influence over Mirabeau was exerted entirely for his good. In August, 1784, he withdrew to London to allow another storm to blow over. In England he met his old schoolfellow, Sir Gilbert Elliot (later first Earl of Minto), Mr. (later Sir) Samuel Romilly, Lord Lansdowne, and other well-known men. He there wrote the *Considérations sur l'ordre de Cincinnatus*, which caused a sensation in the United States. After nine months in England, the intercessions of Madame de Nehra enabled him to return to Paris, where he entered into intimate relations with the Genevese exiles and other Liberals, like Brissot, and wrote numerous pamphlets on financial questions, published during 1785. These were followed (1787-1789) by his attacks on stock-jobbing and his criticisms on Necker's administration of the finances. In the meantime, he had twice visited Prussia, once on a secret mission for the Government. On his first visit (December, 1785, to May, 1786) he was received by Frederick the Great, whose death occurred during his second visit at Berlin (July, 1786, to January, 1787). In 1787 he failed in an attempt to secure the position of Secretary to the Assembly of Notables, and his attacks on Necker drove him to take refuge in Prussia. Returning from this third visit to Berlin, he published in 1788 his most famous work, *De la monarchie prussienne sous Frédéric le Grand* (8 vols. and atlas, London, 1788). In October, 1788, Mirabeau once more was reconciled with his father, and in January, 1789, he arrived at Aix to participate in the elections to the States-General. In April, having been ejected by his own order, the nobility, he was elected by the Third Estate both of Aix and of Marseilles to the States-General, and he chose to represent the former city. He was in Paris in time to publish on May 2, 1789, the first number of his newspaper, which, after some changes of title, finally took the name of *Courrier de Provence*, and a few days later to be present at the opening of the States-General at Versailles. He never had a following upon whom he could depend in the States-General, where his success was always a result of his ability to take advantage of temporary enthusiasm or excitement—an ability which gave him a reputation for boldness, for knowing his own mind, for oratorical powers, and for many of the arts of the demagogue. The true greatness of Mirabeau was not revealed until the publication of his works, and especially his correspondence with La Marck, many years after his death. From the first Mirabeau saw that the royal and ministerial scheme of financial reform would be insufficient to cure the existing evils, but he likewise saw that reforms could be successfully carried out only by a strong Government. From the opening of the States-General until his death two years later, Mirabeau was undeniably the most important figure in public life in France, and the story of his life is that of the Revolution. He took part in the debates concerning the status of the members of the Third Estate, and his bold attitude as their spokesman at the royal session of June 23d marked him as the champion of the Third Estate in the struggle which ended in the reorganization of the States-General as the National Assembly. He protested vigorously against the attempt to overawe the Assembly by the mobilization of troops around Paris, but his father's death on July 13th prevented his participation in the stirring events of the following day when the Bastille was stormed and destroyed by the populace of Paris. The protracted debates on the rights of the individual, and the reckless haste in the destruction of the old order by the Assembly on August 4th, called forth his protests. Still he recognized the importance of the proposed Declaration of the Rights of Man, and took an active part in framing it. Mirabeau, however, saw that neither theoretical nor destructive, but constructive statesmanship was the need of the hour. One by one he brought forward his favorite constitutional measures and defended them with all his powers of logic, eloquence, and persuasion, only to see them voted down. After the failure of his proposition to choose the royal Ministers from the members of the National Assembly, on November 7, 1789, Mirabeau strove earnestly to put his great abilities at the service of the King, whom he had attempted to advise as early as October 15th. He tried to work with Lafayette and Necker, but everywhere he was viewed with suspicion, his advice was never followed, and his assistance was rejected entirely or accepted with ill grace. Finally in May, 1790, he abandoned his attempts to coöperate with Necker and Lafayette, and, through La Marck, entered into regular relations with the King and Queen, for whom he wrote his famous series of notes of advice. This change was marked in the Assembly by his speech in favor of the royal prerogative, especially in questions of peace and war, which directed suspicion toward him, and caused a temporary outburst of popular indignation against him. He was largely responsible for Necker's resignation in September, 1790, and for the appointment of Clavière in his place. In July he had been placed on the Diplomatic Committee of the Assembly, and, in coöperation with his old friend Montmorin, the Minister of Foreign Affairs, had dealt with the perplexing questions of foreign relations, such as the annexation of Avignon and the maintenance of the Family Compact with Spain. He insisted that no other country should interfere in the internal affairs of France; that other countries must keep their agreements with France; and that France must respect her agreements with other countries. On November 30, 1790, he was elected president of the Society of the Friends of the Constitution, popularly known as the Jacobin Club, and on January 29, 1791, he received the coveted honor of election as president of the National Assembly. His last note to the Court, through La Marck, was sent on February 3d. His last appearance in the Assembly was on March 27th. On April 2, 1791, he died in the Rue de la Chaussée d'Antin in Paris. He was buried in the Church of Sainte-Geneviève (the Pantheon), but three years later his remains were removed to make room for those of Marat.

The greatness of Mirabeau has been generally recognized, but in estimating the details of his life and policy there has been the widest divergence of opinion. French republicans have condemned him unsparingly for his monarchical sympathies, but most of all because in return for his services the Court paid his debts and supplied him with funds. In his defense it must be said that Mirabeau regarded himself as *de facto* prime minister, charged with the duty of saving France, a task to which he felt he alone was equal. The keynote of his advice to the Court was that the King should transfer the Court and the Assembly from Paris to Fontainebleau, or Compiègne, or some other small town of Central France, where the influence of the mob of Paris would cease to control the Assembly, and the King and the Assembly would be free to give France a strong monarchical constitution. Mirabeau had great power over men, and made those who came under his fascination willing to merge their personalities in his and allow him to take all the credit for their labors. The *Souvenirs* of Etienne Dumont, one of his collaborators, first showed fully Mirabeau's methods of work, and the way in which he made regular use of the services of Dumont, Reybaz, Pellenc, and even better known persons like Clavière and the Abbé Lamourette. In Mirabeau everything was on a colossal scale; in personal appearance and moral character he was almost a monster; in intellect and powers of endurance he was a titan. In his personality all that was noblest and best of the French Revolution seemed combined with the greatest of its characteristic evils. The philosophers of history have mourned Mirabeau's death, because they believed that had he lived he would have saved France from the excesses of the Reign of Terror. It would be safe to say that he was the only one who might have rendered France that service, but it is to be doubted whether even the man whose character can best be summed up in the word excess could have saved his nation from the evil of excess. Alike terrible in their greatness, Mirabeau and Napoleon were the greatest men of the French Revolution.

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tion française (ib., 1882); for his methods of work, Dumont, *Souvenirs;* and Reybaz, *Un collaborateur de Mirabeau* (ib., 1874); for his election to the States-General, Guibal, *Mirabeau et la Provence* (ib., 1887-91); for his career in the Assembly, Reynald, *Mirabeau et la Constituante* (ib., 1872). The best lives are Stern, *Das Leben Mirabeaus* (Berlin, 1889); Mézières, *Vie de Mirabeau;* and Loménie, *Les Mirabeaux* (5 vols., Paris, 1889-91).

MIRACLE PLAY (OF., Fr. *miracle,* from Lat. *miraculum,* miracle, from *mirari,* to wonder, from *mirus,* wonderful; connected with Gk. *μειδᾶν, meidan,* Skt. *smi,* to smile). Strictly, the second stage in the development of the modern drama under religious auspices, though it is sometimes confounded with the first, for which, and for a general account of this development, see MYSTERY. The distinction between the two, where it is made, is based on the fact that whereas the mysteries proper took their subjects from the Scripture narrative, centring about the life of Christ, the miracle plays were taken rather from the lives of the saints. The significant features of this change were that by getting away from the sacred text of the Scriptures greater latitude was gained, and a greater range of characters; a nearer approach to a representation of contemporary life was thus also permitted, and a freer introduction of the comedy element than reverence would allow in the earlier form. Matthew Paris mentions a miracle play, *Ludus de Sancta Katharina,* that was performed at Dunstable about 1110, under the direction of a certain Geoffrey, afterwards Abbot of Saint Albans. Again, William Fitz-Stephen, in his *Life of Thomas Becket* (about 1182), writes approvingly of London plays on the miracles and sufferings of martyrs and confessors. Other miracle plays, based on the lives of Saint Fabian, Saint Sebastian, Saint Botolph, Saint George, and Saint Crispin, were performed in the fourteenth, fifteenth, and sixteenth centuries. Very few texts of English miracle plays have been preserved; but from numerous Continental specimens, it may be inferred that they were in aim and structure similar to the mysteries. For bibliography, see MYSTERY.

MIRACLES. The view to be taken of these extraordinary events is very largely a question of what definition of them is presupposed. A miracle was for a long time held to be "a violation or suspension of, or an interference with, the laws of nature." A later typical definition makes it "an extraordinary operation cognizable by the senses, which has its course not in the order of nature, as known to us, but in God." Another, not antagonistic to this, but perhaps more in accordance with the most recent scientific and religious thought, understands a miracle as "a revelation of a higher life, the prophecy of a new stage in the development of creation."

The old definition upon which Hume trained his intellectual artillery has disappeared with the eighteenth century Deism which gave it birth. Hume's argument and the replies of the Christian apologists of his day are no longer factors in the discussion of the miraculous. The theory of special creations has been supplanted by that of organic growth. The divine being is recognized as immanent as well as transcendent. He is neither banished from the world nor buried in it. As a result, God and man are closer together. The line of demarcation between the natural and the supernatural is finer. Some writers even insist that the common distinction between the two is unreal and misleading. We are told that there are not and cannot be any divine interpositions in nature, for God cannot interfere with Himself. His creative activity is everywhere present.

Man, though made in the image of God, is not the measure of God. If he were, nothing would be more supernatural to him than the visible and known course of things is now. To men thinking along these lines miracles are no longer interferences with or violations of the fixed laws of nature. They are but the manifestations of a Higher Life—the expression among the lower sequences of life of that which a larger vision may one day make our own. Man himself, by the exercise of his personality, works wonders among the laws or forces of the natural world which are brought under his control. Men of scientific training effect changes in physical things which are miracles to other men. Grown-up people perform miracles in the sight of children. A distinction, moreover, has been made between 'known' and 'unknown' laws. The old laws formerly designated as 'the laws of nature' are not violated or suspended. All natural processes go on, but they are counteracted or interacted by a new kind of nature working by a new law with a new power. The 'fixity of law' in the physical world is no longer an indispensable factor in biological phraseology. It is contended that modern science, in enlarging its horizon, has discovered and labeled some of the principles by which an immanent God effects His beneficent purposes, but that beyond and above these are other, and to man, as yet, 'unknown' and higher laws.

Further: the great First Cause who, Christianity assumes, is behind all the evolutionary processes of nature has another kingdom. He is the author and controller of the moral as well as the natural order of the universe. Embodied in the doctrine of the divine immanence is the unity of a divine purpose throughout the moral and the physical world. The natural and the moral are not two opposing spheres of which the one dominates the other, but the one conjoint revelation of the moral nature of God, the lower of which prepares for and leads on to the higher. Or, in other words, the moral and the material world are obviously and incontestably part and parcel of one and the same system. Hence, our definition may be enlarged to make a miracle not only the prophecy of a new state in the development of creation, but "an event in physical nature which makes unmistakably plain the presence and direct action of God working for a moral end." This view eliminates the Kantian dualism, and makes the Bible miracles not detached and meaningless portents, but part of a preparatory dispensation in the divine evolution. Displays of miraculous power are but the manifestations to man in his imperfection of that for which he hungers, and toward which he struggles—the perfection of the moral king of the universe.

To the unbiased thinker along these lines the rationale of miracles is at once apparent, and their possibility or even probability presents no serious difficulty. But the credibility of the so-called miraculous events can only be established by satisfactory evidence. Faith is not credulity, and it presents a reasonable demand for proofs. The Apostles clearly had no prejudice in favor of the resurrection and ascension of their master. They had everything to lose and nothing to gain, from a worldly point of view, by sticking to their stories. So the Gospel evidence cannot be simply ignored. New Testament criticism, moreover, seems unable to find any theory by which the miraculous can be entirely eliminated, and the historicity of the Gospels still preserved.

Passing from the Gospels to the Epistles, the great authority in support of the Resurrection is held to be Saint Paul, especially I. Cor. xv., the genuineness of which is unchallenged by impartial criticism. His citation of the manifestation of the risen Christ to "above five hundred brethren at once, of whom the greater part remain unto this day," remains a strong argument. Owing to the proximity of Corinth to the Syrian coast, it could easily have been challenged, but it does not appear that it was. It would follow, then, that within twenty-five years after the Crucifixion there were living over two hundred and fifty persons who had seen Christ alive after His death at one time and place.

The evidence for apostolic miracles, as contained especially in a number of passages of the Epistles to the Romans, Galatians, and Corinthians, is of a kind which, for the special purpose for which it was written, is particularly valuable. This evidence, which gains force from being incidental and not didactic, shows (in Sanday's words) that the Apostle "was conscious of the power of working miracles, and that he had actually wrought them; and it shows that he assumed the existence of the same power in others besides himself, and that he could appeal to it without fear of being challenged."

The evidential value of miracles does not hold as prominent a place in Christian apologetics as it once did. The tendency to-day is to put Jesus Christ and His claims to recognition as a Teacher and Saviour in the forefront of the Christian position. He was His own greatest miracle, an evidence of Christianity the force of which can be estimated without special critical training. His miracles were according to the law of His being 'in rational sequence' with the character of His person and mission. Works (*ἔργα*) and powers (*δυναμεῖς*) were natural to Him, as "the unique manifestations of His unique personality." Hence, we are told that the unique revelation of God made in the person of Jesus Christ must be its own evidence. The appeal is made to men to believe in the Christ primarily on moral and spiritual grounds. His miracles are not credentials: they are manifestations of and inseparable from Himself. Belief in His person and character will ultimately lead to a belief in His miracle-working. The fact that miracles are of the very substance of the Gospels is but the reflection of the deeper fact that they are of the very essence of Christ's manifestation of Himself.

The apostolic miracles may be viewed from the same standpoint, as the flashing forth after Pentecost of the more glorious divine life when an opening was made for it. They were coupled with and the power to work them was transmitted by the "laying on of hands," and it is widely held that no real miracles have been performed since the death of the last of those upon whom the Apostles laid their hands. To take this position, however, is to challenge the genuineness if not to deny the possibility of what are known as 'ecclesiastical' miracles. Some of their advocates admit that the great mass of them were a new dispensation, but insist that no strong antecedent improbability can be entertained against such a dispensation, because the Scripture miracles had already borne the brunt of hostile attacks and 'broken the ice' for their successors. It may fairly be said, too, that the claim for the cessation of miracles in subapostolic days, or, as some hold, after the Church was established by the civil power under Constantine, and, therefore, did not need supernatural assistance, is but a part of the now generally exploded idea that miracles were given for evidential purposes. On the other hand, it is noticeable that during the second and third centuries Christian writers have comparatively little to say about contemporary wonder-working, except in three forms, viz. curing disease, casting out demons, and prophesying. They seem to recognize that the extensive powers resident in Christ and the Apostles have ceased to operate. But in the fourth century, and on through the Middle Ages, constant reference is made to miracles of all kinds and full descriptions of their occurrence are given. The schoolmen bent their energies to setting forth the doctrine of the Church with regard to these records of the supernatural, and reconciling them with what was then believed concerning the world and God. Thomas Aquinas taught that a miracle is something altogether outside the natural order, while Albertus Magnus held that God has woven the miraculous into the order of nature, as one of its possibilities. Abélard freely criticised the accounts of alleged miracles in the age in which he lived, yet he believed that divine power might alter even the nature of things, whence miracles were possible. The Roman Catholic Church has always maintained that the 'spiritual gift' of working miracles (cf. I. Cor. xii. 10) has not ceased, but resides in the Church forever. It does not, however, require a belief in the truth of any particular one of these later miracles, leaving the evidence in the individual case to be the criterion. Proof of the power to work miracles is an essential prerequisite to canonization.

In conclusion, then, all real miracles may be regarded as sacraments of divine working—'outward and visible signs' of the inner and unbroken unity of the natural and moral kingdoms of the Supreme Love. In this sense they were parts of a great whole—normal and fitting vehicles of a revelation. They were in themselves "the revelations of a higher life, the prophecies of a new stage in the development of creation." But in them, as in all so-called 'miraculous' manifestations, the moral as well as the historical circumstances must be fully grasped and clearly presented before a hearty and loyal recognition can be secured.

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1873); Trench, *Notes on the Miracles of Our Lord* (ib., 1846); Mozley, *On Miracles*, Bampton Lectures (ib., 1876); Bushnell, *Nature and the Supernatural* (new ed., New York, 1876); Drummond, *Natural Law in the Spiritual World* (ib., 1883), and two answers to Drummond—Cockburn, *The Laws of Nature and the Laws of God* (ib., 1886); Laing, *Modern Science and Modern Thought* (ib., 1885); Moore, *Science and the Faith* (ib., 1889); Liddon, *Some Elements of Religion*, Bampton Lectures (ib., 1872); Christlieb, *Modern Doubt and Christian Belief* (Edinburgh, 1874); Westcott, *The Gospel of Life* (London, 1893); Illingworth, *Divine Immanence* (ib., 1898); Bender, *Der Wunderbegriff des neuen Testaments* (Frankfort, 1871); Lias, *Are Miracles Credible?* (London, 1883); McCosh, *The Supernatural in Relation to the Natural* (ib., 1862); Westcott, *Characteristics of the Gospel Miracles* (Cambridge, 1859); Sternmeyer, *The Miracles of Our Lord in Relation to Modern Criticism* (Eng. trans., Edinburgh, 1875): Fisher, *Grounds of Theistic and Christian Belief* (New York, 1883); Bormiot, *Wunder und Scheinwunder* (Regensburg, 1897); Taylor, *The Gospel Miracles in Their Relation to Christ and Christianity* (New York, 1880); Müller, *Natur und Wunder, ihr Gegensatz und ihre Harmonie* (Freiburg, 1892); id., *Das Wunder und die Geschichtswissenschaft* (ib., 1898); Hogan, *Clerical Studies* (Boston, 1898); Temple, *The Relation Between Religion and Science*, Bampton Lectures (London, 1884); Bruce, *The Miraculous Element in the Gospels* (ib., 1887); Row, *Christian Evidences Viewed in Relation to Modern Thought* (ib., 1877); Abbott, *The Kernel and the Husk* (ib., 1886); Huxley, "The Value of Witness to the Miraculous," in *Christianity and Agnosticism* (New York, 1899); White, *History of the Warfare of Science with Theology* (ib., 1896).

MIRAFLORES, mē′rȧ-flō′rȧs, Manuel de Pando, Marquis, and Count of Villapaterna (1792-1872). A Spanish statesman. He was born at Madrid, was sent as ambassador to London in 1834, and was ambassador at Paris in 1838-40. In 1846 he was Premier, and in 1863 again filled the same office. He was ambassador to Vienna in 1860, and was several times president of the Senate. He wrote a number of works which are of value for the political history of Spain in the nineteenth century. The most important is a *History of the First Seven Years of the Reign of Isabella II.* (1843-44).

MIRAGE, mĭ-räzh′ (Fr., from *mirer*, to gaze). A phenomenon extremely common in certain localities, and due to conditions existing in the atmosphere. As a result of a deviation of the rays of light caused by refraction and reflection, objects seen with the eye appear in unusual positions and often multiple or inverted. One cause of mirage, such as occurs in a desert, is a diminution of the density of the air near the surface of the earth, often produced by the radiation of heat from the earth, the denser stratum being thus placed *above*, instead of, as is usually the case, below the rarer. Now, rays of light from a distant object, situated in the denser medium (i.e. a little above the earth's level), coming in a direction nearly parallel to the earth's surface, meet the rarer medium at a very obtuse angle, and (see Light) instead of passing into it, they are reflected back to the dense medium, the common surface of the two media acting as a mirror. The image produced by the reflected rays will appear inverted, and below the real object, just as an image reflected in water appears when observed from a distance. If the object is a cloud or portion of sky, it will appear by the reflected rays as lying on the surface of the earth, and bearing a strong resemblance to a sheet of water; also, as the reflecting surface is irregular, and constantly varies its position, owing to the constant communication of heat to the upper stratum, the reflected image will be constantly varying, and will present the appearance of a water surface ruffled by the wind. This form of mirage is of common occurrence in the arid deserts of Lower Egypt, Persia, Turkestan, etc. In the case of mirage at sea the denser layers of air are next to the surface of the water, and the reflection takes place from the rarer atmosphere above. Consequently we have the object appearing in the air suspended and inverted. Sometimes images of objects are seen not above one another, but side by side, caused by the existence of bodies of air of different densities in proximity.

In particular states of the atmosphere reflection of a portion only of the rays takes place at the surface of the dense medium, and thus double images are formed, one by reflection, and the other by refraction—the first inverted and the second erect. The phenomena of mirage are frequently much more strange and complicated, the images being often much distorted and magnified, and in some instances occurring at a considerable distance from the object, as in the case of a tower or church seen over the sea, or a vessel over dry land, etc. The particular form of mirage known as *looming* is very frequently observed at sea, and consists in an excessive apparent elevation of the object. Consult Müller, *Lehrbuch der kosmischen Physik* (Brunswick, 1896).

MIRAMAR, mē′rȧ-mär′. An imperial palace and public pleasure resort on the Gulf of Triest, six miles northwest of Triest (q.v.).

MIRAMICHI (mĭr′ȧ-mē-shē′) **RIVER.** The second largest river in New Brunswick, Canada. It is formed by the junction of the northwest and southwest Miramichi (Map: New Brunswick, C 3). It flows, after a course of about 100 miles, into the Bay of Miramichi, a part of the Gulf of Saint Lawrence. Pine woods abounding with game line the banks of the river, which is navigable for vessels of modern size for a distance of 40 miles from its mouth. The fishing is excellent, salmon and trout abound, and there is a State fish breeding establishment on one of the tributaries.

MIRAMON, mē′rȧ-mōn′, Miguel (1832-67). A Mexican general, of French descent, born in the City of Mexico. He was educated for the army, and fought against the United States at Molino del Rey and Chapultepec. He saw much active service during the fifties, and was promoted to be a lieutenant-colonel in 1855. He was one of the leaders of the opposition to Comonfort (q.v.) in 1856, and supported Zuloaga, the representative of the clerical and reactionary party, in the movement which forced Comonfort to retire to the United States in 1858. Later in the same year he was chosen acting President by a *Junta de Notables*, but, contrary to the expectations of the junta apparently, he turned the office over to Zuloaga and assumed the conduct of the campaign against the Liberals, led by Juarez. Returning to the capital, he was again installed as acting President, exercising its duties until December, 1860, when his defeat by Juarez at Calpulalpam forced him to leave the country. He reappeared in Mexico in 1866, after the announcement that the French army was to leave the country, and offered his services to Maximilian. Raising an army in the West, he joined the Emperor at Querétaro, where he was wounded during the final struggle with the republican forces. He was tried and condemned to be shot with the Emperor on June 19, 1867. As they were lined up for the execution, Maximilian insisted that Miramón should take the place of honor in the centre, as a tribute to his bravery. For bibliography, see under Maximilian and the general works on later Mexican history.

MIRANDA, mê-rän'dȧ. A Portuguese poet. See Sá de Miranda, Francisco de.

MIRAN'DA. In Shakespeare's *Tempest*, Prospero's daughter and the lady love of Ferdinand, who was shipwrecked on the desert island on which she was brought up.

MIRANDA, mê-rän'dȧ, Francesco (1750?-1816). A Spanish-American revolutionist. He was born in Venezuela, and entered the Spanish Army, rising to the rank of captain. He resigned in order to serve with the French in the United States. He was then sent to Cuba, where he engaged in illegal trade and was obliged to take refuge in Europe. There he traveled extensively, and was well received at the Court of Russia. The French Revolution called forth his enthusiastic admiration. He served in the French Republican army, and gained the rank of major-general. Although he had some skill as a commander, the division under him met with little success. The defeat at Neerwinden (1793) was attributed largely to his treachery, and the suspicion led to his arraignment before the Revolutionary Tribunal. After the fall of the Girondists he fled to England, and endeavored in vain to induce William Pitt to aid him in an attempt to free Venezuela from the Spanish dominion. In 1803 he went to New York, where he found means to fit out two vessels and some 200 volunteers, with whom he sailed for South America in 1806. He succeeded in taking possession of one or two coast towns, but the great popular demonstration in his favor which he had expected was entirely lacking. In 1810 he organized another expedition, and took possession of Valentia, Puerto Cabello, and nearly the whole of New Granada. Miranda organized a revolutionary government, proclaimed a constitution, made himself Vice-President, and entered Carácas in triumph, in April, 1812. The members of the Government were not able to act in harmony. Miranda was taken prisoner by the opposition faction of revolutionists in July, and shortly afterwards fell into the hands of the Spanish authorities, by whom he was sent to Spain. He died in the dungeons of the Inquisition at Cadiz three years later. Consult Biggs, *History of Miranda's Attempt in South America* (London, 1809). For Miranda's career in France, consult Rojas, *Miranda dans la Révolution française* (Carácas, 1889), a collection of official documents.

MIRANDOLA, mê-rän'dô-lȧ. A town in the Province of Modena, Italy, 19 miles by rail north-northeast of the city of Modena (Map: Italy, F 3). The little town is regularly laid out, and has some extremely interesting buildings, of which the old ducal palace, the Cathedral, and the Church of Gesù are the most important. The principal industries are cattle-raising and farming. Population, in 1901 (commune), 13,731.

MIRANDOLA, Giovanni Pico della. An Italian humanist. See Pico della Mirandola.

MIRANHA, mê-rä'nyȧ. See Maranha.

MIRAT, mê-rät'. A city of British India. See Meerut.

MIRAVAL, mê'rȧ'väl', Raimon de (c.1190-1216). A Provençal poet. His poverty compelled him to subsist on the favor of the great lords at whose courts he seems to have passed most of his time. His chief patron was Raimon VI. of Toulouse, addressed in his poems by the name *Audiart*. Though living at a time when his country was in the throes of death, Raimon wrote solely of the gallantries of Court life. He died, probably, at a convent in Catalonia. Consult Andraud, *La vie et l'œuvre du troubadour Raimon de Miraval* (Paris, 1902).

MIRBACH, mēr'bäG, Julius, Graf von (1839 —). A German politician, born in Sorquitten, East Prussia. He served in the army after completing his legal studies in Königsberg, Bonn, and Berlin, and in 1865 retired to manage his estates near Sensburg. In 1874 he entered the Prussian House of Lords, and in 1878-81 and 1886-98 was a member of the Reichstag, and a prominent figure in the German Conservative Party, taking a foremost part in economic and agrarian reforms, acting as leader of the *Steuer- und Wirtschaftsreformer* (1879 sqq.), and eagerly opposing the gold standard. He was ennobled in 1888.

MIRBEL, mēr'běl', Charles François Brisseau (1776-1854). A French botanist, born in Paris. In 1800 he began a botanical course at the Athénée, and in 1803 he was made intendant of the Malmaison Gardens, where he had opportunity to continue his researches into plant life. In 1806 he was made a councilor of State at the Dutch Court, and as director of fine arts he was charged with the mission of organizing a school in Paris for Dutch artists. He was professor of culture at the Jardin des Plantes (1828), and taught his subject in the Normal School. His great contributions to structural botany are recorded in his works: *Traité d'anatomie et de physiologie végétales* (1802); *Exposition de la théorie de l'organisation végétale* (1809); *Elements de botanique et de physiologie végétale* (1815); and *Histoire naturelle des végétaux classés par familles* (18 vols., 1802-26).

MIRÉS, mê'rȧ', Jules (1809-71). A French financier and speculator. He was born at Bordeaux of Jewish parents, and commenced operations on a large scale in Paris in 1848. In company with Moïse Millaud, he began to buy up the press of Paris; he purchased the *Chemins de Fer*, and afterwards the *Conseiller du Peuple*, the *Constitutionnel*, and *Le Pays*. Swaying public opinion in this manner, he organized the *Caisse générale des chemins de fer*, or railway bank, commenced to build railroads in Spain and elsewhere, negotiated municipal and national loans, and acquired an immense fortune. During the last four years of his career his speculations amounted to 1,500,000,000 francs. Arrested for fraud in 1860, he was condemned to imprisonment, but was freed in 1862. He resumed banking operations, but people came to distrust his promises of magnificent possibilities. He was a man of infinite resources, quick to plan, daring to act, carrying out his immense *coups* by gigantic combinations, overcoming all opposition by the onset of billions and with the help of his hired journalists and politicians. He published in 1870 *Un crime judiciaire*, and carried on a lively war of pamphlets with his enemies.

MIR′FIELD. A manufacturing town in the West Riding of Yorkshire, England, eight miles east-southeast of Halifax, one of the chief railway centres in the country (Map: England, E 3). It has manufactures of woolen fabrics, carpets, and blankets. Population, in 1891, 11,707; in 1901, 11,300.

MIR′IAM. The sister of Moses and Aaron. In the triple tradition of the career of Moses (q.v.), as embodied in the Book of Exodus, Miriam appears only in the narrative of the Elohist. (See ELOHIST AND YAHWIST.) She is called a 'prophetess' and is represented as celebrating the deliverance of the people from Egypt as the leader of a female choir (Ex. xv.). Apart from this, she is mentioned again only in connection with Aaron's rebellion against Moses, in which Miriam stands on Aaron's side. She is smitten with leprosy as a punishment (Num. xii.), but after seven days' isolation (Lev. xiii. 5) is healed by Yahweh at Moses' solicitation. Her death takes place at Kadesh (Num. xx. 1). Miriam, though not expressly named, is thought to be the sister referred to in the story of Moses' infancy (Ex. ii.), who acts as a nurse and protector to him. The name may be connected with Merari, one of the sons of Levi (Ex. vi. 16), and a very plausible view is to assume that Aaron and Miriam represent priestly families, the one at Horeb, the other at Kadesh, who were joined to the early traditions of the Hebrews by virtue of reminiscences that some of the clans once followed the cult at the sanctuaries in the two places named. The association between Moses, Aaron, and Miriam once established gave rise to further elaboration which was adjusted to the general priestly narrative in the Pentateuch. The allusion in Micah vi. 4 to 'Moses, Aaron, and Miriam' as the forerunners in the redemption of Israel, is a valuable indication for the period at which the combination of the three in popular tradition and legend had taken place.

MIRIBEL, mē̇′rē̇′bĕl′, MARIE FRANÇOIS JOSEPH DE (1831-93). A French general. He was born at Montbonnot, studied at the Ecole Polytechnique and at the Military Academy of Metz, and at twenty-four was commissioned a lieutenant of artillery and sent to the Crimea. He fought in Italy in 1859 and in Mexico (1862-65); served on the international commission dealing with the use of explosive bullets; and in 1868 was appointed military attaché in Saint Petersburg. Miribel fought bravely at Champigny and Buzenval in the Franco-Prussian War; commanded a corps of artillery against the Commune; and in 1877 became chief of the general staff. His reappointment to this post in 1881 created great excitement, and he resigned after the fall of Gambetta's Ministry. In 1890 he was once more made chief of staff with greater powers than before, and showed himself an able administrator.

MIRIM, mė-rēɴ′, or LAGÕA MIRÍ. A lake or lagoon in the extreme southeastern corner of Brazil, on the boundary of Uruguay (Map: South America, D 6). It is 130 miles long and from 5 to 25 miles wide, and is separated from the Atlantic Ocean by a low sandy tract from 15 to 40 miles wide, containing several true coast lagoons. It receives a number of small rivers from the west, and, though its shores are low and marshy, it is not in direct communication with the ocean, but discharges its waters northward into the Lagõa dos Patos (q.v.). Like the latter, it was evidently formed through the cutting off by sand-bars of a large bay of the ocean. The water of Lake Mirim is fresh, and tides are not felt in it.

MIRITI (mē̇-rē′tē̇) **PALM.** See MAURITIA.

MIRKHOND, mêr-ᴋônd′, HAMAN ED DIN (1433-98). A distinguished Persian historian, born of Sayyid descent from a Bokharan family probably near Nishapur. About 1474, under the patronage of Mir Alishir, Mirkhond began his historical work, entitled *Rawẓat-uṣṣafa*, or 'Garden of Purity.' It is of great value, and, on the whole, is a very remarkable compilation, being, save for the seventh volume, which deals with the latter part of the fifteenth century, and must have been by Mirkhond's son, Khondemir (1475-1534), the work of a single man. Beginning with mythical times, the *Garden* contains biographical notices of the leading Persian notables down to 1523. The part on the early kings was translated by Shea (London, 1832); that on the Sassanids, into French by S. de Sacy (Paris, 1793); on the Samanids, into Latin by Wilken (Berlin, 1832), and into French by Defremery (Paris, 1845); on the Seljuks, by Vullers into German (Giessen, 1837); and the story of Mohammed by Rehatsek into English (London, 1893).

MIRROR (OF. *mireor*, *mirour*, Fr. *miroir*, It. *miratore*, *miradore*, from Lat. *mirari*, to look, from *mirus*, wonderful; connected with Gk. *μειδᾶν*, *meidan*, Skt. *smi*, to smile). An object having a smooth or polished reflecting surface by which virtual or real images of an object are produced. Mirrors are used largely for toilet and decorative purposes, and also in scientific apparatus and in numerous other practical devices to concentrate, scatter, or divert rays of light or heat. The action of the mirror depends on the law of reflection where it is stated that the angle of reflection must equal the angle of incidence and be in the same plane. This optical principle was well known to the ancients and was doubtless long preceded by an actual practical knowledge of the instrument. Probably for ages after the civilization of man commenced, the still waters of ponds and lakes were the only mirrors. We read in the Pentateuch of mirrors of brass being used by the Hebrews, while it is known that mirrors of bronze were in very common use among the ancient Egyptians, Greeks, and Romans, and many specimens are preserved in museums. Praxiteles taught the use of polished silver for mirrors in the year B.C. 328., and polished mirrors of obsidian or natural glass were used by the Romans.

Mirrors of glass were first made at Venice in

1300; and judging from those still in existence, they were very rude contrivances, compared with those of modern make.

It was not until 1673 that the making of mirrors was introduced into England, and the industry has since developed in Europe and America to a point where it is a very important manufacture; and mirrors can be produced of any size to which plate glass can be cast.

For many centuries mirrors were made according to the process originally introduced at Venice, by backing a sheet of glass with an amalgam of mercury and tin. The surface was overlaid with sheets of tinfoil, rubbed down smooth, and the whole covered with quicksilver, which immediately formed an amalgam with the tin. The superfluous mercury was then run off and a woolen cloth held firmly over the surface, by means of iron weights. After this pressure had been continued twenty-four hours, more or less, the weights and cloth were removed and the glass placed on a table with a movable top, which was gradually inclined until the unamalgamated quicksilver had entirely drained away, and only the surface of perfect amalgam remained adhering to the glass. This process, which was long used, was open to many objections, not least of which was its extreme unhealthfulness for the workmen. The process was also long and tedious, and at best made an unsatisfactory mirror, reflecting less than half the rays of light.

The first attempt to back the glass with silver was made by Liebig in 1836, and different solutions were proposed by other chemists, all of which produced mirrors that were satisfactory for a short time, but finally became spotted. In 1855 Pettijean patented a process which, with various modifications, is the one now in general use. The method of mirror manufacture common in America may be described as follows: The raw stock or plain plate glass reaches the factory carefully packed in cases of immense size. The glass is first thoroughly inspected and all defects marked. It then goes to the cutters' department, where it is cut into the proper sizes. Thence it is moved to the beveling department, where it is beveled and polished on rapidly revolving emery wheels of varying degrees of smoothness, the plates—some of them of enormous size—being lightly held against the wheel by the workmen. After both surfaces, including the beveled edge, have been reduced, as nearly as possible, to a condition of perfect smoothness, the glass is passed on to the silvering department. Here it must be thoroughly cleansed, and so delicate is this operation that a specially distilled water is often required for the purpose. The glass is now ready for the essential process of silvering. The nitrate of silver is dissolved in ammonia and is precipitated by a solution of tartaric acid. The glass is placed on warm tables and the solution poured over it. The heat helps the silver to precipitate and adhere to the glass. The silver back is given a coat of shellac and then of paint, which completes the process. Silvered mirrors reflect from 20 to 25 per cent. more of light than those backed with quicksilver.

The optical considerations involved in reflection will be found fully discussed together in the article on LIGHT, but brief mention may here be made of mirrors whose reflecting surfaces are other than plane. In a concave spherical mirror we have distant rays of light or heat brought to a focus and a real image form. Conversely, if a point source of light is placed at the focus of the mirror, a parallel beam of light results. The first idea is made use of in the reflecting telescope (see TELESCOPE), while the latter is employed in the searchlight (q.v.).

A *parabolic mirror* is one "in which every section through the principal axis cuts the surface in a parabola, so that rays from a light placed at the focus are all reflected parallel to the axis and, conversely, parallel rays are brought to the focus." The reflector of a locomotive headlight is thus constructed. See ABERRATION, SPHERICAL; LIGHT.

Cylindrical mirrors do not play as important a part in optics and optical instruments as those of spherical and parabolic cross-section, but their effects are sometimes interesting. By using a glass that is curved instead of flat, the reflected shape of the object will become distorted; a *concave* cylindrical mirror lengthening it at the expense of width, and a *convex* mirror producing the opposite effect.

As heat is reflected as well as light from the surface of a mirror, a concave mirror may be used to bring rays of light to a focus. In this way combustible substances may be set on fire at a distance from the reflector whence they receive their heat. The *Archimedean mirror* was made on this plan. A series of mirrors set in a concave curve concentrated the rays of light upon an enemy's ship, causing it, according to the story, to burn.

MIRROR CARP. An artificial variety of carp (q.v.) with very large scales in two or three rows along the sides of its body, which is otherwise bare.

MIRROR FOR MAGISTRATES, A. A long series of poems on incidents in English history showing the tragedies in the lives of great men. The plan was suggested by Boccaccio's *Falls of Illustrious Men* and Lydgate's *Falls of Princes*, and was devised by William Baldwin, George Ferrers, and Sackville, who wrote a general introduction called the *Induction*. It was partly printed in 1555, when it was stopped by Lord Chancellor Gardiner. It was licensed, however, in 1559, and then contained nineteen metrical biographies, beginning with Tressillian in Richard II.'s reign. New editions, with additional lives by various writers, appeared in 1563, 1574, 1578, 1587, and 1610, and a reprint of the whole by Haslewood in 1815. Some of the best-known contributors are Thomas Sackville, whose *Induction* and *Complaint of Stafford, Duke of Buckingham*, are the most valuable parts of the work; Michael Drayton, Thomas Churchyard, and John Skelton.

MIRROR OF KNIGHTHOOD, THE. A translation of a Spanish romance, *Cavallero del Febo*, the Knight of the Sun, which tells the adventures of Febo and his brother Rosiclair. It belongs in a sense to the Amadis cycle of romance, as the father of the Knight of the Sun was related to Amadis. The Spanish version was evidently the work of several, and was left unfinished. The translation of the romance into English was printed in 1578. See Dunlap's *History of Prose Fiction*.

MIRZA, mēr′zȧ (Pers. *mirzā*, contracted from *Amīr Zādah*, son of the prince). A Persian title. As a prefix preceding the surname of the individual it is a common Persian title of honor; but when annexed to the surname it designates a prince or a male of the blood royal.

MIRZAPUR, mēr′zȧ-po͞or′. The capital of a district of Benares, in the United Provinces, British India, on the right bank of the Ganges, 30 miles southwest of Benares, and 509 miles northwest of Calcutta on the East Indian Railway. (Map: India, D3). It is a well-built city; the river front is lined with a series of elegant ghats, and there are several interesting temples and handsome European residences. It is noted for its manufactures of carpets and rugs, and has numerous lac factories. Prior to the railway period it was the largest cotton and grain trading centre on the Ganges, and the converging market of north and central India. Population, in 1891, 84,130; in 1901, 79,787.

MIRZA SCHAFFY. See BODENSTEDT.

MISANTHROPE, mē′zäɴ′trōp′, LE. A comedy by Molière (1666) dealing with refined society and based on a study of character rather than on incidents. It depends for its comedy element chiefly on the constant discord in the elevated character of Alceste and the more commonplace characters of the other persons of the play. The comedy is considered Molière's masterpiece, and shows his style at its highest development.

MISCARRIAGE. In its broadest sense, a breach of legal duty. This is the signification in the fourth section of the English Statute of Frauds, and in similar statutory provisions in this country, which in order to make a person liable to answer for the debt, default, or miscarriage of another person, require special promises in writing. The term bears quite a different meaning in criminal law, being substantially synonymous with abortion (q.v.).

MISCEGENATION (from Lat. *miscere*, to mix + *genus*, race). Mixing of races; usually restricted to amalgamation of Caucasian and African races in America. The expression came into common use in discussions of negro slavery in the United States toward and after the middle of the nineteenth century, when certain publicists advocated the gradual absorption of the blacks by intermarriage with whites. The expression is seldom employed in scientific discussion of racial problems, such collocations as 'mixing of races,' 'blood-blending,' etc., taking its place. The process so denoted is of much importance; indeed, one of the primary factors of human development, as is shown by the fact that the most advanced peoples are those whose blood is most mixed. The effect of blood-blending seems to vary with the degree of diversity between the uniting races, the benefit being greatest when the races are least diverse, and the effect less beneficial or even injurious when the races are widely distinct; thus the blends of white and red (meztizo) and of red and black (zambo) are apparently better, measured by the vitality and fecundity of the progeny, than that of white and black (mulatto). The process of racial assimilation is going on in every part of the world, and with progressively increasing rapidity. Even in the United States, despite the most strenuous opposition on both national and sentimental grounds, the admixture of whites and blacks has gone so far that among the nine millions enumerated as colored in the census of 1900, the population of pure-blooded Africans is comparatively small, while the admixture of red and white races has affected a proportion of our population which may be estimated at 30 per cent. to 60 per cent. of the element reckoned as Indian. The data are too meagre to indicate the vital value of the meztizo type in the United States, though the experience of Mexico suggests that the value is high. The more general aspects of racial blending are discussed in the article MAN, SCIENCE OF.

MISCHIANZA, mĭs′kē-än′tsȧ, THE. An elaborate fête or entertainment given at Philadelphia, May 18, 1778, during the Revolutionary War, by officers of the British Army, in honor of Sir William Howe, who having been superseded in the command of the British Army in America by Sir Henry Clinton, was about to sail for England. The entertainment, which was given at Walnut Grove, the country-seat of Thomas Wharton, lasted twelve hours, and comprised a regatta, a mock tournament between the 'Knights of the Blended Rose' and the 'Knights of the Burning Mountain,' a dance and a dinner. Captain (later Major) André was prominent in planning and directing the entertainment, and wrote a detailed description, which may be found in Sargent, *Life of Major André* (last ed., New York, 1902).

MISDEMEANOR (from *mis-* + *demeanor*, from *demean*, from OF. *demener*, *deminer*, to manage, from Lat. *de*, down + *minare*, to lead, drive). The name given by English common law to every crime below the grade of felony (q.v.). By the common law, the offense of greatest enormity is treason, and the least is misdemeanor. The original distinction between felony and misdemeanor consisted in the consequences of a conviction. A party convicted of felony, if capital, forfeited both his real and personal estate; if not capital, his personal estate only. A party convicted of misdemeanor forfeited none of his property. The distinction is not kept up between the two classes of crimes by any greater severity of punishment in felony, for many misdemeanors are punished as severely as some felonies. But it has been the practice of the legislature, when creating new offenses, to say whether they are to be classed with felony or misdemeanor; and when this is done, the above incidents attach to the conviction accordingly, in the absence of legislation to the contrary.

Misdemeanor, in the United States, does not include, in its legal application, offenses against police regulations, city by-laws, and the like, though in common language and in some statutes it may extend to any misbehavior. It is evident that what is a statute felony in one State may be a misdemeanor in another, and it is therefore impossible to give a complete classification of such offenses. They may be crimes against public justice, peace, health, or trade; against personal or property rights of individuals; or may be mere attempts and solicitations.

In some States it is provided that upon acknowledgment of satisfaction by the injured party, in such cases as assault and battery or malicious mischief, the criminal proceeding shall, with the consent of the magistrate, be dropped;

a course which, obviously, would be improper in dealing with felonies.

See Felony and Law, Criminal.

MISENO, mė-zā′nō (Lat. *Misenum*), Cape. A promontory projecting into the Bay of Naples on the northwest and connected with the mainland by a narrow strip of coast, nine miles southwest of the city of Naples. On the outskirts of the promontory are the scanty ruins of the ancient city of Misenum, including the Piscina Mirabilis, a huge reservoir with a well-preserved vaulted roof, supported by pillars, and the Grotto Dragonara, a subterranean vaulted structure, of uncertain use. Misenum was made by Augustus the naval station for a division of the Roman fleet, and for that purpose a great harbor with three basins was constructed, of which the inner is now a lagoon, the Mare Morto. The town was destroyed by the Saracens, A.D. 890.

MISE OF AMIENS, ȧ′mė′äɴ′ (OF., Fr. *mise*, putting, expense, judgment, from Lat. *mittere*, to send). The name given to the decision of Louis IX. of France, delivered as arbitrator between Henry III. of England and his barons on January 23, 1264. All points in dispute were decided in favor of Henry, and the Provisions of Oxford (q.v.) were specifically annulled. See Montfort; Henry III.

MISE OF LEWES, lū′ĭs. The name given to the capitulation of Henry III. of England after the battle of Lewes, in which on May 14, 1264, the barons defeated and captured him. This treaty greatly limited the royal power, and upon it Simon of Montfort sought to establish a new constitution for England. See Montfort; Henry III.

MISÉRABLES, mė′zȧ′rȧ′bl′, Les. A noted romance by Victor Hugo, begun in 1846, but interrupted by the author's political activity. It was completed during Hugo's stay in Saint Peter's, Guernsey, and was published in 1862, the first part appearing simultaneously in Paris, Brussels, London, New York, Madrid, Berlin, Saint Petersburg, and Turin. It formed ten volumes, divided into five parts, entitled *Fantine*, *Cosette*, *Marius*, *L'idylle rue Plumet*, and *Jean Valjean*. The interest centres throughout on Jean Valjean, a fallen man who achieves his own rehabilitation after long physical and mental suffering and degradation. The leading characters, Valjean, Javert, and Gavroche, are creations of Hugo. The saintly Bishop Mynil or Bienvenu is modeled on De Miolles, Bishop of Digne; Marius represents the author's idea of himself in his youth, and the Baron Pontmercy is intended as a sketch of Hugo's father. The work embodies the fruits of long observation and study set down with keen exactness and force.

MISERERE, mĭz′ė-rē′rė (Lat., have mercy). The name, taken from its first word, of the Psalm which is the 50th in the Vulgate and the 51st in the Authorized Version; the principal one of the seven penitential Psalms, commonly understood to have been composed by David in his remorse after being rebuked by Nathan for his sin with Bathsheba. It is used on numerous penitential occasions in the Roman Catholic Church, and forms part of the service for Ash Wednesday in the Anglican Prayer-Book.

MISERERE. A projection on the under side of the seats of the stalls of mediæval churches, chapels, and other ecclesiastical buildings. They are usually ornamented with carved work, and are so shaped that when the seats proper are raised they form a support at a higher level to a person resting upon it. Aged and infirm ecclesiastics were allowed to use these during long services.

MISFEASANCE (OF. *mesfaisance*, wrong, from *mesfaire*, *mesferre*, Fr. *méfaire*, to do wrong, from *mes-*, from Lat. *minus*, less + *faire*, from Lat. *facere*, to do). Doing a lawful act in an improper or negligent manner; contrasted with malfeasance and with nonfeasance. When misfeasance results in legal damage to a person, it amounts to an actionable tort (q.v.), although the same act may be a breach of contract also, as when a common carrier injures a passenger by the negligent use of its property or improper conduct of its servants. See Tort.

MISHAWAKA, mĭsh′ȧ-wa̤′ka. A town in Saint Joseph County, Ind., four miles east of South Bend, the county-seat; on the Saint Joseph River, and on the Chicago and Grand Trunk, the Elkhart and Western, and the Lake Shore and Michigan Southern railroads (Map: Indiana, C 1). It has good water power from the river, and is noted as a manufacturing centre, the products including windmills, heavy machinery, pulleys, agricultural implements, furniture, church organs and furniture, gasoline engines and launches, paper pulp, flour, and knit felt, and felt boots and rubbers. The government is administered under a charter of 1899, which provides for a mayor, chosen every two years, and a unicameral council. The city owns and operates the water-works and electric light plant. One of the oldest cities in northern Indiana, Mishawaka was settled in 1828 and was incorporated in 1834 as "Saint Joseph Iron Works," the change to its present name being authorized by special legislative act in 1838. Population, in 1890, 3371; in 1900, 5560.

MISH′MIS. The natives of the Mishmi Hills in the valley of the Brahmaputra in Northeastern India. By language they are related to the adjacent peoples of Indo-China (Chins, Shans, Lushai, etc.). These primitive tribes are very interesting from a sociological point of view. Among them the custom that the favorite child (without respect to age) inherits prevails. The marriage customs are also peculiar. Consult: Cooper, *The Mishmee Hills* (London, 1873); Dalton, *Descriptive Ethnology of Bengal* (Calcutta, 1872).

MISH′NA (Heb., explanation, from *shānah*, to learn). The body of the 'oral law,' or the juridico-political, civil, and religious code of the Jews. As such it forms a kind of complement to the Pentateuchal codes, which it explains, amplifies, and immutably fixes in accordance with traditional usage, enforced by the application of the peculiar exegetical methods developed in the rabbinical schools of Babylonia and Palestine. The Mishnaic laws were subsequently submitted to a process of exposition similar to that which the biblical enactments underwent, and hence there arose, as a supplement to the Mishna, the Gemara (q.v.), embodying the discussions on the Mishna by the rabbis of Babylonia and Palestine from the third to the sixth century, when the Mishna and the Gemara were brought together in a final compilation known as the Talmud. The Mishna, to which again there are 'apocryphal' supplements known as Toseftas (additions) and Baraithas (extras), was finally redacted, after some earlier incomplete collections by Rabbi Jehudah, called Hanasi (c.200 A.D.), at Tiberias. It is mostly written in pure Hebrew, and is divided into six portions (Sedarim): (1) Zeraim (seeds), on benedictions, agriculture, tithes, etc.; (2) Moed (feast), on the Sabbath, festivals, and fasts; (3) Nashim (women), on marriage, divorce, etc. (embracing also the laws on the Nazirship and vows; (4) Nezikin (damages), chiefly civil and penal laws (also containing the ethical treatise Aboth); (5) Kodashim (sacred things), sacrifices, etc.; description of the Temple of Jerusalem, etc.; (6) Teharoth (purifications) on pure and impure things and persons. (See further TALMUD.) An English translation of the Mishna has been published by J. Barclay (London, 1878).

MISILMERI, mē'zēl-mā'rē. A town in the Province of Palermo, Sicily, 10 miles south of Palermo (Map: Italy, H 10). The castle, situated on a hill overlooking the town, commands a magnificent view of the surrounding country. The inhabitants are chiefly engaged in agriculture. Population, in 1901 (commune), 12,819.

MISIONES, mē'sē-ō'nās. A territory of Argentina, situated at the northeastern end of the republic, between Paraguay and Brazil, and bounded on the southwest by the Department of Corrientes (Map: Argentina, G 9). Its area is estimated at 20,000 square miles. It is watered by numerous small affluents of the Paraná and the Uruguay, and is very densely wooded, only a small portion of its area being under cultivation. Practically the only products are *yerba maté*, or Paraguay tea, and cabinet woods, though sugar and tobacco are being more and more cultivated. In the seventeenth century the Jesuits planted in and around the present territory over thirty missions. With the expulsion of the Jesuits their missions fell into decay. The present population of the territory is a little over 33,000. The chief town is Posadas on the Paraná, with a population of about 3000.

MISKOLCZ, mĭsh'kōlts. The capital of the County of Borsod, Hungary, situated in the valley of the Szinva, 113 miles by rail northeast of Budapest (Map: Hungary, G 2). It has a thirteenth-century late Gothic church, a Minorite convent, a Protestant gymnasium and two lower gymnasia, a fine hospital, and a Hungarian theatre. It is lighted by electricity and has a fine municipal bath. The trade in wine and agricultural products is considerable. The local manufactures consist of flour, pottery, porcelain and majolica wares, and machinery. Population, in 1890, 32,288; in 1900, 43,096, chiefly Protestant Magyars.

MISNOMER (OF. *mesnomer*, *mesnommer*, dialectic Fr. *ménomer*, misname, from *mes-*, from Lat. *minus*, less + *nomer*, name, from Lat. *nominare*, to name, from *nomen*, name). An error in naming a person in a pleading, deed, or other written instrument. Under the common-law rules of pleading, a party intended as the defendant in an action can take advantage of a mistake in designating him by an incorrect name by a plea in abatement which simply alleges the error and states his true name. However, in England and the common-law jurisdictions in the United States this defect may now be cured by amendment if the person so served appears in the action, even though he pleads the misnomer. Where a person is served with a process intended for him but not designating him by his correct name, he may disregard it, and a valid judgment cannot be entered against him. Under modern codes of procedure the same rules apply, except that if a person is served with a summons incorrectly naming him, and he desires to appear and object, he must make a motion to set aside the service on the ground of mistake. In such a case the plaintiff will be allowed to amend his summons and complaint, usually upon terms, such as the payment of costs. The term misnomer is less frequently but correctly applied to a mistake in a name in written instruments other than pleadings. See INTERPRETATION; EQUITY; MISTAKE; NAMES; PLEADING; WILLS, etc.

MISPICK'EL (Ger.). See ARSENOPYRITE.

MISPRISION (OF. *mesprision*, *misprison*, mistake, from *mesprendre*, to mistake, from *mes-*, from Lat. *minus*, less + *prendre*, from Lat. *prendere*, *prehendere*, to take). In its general sense, a crime under the degree of a capital offense, but graver than an ordinary misdemeanor (q.v.). In the early English law it was more frequently employed in a negative or passive sense, to describe the omission to perform some important legal duty, as concealment of the treason of others. It also applied to certain positive acts in the nature of contempts against the dignity and peace of the King and his officers. Misprision of treason was the most serious offense to which the term applied, and consisted in the concealment of any knowledge which a person might have of treasonable acts or utterances against the King, and did not necessarily imply that the person was himself otherwise implicated or involved in the crime. It was formerly punishable with forfeiture of goods and imprisonment for life, but by statute forfeiture of goods has been abolished, and penal servitude for life remains the statutory penalty. Misprision of felony is concealment of a felony by one who did not participate in its commission by act or encouragement, but who has learned of it in some way. It is still an offense in the English law, but is rarely prosecuted. The various acts and omissions, other than the above, which were formerly included in the rather vague term misprision, have been mostly classified with the crimes with which they were associated, under the name of accessory acts.

The term misprision is seldom employed in the United States except in regard to treason, and by an act of Congress misprision of treason is punishable by a fine not exceeding $1000, and imprisonment not exceeding seven years. See ACCESSORY; CRIME; SUBORNATION.

MISREPRESENTATION. An untrue representation, by words or by conduct, which induces another to act to his injury. When deliberately or recklessly made by one party to a business transaction concerning a matter of fact and relied on by the other party to his damage, it amounts to fraud (q.v.), and has been dealt with fully under that heading and the heading of deceit (q.v.). A false representation, if made by an honest mistake, never subjects the maker to an action in tort. Whether it will afford the party to whom it is made a ground for relief of any kind depends upon the circumstances of the case.

As a rule, an innocent misrepresentation will not affect the validity of a contract in connection with which it is made, unless it was the very basis of the contract or one of its material terms.

In certain classes of contracts, notably those of marine and fire insurance (q.v.), any misrepresentation or concealment of a material fact, however innocent, renders them void. This is due largely to the fact that such contracts have come into English law from the law merchant, and that early mercantile usage put an absolute legal duty on the insurer to state correctly all facts relating to the thing insured, which would ordinarily affect the insurer's decision in taking the risk. Courts of equity deal somewhat differently with innocent misrepresentation from courts of common law. They will generally refuse a decree for specific performance in favor of one whose claim rests upon a misrepresentation, although it is an honest one; and in some cases they grant a rescission of a contract induced by such statements when a court of law would not. Consult: Anson, *Principles of the Law of Contract* (Oxford, 1900); Burdick, *The Essentials of Business Law* (New York, 1902); Kerr, *A Treatise on the Law of Fraud and Mistake* (London, 1902).

MISRULE, Lord of. A mock dignitary who presided over the Christmas revels of the Middle Ages. He was assisted by a staff of from twenty to sixty officials, and furnished with musicians, dragons, hobby-horses, and other paraphernalia of fun. In Scotland he was sometimes known as the Abbot of Unreason, in France as l'Abbé de Liesse. See Abbot of Joy.

MISSAL (ML. *missale*, from *missalis*, relating to the mass, from *missa*, mass). The book which contains the prayers, lessons, and rubrics of the mass in the Roman Catholic Church. Until the Middle Ages the various parts of the service were distributed in separate books, according to the part taken by the assistants; the parts which the celebrant alone recited in the mass and other sacraments were contained in the *Liber Sacramentorum*, or sacramentary. But when low masses became more frequent, and the celebrant had to say practically the whole service, the parts were collected into one book called *Missale Plenarium*. These complete missals have been in use since the sixth century. By the twelfth, the Roman liturgy was in use generally throughout Western Europe; but a number of provinces and dioceses had their own missals. The disadvantages of this diversity in liturgical use caused numerous requests to be made to the Council of Trent for a reform in the matter. The Council appointed a commission on the subject in 1562, and as they had not concluded their labors by the last session, left the decision in the hands of the Pope. The commissioners, among whom was Thomas Goldwell, Bishop of Saint Asaph in Wales, were not instructed to compile a new missal, but by examination of ancient manuscripts to reconstruct the Roman missal according to the rites and customs of the Fathers. Pius V. authorized the missal which was the result of their work by the bull *Quo primum* of 1570, commanding its universal use in places which could not show a prescription of 200 years for their local uses. Thus the older Orders, such as the Carthusians and Dominicans, preserved their traditional rites; and the Ambrosian missal held its ground in the Diocese of Milan. Further revisions took place under Clement VIII. in 1604 and Urban VIII. in 1634; later revisions, as by Leo XIII. in 1884 and 1898, have touched merely matters of detail, principally in the rubrics. Besides these and the tables which are in the beginning of the book, it includes the proper of the seasons, i.e. the service for the Sundays and greater festivals; the proper of saints, arranged in the order of the civil calendar from Saint Andrew's Day, which regulates the beginning of Advent and thus of the ecclesiastical year; and the common of saints, the services for those days which have no special mass. The central and invariable parts, known as the *Ordo* and *Canon Missæ*, come before the service for Easter Day. The older local missals, especially the French and English, are of great interest to liturgical students. No new attempts have been made to construct such books in the Catholic Church except by some French bishops under Jansenist influence about the end of the seventeenth century; these held their own in certain places even as late as the middle of the nineteenth century, when they were all laid aside, largely through the influence of the celebrated scholar Dom Guéranger. Consult authorities referred to under Liturgy; and for the old English missals, Maskell, *The Ancient Liturgy of the Church of England, according to the use of Sarum, York, Hereford, and Bangor* (3d ed., Oxford, 1882). See also Mass.

MISSI (Lat., those sent). Officials sent out by the Frankish kings for special purposes. Under Charles the Great the *missi dominici* were the Emperor's special representatives. The Empire was divided into a number of districts; into each district each year two *missi*, one a lay noble, the other an officer of the Church, were sent to hold court, hear complaints, redress grievances, and make a special report to the Emperor. By this means Charles sought to control the counts and to centralize the government. The *enquêteurs*, employed by Saint Louis, had similar functions. Consult Adams, *Civilization During the Middle Ages* (New York, 1894).

MISSING LINK. A term used to designate the stage assumed to intervene in evolution between the ape and man, and in a more general sense any hypothetical form intermediate between two actual forms of life.

MISSION (Lat. *missio*, a sending, from *mittere*, to send). In the singular, a term used by Roman Catholics and Anglicans to designate a series of special services lasting usually for at least a week, intended to call sinners to repentance, and to deepen the spiritual life of the faithful; somewhat analogous to what is known as a revival among Protestants. In the Roman Catholic Church such work was constantly carried on by some of the most famous saints, such as Francis of Assisi, Dominic, Carlo Borromeo, Francis de Sales, Vincent de Paul, and Alfonso Liguori. The two last especially founded their congregations (see Lazarists; Redemptorists) for such a purpose. In modern times the means employed and the order of exercises have become more systematic. Fervent preaching by the missioners, who are usually members of some religious order, is the salient feature; it deals largely with sin, repentance, death, judgment, heaven and hell, and its purpose is to bring the hearers to a devout reception of the sacraments and an earnest Christian life. It usually closes with a solemn service of renewal of baptismal vows, thanksgiving, and consecration, and with the proclamation of a special indulgence. In the last third of the nineteenth century similar missions, presenting no distinctive feature of their own, have been held with increasing frequency in the Anglican communion, especially in High Church parishes.

MISSIONARY RIDGE, BATTLE OF. See CHATTANOOGA, BATTLE OF.

MISSION INDIANS. A collective term for the surviving remnants of the tribes civilized and Christianized by the efforts of the Spanish Franciscan missionaries in southern California in the latter part of the eighteenth century. They were originally of many various dialects and stocks, chiefly Shoshonean and Yuman, roving over the desert and mountain region stretching from the lower Colorado River to the Pacific, and in almost the lowest stage of culture. By the heroic and persistent labor of Father Junípero Serra and his successors, beginning in 1776, they were gathered into civilized communities, where they supported themselves by farming and simple mechanical arts, and under the kindly supervision of the fathers, reared those magnificent mission structures which are the glory of old California. For half a century the missions grew and flourished, until in 1831 they contained 19,000 civilized Indians, but with the overthrow of the Spanish power by the Mexican revolutionary government came oppression, spoliation, and finally confiscation and destruction in the period from 1835 to 1840. The missionaries were banished, the missions plundered and left to fall into ruin, and the Indians driven into the desert and the mountains. Under the later American rule the remnants of the mission Indians continued to be regarded and treated as outcasts until, chiefly by the endeavor of Helen Hunt Jackson (q.v.), public attention was so forcibly directed to their neglected and unfortunate condition that the Government took steps for their relief by setting aside some small reservations for their occupancy and appointing an agent to look after their affairs, together with a good school equipment. Since then some progress has been made toward bringing them up to the standard to which they had attained under the mission system more than a century ago. The two great barriers in the way are the uncertain tenure of their lands and the monopoly of the water supply by white claimants. At present they occupy 32 small reservations, aggregating altogether only 180,000 acres. The total population is 3000, the largest settlements being Torres, 520; Morongo, 290; Potrero, 225; Mesa Grande, 200; Temecula, 190. They are described as industrious and good workers among the whites during the labor season, but strongly given to drink and improvident of the future, much of which disposition their agent attributes to discouragement and bad surroundings.

MISSIONS, CHRISTIAN. The term Missions as used in this article signifies Christian missions among the peoples of non-Christian countries. Christian missions proceed from the example and precepts of Jesus Christ, from appreciation of His teachings as essential to the world, and from the natural impulse of His followers to pass on to others that which has benefited themselves. The object of such missions is to propagate the Christian religion; that is to say, to make Jesus known to those who do not know Him, and to persuade them to admit Him to the control of their life. The history of missions may be divided into three periods: (1) The Early Period, embracing the first seven centuries of our era, until the rise of Islam. In this period missionary activity was generally unorganized and individual. (2) The Middle Period, including nine centuries, from the beginning of the eighth to the end of the sixteenth century. Here the Church as an organization originated and directed foreign missionary activity. (3) The Modern Period, from the beginning of the seventeenth century until the present time. In this period occurred the rise of Protestant Foreign Missions, chiefly conducted by voluntary societies.

I. THE EARLY PERIOD.

The energy of the Apostles in winning men to believe in Jesus Christ is a characteristic feature of the New Testament narrative of the beginnings of Christian history. Early traditions give ground for belief that their missionary operations were extended. Yet excepting in the case of Paul and his companions details are meagre. The explanation of the rapid spread of Christianity seems to be that individual believers taught it wherever they went, whether for business, for safety from enemies, or as slaves to heathen masters. Great importance was attached also to translating the Bible into the language of every people at this period. Examples of this automatic spread of Christianity may be seen in its appearance in Antioch before any Apostle went there, its entrance into Italy before Paul's visits, into Britain by way of Gaul from Smyrna during the second century, along the ordinary routes of trade, and into the bivouacs of the Goths in the third century through captives taken in war. By the time that Constantine the Great, early in the fourth century, came in contact with Christianity in Western Europe, shrewdly championing it in his struggle for supremacy, groups of Christians were found in all parts of the Roman Empire, from Britain to Persia. Christians formed but a small percentage of the population. But they had a high ideal and the energy of aspiration. This produced unflagging activity in missions in the West and in the East. The monasteries now performed great services for religious culture in out-of-the-way places. In the fifth century the centre of missionary initiative for the West seems to have been in Central Gaul. Thence bishops went over into Britain to help the Christians settle doctrinal difficulties, and thence Patrick took his new-found knowledge into Ireland. For the East at the same time the centre of missions seems to have been in Mesopotamia, at places like Edessa and Nisibis, with a long chain of advance posts reaching into Central Asia and India, and with a training school at Samarkand. Toward the north at the same period Ulfilas (q.v.) went on a mission to his heathen kin in the region of the Danube, giving them an alphabet and a Bible in their own tongue. In the sixth century the initiative in the West was from the British Islands eastward and from France northward. Desire to teach Christ brought Columba from Ireland to Iona, which became a wonderful centre of Christian culture and of missionary zeal in behalf of Scotland, North Britain, and Central Europe. As to the East, the line of foreign missionary advance was among the Tatars and in China, and was carried on by Nestorians in relations with the Church in Mesopotamia. At the very end of the sixth century the beginning of a missionary policy in the Church as an organization appeared in the dispatch of Augustine and his helpers from Rome to England, where the Saxon invasion had nearly crushed out Christianity. Augustine's mission from the Pope was to evangelize the pagans and to win the assent of the English Christians to Roman ecclesiastical control. The method of operation of these independent missions was an adaptation of the monastic system which found vogue in the East in the third century. A band of Christians under a leader would form a settlement in a wild and savage region, where they labored for their own support. By kindness some of the barbarians would be drawn to settle near the monastery. After the favor of emperors began to give the Church numerical preponderance, power, and wealth, these gains led to spiritual loss, and missions were left to the chance ability of simple-minded believers in remote regions. At the beginning of the seventh century Christianity was still an Oriental religion. In Europe its northern bounds were, in general, marked by the Danube and the Alps, although during the century missionaries made ineffectual attempts at a lodgment in Denmark, and Columban, going forth from Iona with his associates, began a fiery and successful propaganda among the barbarians of Central Europe. The narrow limits of European Christendom at this time should be borne in mind if we would realize the full meaning to the Christian Church of the Mohammedan irruption. The Eastern Church had one momentous mission to its credit in the ninth century in its dispatch of Cyril and Methodius to endow the Slav races with knowledge of Jesus Christ and with a translation of the Scriptures. In the far East the Nestorians also continued their operations until the Tatars finally cast in their lot with Islam, and Tamerlane in the fourteenth century destroyed the last vestiges of the Central Asian Church. But with regard to the Church in general, from the end of the seventh century onward for nine hundred years the only Christian foreign missions were remote from the touch of the Mohammedan power, and belonged to the Western or Latin section of the Church.

II. THE MIDDLE PERIOD.

(1) In Germany. The wanderings of the Germanic nations and the inroads of the Huns had destroyed along the Rhine and the Danube the flourishing Christian communities of the fifth century. It was only after the rise of the Frankish State that efforts were made to restore the former condition of Christianity and to spread its influence over all Central and Northern Europe. From the conversion of the Bavarians to that of the Saxons (500-800) stretches a period filled with spiritual heroism on the one side and with tenacious resistance on the other. The missionaries are mostly Irishmen in the first half of the period, Anglo-Saxons in the other. The memory of the famous Saint Severin (died 482) worked favorably in Bavaria; early in the sixth century the royal family of the Agilulfings was Catholic. Irish missionaries worked in the land throughout the seventh and eighth centuries. The Frankfort saints Rutpert, Emmeran, and Corbinian continued and perfected their labors. The Irishman Saint Gall (Callech) was the apostle of Swabia and Helvetia; from his monastery by Lake Constance went out the missionaries of these lands. At the same time his superior and long-time companion, Columban (died 615), converted the German Lombards of Italy to the Catholic faith. Southern Germany owes the knowledge of the Christian faith to other Irish missionaries, Saint Fridolin, once abbot at Poitiers and then founder of the island abbey of Säckingen; Saint Trindpert, founder of the abbey of that name in the Breisgau; Saint Pirmin (died 753), founder of Reichenau, Murbach, and Hornbach. The Irishman Saint Kilian (died 689), with his companions Coloman and Totnan, evangelized Thuringia, and founded the See of Würzburg. Contemporaneously, Saint Willibrord came from the monastic schools of Ireland, to preach the faith to the fierce Frisians, and to found the Archbishopric of Utrecht, with the authorization of Pope Sergius I. (695). Before Willibrord, there had worked along the Rhine and the Moselle the holy man Goar in the sixth century, and among the Frisians Saint Amand of Maestricht (660) and the goldsmith Saint Eloi (Eligius) of Noyon (659). All of these men came under the influence of the Columban monastery of Luxeuil, and were filled with missionary zeal.

The real apostle and founder of German Christendom is the Anglo-Saxon Wynfrith, or Boniface. In 716 he attempted to evangelize the Frisians. In 719 he received at Rome from Gregory II. (715-731) the authority to preach among the degenerate Christians and the pagan inhabitants of Germany. In turn he labored throughout Bavaria, Hesse, and Thuringia, and along the Rhine, founded the oldest and principal sees of those regions, established monasteries like Fulda, and gathered about himself some of the noblest spirits of the age. The Carolingians were always friendly and helpful. In union with them he held, between 740 and 750, four national synods that laid the basis of German mediæval Christian life. He suffered martyrdom June 5, 755 (754 ?), at the hands of heathen Germans, near Dockum in West Friesland, whither he had gone with fifty-two companions to confirm some newly baptized converts. The solid mass of Saxon paganism had been attacked by the two Ewalds, surnamed the Black and the White, like Willibrord, disciples of the Irish monastic schools. They sealed their hopes with their blood in 695. The long wars of the Carolingians with the Saxons soon took on a religious character. Compulsory baptism and swift apostasy were the rule throughout the eighth century. A cruel slaughter of 4500 Saxons at Verden in 782 stains the fair fame of Charlemagne. The conquered Saxons were exiled, transplanted, oppressed by laws of Draconian severity; in 785 the dauntless chiefs, Witikind and Alboin, finally yielded, and by 804 the land was entirely Christianized. Missionaries soon overran Saxony, and by their virtue, beneficence, organizing skill, and their monasteries, soon established the Christian faith on a firm basis. The Abbey of Corvei (822) was soon the centre of their activity.

(2) Among the Northern Nations. Another period of three hundred years (800-1100) was necessary for the winning of the northernmost Germanic tribes. In 826 political necessity made Harald, King of Denmark, a suitor at the Court of the Carolingians. On his return he took with him Ansgar, a monk of Corvei, eventually the apostle of the North. His chief deeds were the establishment of the See of Hamburg-Bremen (832), the partial evangelization of Sweden (850), the building of churches, schools, monasteries, and hospitals throughout his own vast diocese. He died in 865, and is buried at Bremen. The devastations of the pagan Northmen and the onslaught of the Hungarians withheld from the northern missions the political influence of Christian Germany; after the battle of Merseburg (933) the conversion of Denmark went on, not without interruption, from the See of Saint Ansgar. The Danish conquests in England helped this process; in 1017 both kingdoms were ruled by Canute the Great; in 1026 he was a pilgrim to Rome, whence he wrote to his people a noble Christian letter. In 1086 another Canute was enrolled among the Christian saints. In 1104 Lund was made a metropolitan see. Sweden was slowly won over to the faith of Jesus Christ, chiefly in the course of the eleventh century, and with many a reaction to pagan life and belief. In 1162 Upsala became the Christian metropolis of Sweden. Long ere this Norway possessed a metropolitan see at Trondhjem (1035). The land was thoroughly Christian before Denmark and Sweden, although it received the visits of missionaries after both of these kingdoms. Haakon the Good (c.934-960) was an earnest Christian king, but another did not arise until Olaf Tryggvason (995-1000). Olaf Haraldson (1016-28) sent German and English priests through the Kingdom; his overstern and cruel policy created a reaction, but the still harder yoke of Denmark favored the cause of Christianity. From 1035 Norway may be styled a Christian kingdom. Iceland was temporarily inhabited by Irish monks before the year 800; their books, altar-plates, and staves were found by the first Norwegian settlers. After 981 Christianity penetrated the masses of the colonists, and by 1016 they had accepted the Gospel. Under its impulse this gifted little people became a living source of learning and piety. The scattered islands of the northern seas were held during the ninth century in the grip of the pagan Vikings, but in the course of the tenth century were made Christian. Before the epoch of the Danish invasions of Ireland, monks of the Irish nation had visited these islands, chiefly out of ascetic fervor and the desire to lead hermit lives. They were the first to bring Christianity to the dwellers of the Orkneys, the Hebrides, and the Shetland and Faroe islands. In the twelfth century Greenland was evangelized, and the See of Gardor established on the coast; the land was inhabited by Christians until the fifteenth century.

(3) Conversion of Eastern Europe. Slavs and Magyars. As the Slavs had been, since the sixth century, a serious menace to both the East and the West, so the efforts to Christianize them went out from East and West. The Irishman Saint Columban, of Luxeuil and Bobbio, had once hoped to begin the work; it was certainly set on foot from the German See of Salzburg in Bavaria, and a beginning made (797) with the Avars, who at this time disappear from history. In the course of the ninth century the principal Slavic principality was that centred along the river Morava, hence called Moravia. Both Germans and Byzantines sought to reserve this sphere of influence and action for themselves. In 862 the Byzantine Emperor, Michael III., was able to send two missionaries to the Moravians. They were brothers, known to history as Saint Cyril (originally Constantine) and Saint Methodius. They introduced among the Slavs an alphabet, translated the Scriptures, and wrote for them a Slavic liturgy. To these two men the Slavic world owes its first permanent elevation from idolatry, ignorance, and serious moral corruption. Moravia's chief see, Olmütz, dates from 1063.

Bohemia was fully opened to Christian influences only about 871, when its King, Borzivoi, gave his daughter in marriage to Svatopluk of Moravia, and together with his Queen, Ludmilla, was baptized. Of his grandsons, Boleslas cruelly persecuted the Christian faith, while Wenceslas remained faithful; the latter fell by the hand of his brother (938), and is honored as a martyr. In the long reign of the second Boleslas (967-999) Christianity triumphed. The See of Prague was created in 973. The second bishop, Saint Adalbert, went to preach the Gospel among the heathen Prussians, and was put to death by them.

Poland received the missionaries of Christianity through the marriage (965) of its Duke Miecislas with the Christian daughter of Boleslas II. of Bohemia, who soon won over her husband to the faith. The See of Posen was established in 968. From 992 to 1025, Boleslas Chrobry, son of Miecislas, completed the conversion of his country, by the founding of the Archiepiscopal See of Gnesen (1000), to which were made subject Posen, Kolberg, Breslau, and Cracow.

The Wends were a Slavic race, established in Holstein, Mecklenburg, between the Elbe and the Oder, the Oder and the Vistula, and elsewhere in Saxony and Lusatia. They were made Christians by the creation of the border marches in the time of Henry I. and Otho I. (919-973) and the foundation of the sees of Havelberg, Oldenburg, Brandenburg, Magdeburg, and others (946-968). The Wend Prince, Gottschalk, was after 1045 a zealous protector of Christianity, but was treacherously slain in 1066 by a heathen Wend. In the twelfth century the Wends fell under German sway, and many German Christian colonists took their lands and houses. The Wends of Pomerania owe their conversion to the Polish Duke Boleslas III. (1122), and to his agent, Bishop Otho of Bamberg (1124-28). Kamin, Stettin, Julin, were made Christian cities, and Saxon colonists entered the territory; but only in 1168 were the last remnants of heathenism abolished on the island of Rügen.

The Scandinavian Rurik founded the Russian State in 862; soon Christian missionaries from Constantinople found their way thither. The widowed Princess Olga was baptized at Constantinople in 955, and thenceforward labored zealously for the conversion of her people. Her grandson, Vladimir the Apostolic (died 1015), completed the work. The Metropolitan See of Kiev was established by him and made the centre of the religious and educational life of Russia. The primacy was transferred to Moscow in 1328, which in turn was subject to the jurisdiction of

Constantinople until 1589, when Jeremias II., the patriarch of the latter see, was induced to install the Patriarchate of Moscow.

Bulgaria became Christian, 864-866. The Khan, Bogoris, first introduced Greek missionaries, and then appealed to Pope Nicholas I. The latter sent him the famous "Replies to the Consultations of the Bulgarians." Nevertheless, Bulgaria soon came under the sole jurisdiction of Constantinople; the land was subjected by the Byzantine emperors, and in 1388-93 the new Bulgarian realm was conquered by the Turks.

The heathen Magyars had taken possession after the end of the ninth century of what is now Hungary. All attempts at their conversion were fruitless until the victory of Otho the Great of Germany on the Lech, in 955. Duke Gejza (972-997), married to a Christian princess of his own race, asked Otho II. for missionaries; the bishops Pilgrim of Passau and Wolfgang of Regensburg were sent to him. Gejza's son, Saint Stephen of Hungary (997-1038), was married to Gisela, the daughter of Henry II. He created the hierarchical system of Hungary, by founding (1000) the Archiepiscopal See of Gran with ten suffragan sees, as well as many Benedictine monasteries. Pope Sylvester II. (Gerbert) gave him the title of 'Apostolic' King, and is said to have sent him a golden cross and crown (Crown of Saint Stephen).

(4) Missions in Northeastern Europe. Political Conversions. The power of Christendom was now too great to be longer resisted by the outlying heathen peoples. From Sweden went out at the same time the political subjection of Finland, and its conversion to Christianity. It was only in 1293 that the work could be looked on as accomplished. Esthonia, Livonia, and Courland saw Christian missionaries during the twelfth and thirteenth centuries follow in the tracks of the German merchants of Bremen and Lübeck. Here the heathen was fierce and reluctant; fortified monasteries protected the German Christians and the newly converted, until, in 1202, was founded the military order of the Brothers of the Sword (*Schwertbrüder*) or Knights Swordbearers. Its founder, Bishop Albert of Buxhöwden, built the city of Riga and set up therein his see. In 1237 the Brothers of the Sword were united with the Teutonic Knights of Jerusalem, and for sixty years both orders carried on an unceasing warfare against the pagan inhabitants of the Baltic shore. Their most difficult conquest was that of the Prussians. This most stubborn of the Northern heathen-folk gave way only before the organized and experienced knights of German Christendom and the moral and financial support of the Empire. In 1243 the Prussian territory was divided into four sees—Kulm, Pomerania, Ermland, Samland; in 1255 they were placed under the jurisdiction of the Archiepiscopal See of Riga. The Lithuanians, temporarily converted in 1252, relapsed into heathenism. Their Grand Prince, Jagello, married in 1386 the Polish Queen Hedwig, by which act Poland and Lithuania were shortly made one politically. Jagello was baptized, assuming the title of Ladislas II. Vilna was made an episcopal see, and at a diet held there Christianity was declared the State religion.

(5) Missions in the Sixteenth Century. (a) In the Orient. The Portuguese sailors and the merchants were always accompanied by missionaries. As early as 1533 Goa was made an episcopal see. The unworthy conduct of the Europeans was no small obstacle for the missionaries when confronted with such religious systems as those of the Brahmans, Buddhists, and Mohammedans. At the request of the King of Portugal, Saint Ignatius of Loyola destined for the East Indies in 1540 Rodriguez and Saint Francis Xavier. The latter actually sailed in 1541 from Lisbon, and after some time spent in evangelizing the Europeans of Goa, turned his attention to the heathen of Southern India. He preached in the Kingdom of Travancore, and went thence to Malacca and the Moluccas, meeting everywhere with great success. Soon his zeal urged him to undertake the conversion of Japan, where he spent two years (1549-51). In the hope of hastening the conversion of Japan, he turned his attention next to China, but died on the way on the island of Sancian, December 3, 1552. His labors in the East Indies were continued by his Jesuit brethren, especially by Robert Nobili, after 1606. The latter made himself one with the Indian aristocracy, accepted its prejudices, habits, and customs, as far as seemed consistent with Christianity, and enjoyed a large measure of success.

The Nestorian missions in China during the seventh and eighth centuries, and the Franciscan missions of the thirteenth and fourteenth, had no lasting results. In 1583 the Jesuits obtained entrance, and for over a century exercised a moral supremacy in the Flowery Kingdom. Matteo Ricci (1552-1610) rose to the highest official position. His teaching, surveys, and maps were the admiration of all China.

Adam Schall of Cologne (1622) and Ferdinand Verbiest of the Low Countries (1659) won great fame for their Order as successors of Ricci. Under cover of their reputation for scholarship, they labored zealously for the spread of Christianity, quite in the spirit and manner of Robert Nobili. The opposition to this system of 'accommodation' grew so strong that it was condemned in 1704, and the condemnation was confirmed forty years later (1744) by the Holy See. The Christian communities of Japan were grievously persecuted in 1587 and again from 1596 to 1637, when the Empire was strictly closed against all foreigners, with the exception of Dutch traders.

(b) In America. The original Spanish conquistadores were very inhuman toward all nations with whom they came in contact. The first Catholic priest ordained in the New World was a young Spanish lawyer, Bartolomeo de las Casas. He soon gave himself entirely to the work of saving the Indians from their barbarous oppressors; and before his death, in 1566, he had compelled the legislation which saved the remnants of the aboriginal tribes, at least on the mainland. Similarly, Saint Peter Claver (died 1654) was tireless in the service of the unfortunate negro slaves of South America. Throughout the sixteenth century, Dominicans, Franciscans, Capuchins, and Augustinians labored with boundless zeal in all the Spanish colonies. The Jesuits were already in Brazil (1549), and soon had their missionaries in all parts of South America. The famous "Reductions of Paraguay" are perhaps their greatest triumph. One of the most picturesque figures of that period is the Limerick Irishman, Thomas Filde, a Jesuit, who died at Asunción in 1626, after spending forty years among the savages of Paraguay. In North

America the French missionaries followed the flag of France, and worked unremittingly after 1611 throughout all the dominions over which it floats. In 1634 Jesuit missionaries accompanied the first colonists of Maryland.

III. THE MODERN PERIOD.

A. Protestant Foreign Missions: (1) State Missionary Enterprises. At the time of the Reformation, Christendom was still beleaguered by armed Islam. Up to the very end of the seventeenth century a great part of Hungary was in the possession of Turkey, and in 1683 Vienna barely escaped falling into the hands of the Mussulmans. Missionary access to Eastern North Africa and Western Asia was barred by the sword of Islam. At the same time transmarine heathen lands were so distant that Imperial resources alone could reach them. Such resources were all in the hands of the great Roman Catholic powers. The conditions under which the Reformation developed left to the reformers no place for planning foreign missionary enterprise. Luther and his associates appreciated the essentially missionary quality of the Church of Christ, but limited its sphere of action to their own surroundings. They deemed that in any case the Church was helpless regarding foreign missions, since such vast undertakings could be dealt with by governments alone.

The first Protestant foreign missions, then, were State enterprises. In 1555 Admiral Coligny induced the Council of Geneva to send missionaries to Brazil in connection with a Huguenot colony. But both mission and colony soon ended in bloody disaster. In 1559 Gustavus Vasa of Sweden sent missionaries to labor for the pagan Lapps of his own dominions. But this mission came to naught. After the conquest by Holland of several Portuguese colonies in the East Indies, the Dutch East India Company was formed in 1602, and the governors of the various islands were ordered to do all in their power to Christianize the natives. Clergymen were sent out to Ceylon, Formosa, and the Malay Archipelago as missionary chaplains, whose duty included the Christian instruction of natives. But the governors of the colonies obeyed their orders literally, and 'Christianized' the natives without waiting for the missionaries to instruct them. Consequently, when Dutch government came to an end in Ceylon, some 300,000 officially converted natives returned to their former faith. In Formosa Christianity was extinguished by the Chinese, when they drove the Dutch from the island in 1661. In Java, however, the missionary chaplains slowly translated the Scriptures into Malayan. The second of modern Bible translations into heathen languages (John Eliot's Indian Bible, printed in 1683, being the first) was thus produced by the initiative and published (in 1701) at the expense of the Dutch Government. With all its defects this State mission enterprise had permanent results. In Java, the Moluccas, and Celebes has grown up a native Christian Church, numbering nearly 250,000 adherents, with over 350 pastors and preachers, supported by the Dutch Government. Of these probably not more than half are the fruit of later missionary efforts. A similar mission undertaken by Holland in Brazil, through the West India Company, about the year 1621, came to an end with the expulsion of the Dutch about the middle of the century. Such missionary enterprises undertaken for reasons of State, manned by official appointment, and supervised by colonial bureaus and chambers of commerce, were foredoomed to failure. The next of the State missionary enterprises originating on the Continent of Europe illustrates this fact. In 1705 a woman whose husband had been killed by natives in the Danish colony of Tranquebar, in South India, petitioned King Frederick IV. of Denmark to send missionaries to teach the people there. The petition was effective. The King endowed the mission, and, no fit men being found in Denmark, two Germans were appointed to go to India. They were of the disciples of Francke, the German pietist, who saw that the highest form of Christian fruitfulness includes foreign as well as home missions, and whose energy formed schools at Halle to prepare men to serve Christ in the ends of the earth. The two young men, Ziegenbalg and Plutschau, taught singleness of purpose at Halle, and sent out by King Frederick IV. in 1706, began the first serious Protestant mission enterprise in India. Before his death, in 1719, Ziegenbalg had made a translation of the New Testament into the Tamil language, which became the basis of the existing Tamil Bible, and the third modern translation of the Scriptures into heathen languages. Other missionaries from the same home surroundings followed the two pioneers of this Danish mission, notably Schultze and his later associate, Schwartz. Each of these men made a permanent impression upon the people of the country. Fifty thousand Tamils became Christians before the end of the century. After the death of King Frederick IV., the English Society for the Promotion of Christian Knowledge assumed the whole support of the Danish mission in India until 1824, when the enterprise was passed over to the Society for the Propagation of the Gospel. Another mission maintained by King Frederick IV. was that commenced by Hans Egede in Greenland in 1721. It was later transferred to the Danish Missionary Society, and the whole Eskimo population in the neighborhood of the numerous Danish trading-stations was long ago Christianized.

The British Government took steps early in the seventeenth century for the Christianizing of its colonies. The Virginia Company, whose enterprise began in 1584, was directed by its charter to teach Christianity to the Indians, and Sir Walter Raleigh subscribed one hundred pounds to that object. The same duty was laid upon the Massachusetts Colony by charter in 1628. In 1646 the Legislature of Massachusetts passed a law for missionary work among the Indians. This gave State support to the efforts of John Eliot of Roxbury, Thomas Mayhew of Martha's Vineyard, and others. In 1648 Cromwell induced the English Parliament to consider the organization of a Government foreign missionary enterprise. The renewal of civil war, however, put an end to the scheme. But the Corporation for the Propagation of the Gospel in New England, formed in England in 1649, received a grant from Parliament and aided Eliot's mission. It still exists under the name of 'The New England Company,' and expends the revenue from its endowment funds for the education of Indians in the Dominion of Canada. All these efforts resulted in the formation of several villages of converted Indians in New England before progress was arrested by war. In the East Indies, on the renewal of the charter of the British East India Company in 1698, the duty was imposed upon the company of maintaining chaplains at its stations, and later the obligation to see that its native servants were instructed in Christian doctrine. Discussions regarding religious conditions in the company's stations led to the organization in 1698 of the *Society for the Promotion of Christian Knowledge* (S. P. C. K.), designed to provide Christian schools and books for neglected English communities. This was followed three years later by the organization of the *Society for the Propagation of the Gospel in Foreign Parts* (S. P. G.), designed to provide chaplains for the religious culture of Englishmen in foreign lands. Neither of these societies aimed at Christianizing the heathen. But the S. P. C. K. saved the Danish mission in South India from dying with its founder, and supported it for a hundred years. It has also issued Christian literature in the languages of various non-Christian peoples. Its issues of this description in 1900 amounted to 47,500 volumes. As to the S. P. G., it gradually took up work among the pagans, and in 1901 it had 744 missionaries and 3384 native workers in India, China, Japan, Malaysia, Africa, and the West Indies. In view of their later history, these two societies may be regarded as the earliest of the voluntary foreign missionary societies of Great Britain.

(2) Protestant Voluntary Missionary Societies. Since the true aim of missions is to persuade men to admit Jesus Christ to the control of their lives, efforts that tend to accomplish this aim are of equal interest to all Christians. From this point of view we may note the development of the missionary spirit in Protestant Christendom, without pausing to follow into detail its national or denominational particulars. In 1709 the state of the North American Indians led to the formation, in Scotland, of a *Society for the Promotion of Christian Knowledge.* The chief present importance of this society was its employment as a missionary (in 1744) of David Brainerd of Connecticut. The story of his brief life had persuasive influence on both sides of the Atlantic in stimulating similar devotion. A more powerful influence of the same nature was exercised by the writings and the example of the Moravian Brethren, who called themselves the 'Unity of Brethren.' A remnant from persecution, this little people migrated from Bohemia, and in 1772 found asylum in Germany. They were allowed to settle on the estates of Count Zinzendorf, who was himself a pupil of Francke of Halle, and who became their leader. The 'Brethren' established missions among the slaves of the West Indies, in Greenland, among the Indians of the North American Colonies, in South Africa, in South America, and in Labrador before the end of the eighteenth century. More recently they have opened missions in Australia, Alaska, and on the borders of Tibet. In 1900, all the Eskimos at their four stations in Greenland having become Christians, they transferred their Greenland mission to the Danish Church. In their other fields they now have 402 missionaries, assisted by 1869 native workers.

Through such influences and through the writings of Spener and Francke in Germany, and the earnest exhortations of Whitefield and Wesley in England (who had themselves been deeply affected by the writings of Francke and Zinzendorf), and of Jonathan Edwards in America, a resuscitation of personal religion was brought about. At about the same time the travels of Captain Cook revealed the immense extent of the heathen world, while occurrences like the trial of Warren Hastings and the anti-slavery agitation of Wilberforce brought home to the minds of the English people their responsibility for outrages perpetrated by purely selfish men professing the name of Christians. The time was ripe for action to benefit the sufferers from such outrages. As early as 1779 the English Wesleyans sent a number of missionaries among the North American Indians, and in 1786 they began a mission in the West Indies. In 1814 these beginnings were followed by the organization of a society which has supervised the mission work of that Church up to the present time. Its missions lie in Ceylon, in other parts of India, in South Africa, Oceanica, and China. In 1900 this society had in the field 366 missionaries of both sexes, aided by 9408 native workers. In general, however, the sudden development of foreign mission enterprises about the beginning of the nineteenth century did not come from any church organization. It sprang from the awakening of isolated individuals whom the Church opposed as unsteady enthusiasts. In 1786 William Carey, a cobbler and a Baptist minister in England, surprised a ministers' meeting by proposing discussion of the duty of foreign missions. He was frowned down by his elders. In 1792, however, he commanded attention and won support. The duty had become plain. In that same year twelve men united to form the *Baptist Missionary Society,* sending Carey and Thomas as their first missionaries to India. The East India Company would not tolerate missionaries, but they found a safe residence in the Danish Colony of Serampore, near Calcutta. The influence of the mission was immediate. Carey's greatest work was that of Bible translation; and the Serampore press, under his direction, added to the slender list then existing translations of Scripture in thirty-four languages. The Baptist Society extended its work in India, and added to its field Ceylon, the West Indies, West Africa, and China. In 1900 it had in the field 263 missionaries, men and women, with 932 native workers. The example of the English Baptists had effect in all Protestant countries. The reading of Carey's first letters from India led in 1795 to the formation of the *London Missionary Society* (L. M. S.), in which Independents, Presbyterians, Methodists, and Episcopalians united. Since the other denominations have undertaken missions of their own, this society is now composed substantially of Independents alone. Its present fields are Oceanica, South and Central Africa, Madagascar, India, and China. In 1901 it had in the field 455 missionaries, men and women, and 6203 native workers. Nott, John Williams, Morrison, Medhurst, Rice, Moffat, and Livingstone are names which give special lustre to its roll. In 1796 two similar societies were formed in Scotland, which served at first as auxiliaries to the London society. Later they did good work by themselves in South Africa and the West Indies, and afterwards became merged in the missionary societies of the Established Church and the United Presbyterian Church of Scotland. The formation of a society in Holland in 1797 (called the *Netherlands Missionary Society*), to aid in the work of the London Society, illustrates the solidarity of Christian feeling which underlies the modern missionary movement, and also the failure at first to appreciate the extent of the work committed to a single board of directors by Christians of different denominations and nationalities. The Netherlands Missionary Society furnished several missionaries to the L. M. S., and afterwards chose its special field in the Dutch East Indies, where in 1900 it had 11 missionaries. From this beginning a score of other societies in Holland have sprung for direct and indirect foreign missionary work. Meanwhile, the claims of freed slaves at the Sierra Leone colony were pressed upon the Church of England. Pious men in the employ of the East India Company, like Brown and Grant, urged that Church to labor among the people of India. Nothing being done by the Church in 1799, twenty-six of its spiritually minded members, among whom were William Wilberforce, John Venn, and Charles Simeon, organized the *Church Missionary Society* (C. M. S.), at first known as the *Society for Missions to Africa and the East.* They at once encountered opposition on the ground that such enterprises should be directed by the bishops, which made it difficult for them to find fit ministers to go out. Hence, the society drew its early missionaries from Germany. Altogether, more than a hundred of its missionaries have been Germans, many of them of the highest ability, like Krapf, Rebmann, Rhenius, and Pfander. Nearly half a century passed before the C. M. S. won recognition from the episcopate. The fields of the C. M. S. are in India, Ceylon, China, Japan, West Africa, East Africa and Uganda, Mauritius, New Zealand, Persia, Palestine, Egypt, and the northen and western parts of British North America. In 1901 it had in the field 1238 missionaries, men and women, and 7915 native workers, of whom 375 are ordained clergymen. The growth of English interest in missions, combined with the successes of the Halle missionaries in India, led in 1800 to the establishment at Berlin of *Jannicke's Missionary School.* This school during the next quarter of a century furnished some eighty missionaries to the English and Dutch societies, and served to arouse further interest in missions in Germany. Meanwhile, the same ideas were working in America. They found expression in foreign missions through the devotion of Samuel J. Mills and other students at Williams College, who agreed together to give their lives to preaching to the heathen. The earnestness of these young men led to the formation, in 1811, of the *American Board of Commissioners for Foreign Missions* (A. B. C. F. M.), an interdenominational society. The first missionaries of this society, Newell, Judson, Hall, Rice, and Nott, were sent to India, and were instantly ordered out of the country by the East India Company. Judson and Rice joined the Baptists at Serampore, and the others after some trouble succeeded in getting a footing in Ceylon and at Bombay. Within ten years the society had occupied other fields in India, in Hawaii, and in Turkey. After some forty years of existence as an interdenominational society it relinquished some of its fields (in India, Persia, Syria, and West Africa) to the American Dutch Reformed and Presbyterian churches, who wished to conduct separate missions of their own. It is now chiefly supported by Congregationalists. The A. B. C. F. M. has missions in China, India, Ceylon, South Africa, West Africa, Japan, Turkey, and Oceanica. In 1901 the number of its missionaries, men and women, was 549, with 3581 native workers. Judson and Rice, of the first group of missionaries sent to India by the A. B. C. F. M., changed their views on baptism before entering upon their work, and chose Burma for their field of labor. This occurrence led in 1814 to the formation of the *American Baptist Missionary Union* (A. B. M. U.) to assume the support of the two pioneers in Burma. Its present fields are in Burma, Siam, Assam, India, China, Japan, and the Congo Free State. In 1901 it had in the field 489 missionaries of both sexes, with 4613 native workers.

The success of the early missionaries of these English and American societies aroused an interest which extended to the Protestants of the Continent of Europe, and led in 1815 to the establishment of a *Missionary Institute* at Basel, in Switzerland. The training school for missionaries with which this institute began its operations provided valuable men for the English societies. A magazine for missionary intelligence, published by the Institute, deepened missionary interest in Germany and other Protestant countries. In 1822 the Basel Institute began to send out missionaries, one of the earliest of whom, Zaremba, labored effectively in Russian Armenia until expelled by the Russian Government in 1835. Its present fields are in West Africa, India, and China, and graduates of its school are pastors of evangelical churches in Turkey. In 1900 it had in the field 381 missionaries, men and women, with 1190 native workers. The land of Luther had already contributed men and means for foreign missions during many years before its first foreign missionary society was formed at Berlin in 1824 by ten men of mark, among whom were Neander and Tholuck. Following the conservative usage of the Continental Protestants, the first work of the *Berlin Missionary Society* was to establish a training school for missionaries. It began to send men abroad in 1834. Its present fields are in South Africa, German East Africa, and China. It has also done much to draw Christian colonists to the German colonies. In 1900 it maintained 100 men as missionaries in its various fields. During the first part of the nineteenth century a considerable number of little missionary associations had been formed in different parts of Germany to aid existing societies at Basel and elsewhere. Later these developed into the *Rhenish*, the *North German*, the *Leipzig*, the *Gossner*, and the *Hermannsburg Missionary Societies*, and have finally won the support of the official representatives of the Church to what is now a large and important missionary enterprise in Africa, India, China, Malaysia, and Australasia. The foreign missions of the Protestants of France began in 1818, with a missionary magazine intended to give information of the work of missionaries of other nations. This was followed in 1824 by the organization of the *Evangelical Missions Society of Paris*, designed at first to aid existing missions. Since 1825 it has sent missionaries of its own to Central Africa and Senegambia, besides replacing, in consequence of French national prejudices, missionaries of the L. M. S. in Tahiti and Madagascar, and American missionaries in the French Congo region. It now has 66 missionaries in its service. The roots of the existing missionary societies in Denmark, Norway, and Sweden also lie in the first quarter of the nineteenth century. These Scandinavian societies expanded during the last quarter of the century, and in 1900 had between 500 and 600 missionaries in Africa, Madagascar, India, China, and Chinese Turkestan. The intimate relations of some of the Scandinavian societies with German, English, and American enterprises, however, make it certain that some of these missionaries are also reported by societies in other countries. In 1824 the Established Church of Scotland undertook missionary work in India and among the Kaffirs in Africa, one of its early missionaries being Alexander Duff, the father of educational missions. The disruption in 1843 caused the resignation of all the Scotch Church missionaries in India and Kaffraria, they preferring to join the Free Church, which has since carried on extended missionary operations. In 1900 the Free Church joined with the United Presbyterian Church in forming the United Free Church of Scotland. This body has missions in India, Africa, Arabia, Syria, Turkey, China, West Indies, and the New Hebrides. Its missionaries number 403, men and women, and its force of native workers is 2824. As to the Established Church of Scotland, after recovering from the effects of the disruption, it pressed its missionary enterprises, and in 1901 it had in India, Central Africa, China, and Turkey 130 missionaries of both sexes, with 624 native workers. These Scottish mission enterprises are carried on by the Church organizations, and not by independent missionary societies.

The Bible societies grew out of the same religious quickening which gave rise to the voluntary missionary societies (the *British and Foreign Bible Society*, 1804, the *American Bible Society*, 1816, the *Netherlands Bible Society*, the *Scottish National Bible Society*, and others). So far as concerns their publications in the languages of non-Christian peoples these societies do foreign missionary work in the very highest sense, since no Protestant foreign mission can exist without the Bible in the language of the people among whom it is working. The Bible Societies work in harmony with each other and with the missions. Indeed, missionaries have made the greater part of the translations of the Bible now in circulation. In all, the Bible has been translated into 427 languages. The *Religious Tract Society* of London (1799) and the *American Tract Society* of New York (1820) have done a similar work for foreign missions in aiding to provide general Christian literature in the languages of non-Christian lands.

While our survey indicates the origin of the Protestant missionary movement in the spiritual enlightenment of the Christian Church, it cannot detail its expansion since the first quarter of the nineteenth century. In the second quarter of the century the Methodist Church and the Presbyterian Church in the United States, previously occupied with missions among the American Indians, began their great missionary enterprises abroad. In many other denominations in the United States, Great Britain, and Europe, foreign missionary undertakings have been organized. Since the middle of the century foreign missionary societies have been formed in the colonial churches in Canada, the West Indies, India, Australia, New Zealand, South Africa, and other Protestant colonies. Since 1861, when the first *Woman's Foreign Missionary Union* was formed in New York, Christian women in all lands have entered upon the work, organizing women's missionary societies, commonly more than mere auxiliaries to the older enterprises. Educational and medical missionary enterprises have been established in considerable number. Interdenominational missionary societies, like the *Christian and Missionary Alliance* of America and the *China Inland Mission* and the *North Africa Mission* of England, have undertaken extensive enterprises in non-Christian countries. To some extent Christian communities which are themselves the fruit of missions have undertaken foreign missions; as in India, Africa, the Fiji Islands, the Hervey Islands, and Hawaii. In India, Ceylon, and South Africa the Salvation Army has established itself, seeking to forward the evangelization of the heathen by methods peculiar to itself. We may also here mention the *Student Volunteer Movement*, organized in 1886 in America, but now found in many other lands. It is neither denominational nor a missionary society, but unconsciously follows the idea which led the German Baron von Welz in 1633 to make his missionary appeal to students. It has influence in colleges and universities in increasing knowledge of the claims and the results of foreign missions, and in providing the various societies with candidates for service in the field.

According to the statistical tables of the Rev. Dr. J. S. Dennis (in his *Centennial Survey of Foreign Missions*, to which we are indebted for some other statistics given in this article), in 1900 the total number of societies directly or indirectly engaged in the Protestant missionary enterprise was as follows:

American continents	128
Great Britain and Ireland	154
Denmark	4
Finland	2
France	6
Germany	24
Holland	22
Norway	10
Sweden	10
Switzerland	4
Asia	117
Australasia and Oceanica	35
Africa	42
Total	558

These societies are represented in the field by about 15,000 missionaries, men and women, and about 77,000 native preachers, teachers, and other laborers.

The enormous increase of foreign missionary societies during the last half of the nineteenth century, and especially since the work of Livingstone and Stanley culminated in the opening of Africa to colonization, might seem to threaten friction and confusion among these numerous agencies. This has been largely averted, however, because unity of aim develops a sense of the essential unity of all interests. In India, China, and Japan, and in some other countries, interdenominational conferences of missionaries are regularly held for the comparison of experiences, the improvement of methods, and the promotion of comity. In the Netherlands, in Germany, in the United States, and to some extent in Great Britain, conferences between the various Protestant missionary societies are held at regular intervals for the same purpose. Furthermore, general and international missionary conferences have been held, of which the last, known as the Ecumenical Missionary Conference of 1900, brought together representatives of 240 Protestant missionary societies. The harmony displayed at such conferences, representing many denominations, gives the impression that Protestant foreign missionaries should be considered as a single force, and that they stand, to quote the words of the historian McKenzie, "in the foremost rank of powers destined to change the face of the world."

(3) Methods and Problems of Foreign Mission Work. As to the methods used in the presentation of the Gospel, experience has developed certain principles, almost attaining to the quality of a science of missions. *Preaching* in the language of the people is the first and most important method of evangelization; and the establishment of a permanent preaching place, to which all may come if they choose, is a first concern in every missionary station. Need at once appears to place the Bible in the hands of the people. This fixes *literary work* as another method of evangelization. Qualified missionaries translate the Bible, set up presses and print it, prepare helps to its study, tracts, and general Christian literature, and in short apply the enormous influence of the printing-press to the enterprise of making Christ known. In 1900 the publishing centres in Protestant foreign mission fields numbered 148, with an annual output of nearly 365,000,000 pages of Christian literature. Desire that the people shall read not only requires the printing of primers, but the establishment of schools. But every school gives unsurpassed facilities for moral and spiritual culture, and this in proportion to the importance of its general training. Hence *educational work* has an importance as a method of evangelization which is immeasurable where the quality of instruction is of the best and the spiritual power of the teachers is of the highest. In 1900 there were, under the direction of Protestant foreign missionaries throughout the non-Christian world, 18,864 primary schools and kindergartens, with 909,146 pupils of both sexes, and 1614 higher educational institutions, with 142,320 students; 94 of the last-named institutions are universities and colleges attended by 35,539 students of both sexes. *Medical work* is another powerful method of evangelization. Protestant foreign missions in 1900 possessed 355 hospitals and 753 dispensaries, in which 2,579,651 individuals received treatment during the year. A most pervasive method of evangelization is consistent *Christian living*. This includes not only Christian family life, which in itself is an object lesson for non-Christians, but social intercourse with the people. Missionaries, both men and women, find access to the homes of the people, travel among the towns and villages, speak to the poor and ignorant perhaps the only sympathetic words heard in a lifetime, make known to them the Gospel of Christ, and in famine or pestilence they make the interests of the sufferers their own, and help them to endure and survive the catastrophe. The effectiveness of all these methods of evangelization depends largely, however, upon the qualities of the missionaries themselves. Too much stress cannot be laid upon the fact that the success or failure of a mission depends upon men rather than upon methods.

As soon as converts have been won, the problem arises of their organization and culture as a body having self-control, initiative, and the power of expansion. The results of missionary work cannot be permanent unless the Christian Church becomes indigenous on the foreign field. Hence the members of native churches must early be accustomed to manage their own affairs and to support their own church institutions and their schools. Missionaries rarely become pastors of the local churches, and in general avoid settling local ecclesiastical questions except in conjunction with the local ministers. The undertaking of the local church to provide financial resources for its own church-work is called by the somewhat ambiguous term of 'self-support,' and is well established in a large number of missions, notwithstanding poverty among the church members.

Whatever the ability and common sense of the missionary, attack is probable upon him by vested interests represented in the religion of the country where he would preach. The murder, during 1900, of 135 British, Swedish, and American missionaries in China was a tragedy of missions more than once paralleled in quality, though not recently in degree. In this connection a problem arises as to the right of missionaries to ask Government protection. It is generally held that missionaries should not depend upon such protection; that they go among savage tribes at their own peril, and that in lands where laws and treaties exist they must obey the laws. On the other hand, a government jeopardizes the right of all its people residing in any foreign country when it neglects to defend such of them as are maltreated while engaged in lawful occupations.

(4) Results of Missions. Statistical tables of Protestant foreign missions suffer from diversities of conception as to the meaning of the returns which are due to diversity of nationality and ecclesiastical polity. Nevertheless, the following may be taken as a fairly accurate though conservative statement of the number of Christian adherents in Protestant missions throughout the world in 1900:

The American continents, including Greenland and the West Indies	1,115,000
Asia, including Japan and Malaysia	1,700,000
Africa and Madagascar	1,000,000
Oceanica and Australasia	300,000
Total	4,115,000

Of this number, 1,318,000 were communicants, and the number admitted as communicants during the year was 85,000.

Again, foreign missions have not merely planted Christianity in all the principal non-Christian lands of the world. They have added the Bible to the literature of all the great languages of the earth, placing before the eyes of the people the principles of true manhood and its model in the peerless figure of Jesus Christ. The annual circulation of the Scriptures in foreign mission fields is 2,535,466 Bibles, Testaments, and single Gospels or other parts of Scripture. Results of missions visible to the eye in non-Christian lands, but not capable of record in statistics, are the overthrow of degrading superstitions, the limitation or extinction of immoral and cruel customs, the modification of non-Christian religious teaching, the gradual elevation of the standing of woman, the quickening of general intelligence, and the wide introduction of education among illiterate and degraded races, together with the addition of great territories to the area of the world's commerce. To this must be added the work done by missions in charitable care for the sick, the blind, the lepers, and outcasts of every class.

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B. Roman Catholic Foreign Missions. (1) Central Administration. (a) *The Congregation of the Propaganda.*—In a general way the direction of all Roman Catholic missions is vested by the Holy See in the Roman Congregation *De Propaganda Fide*, established in 1622 for Roman Catholic missions by Gregory XV. It consists to-day of twenty-five cardinals, with a cardinal prefect as their head, and a number of prelates and consultors in charge of the various details of administration. The Congregation has at Rome its own palace or bureaux, a college, a library and museum, a polyglot printing-press, and certain fixed revenues, chiefly from domestic or Italian sources. The various missions are distributed by it according to the character of its subjects and the nature of the religious orders to which they belong. It settles finally all disputes between missionaries, whether they regard territorial jurisdiction or the conduct of the missionary work. The regular reports made by missionary bishops or superiors to the Holy See pass through the Congregation, and in general it acts as agent for missionaries in all matters that regularly pertain to other Roman Congregations; e.g. questions of Tridentine law, marriage and divorce, criminal questions, and the like. Its principal meeting is on the first Monday of every month. A weekly meeting is regularly held for minor matters. Among the most important attributes of this Congregation is the selection of bishops. Where there is a regularly established hierarchy, a list of three names is submitted to the Propaganda with all the documents pertaining thereto. These candidates are discussed in the regular monthly assembly of all the resident cardinals, and he who seems the most worthy is proposed to the Pope. This privilege of recommendation, in whatever way it be exercised, differs entirely from the election of a bishop, which belongs to cathedral churches by virtue of the regular canon law. In some countries, as in Canada, and formerly in the United States, the provincial bishops alone recommend the three candidates. In other countries, as in England, Scotland, and Ireland, the clergy or the chapter (i.e. the canons of the cathedral), as the superior part of the clergy, draw up a list which the bishops of the province confirm with their approbation or reject with animadversion on one or the other, or all, of the candidates. Elsewhere, as in the United States since 1884, and in Australia, the clergy or representative part of the clergy recommend three names to the bishops of the province, who in turn recommend these or others to the Holy See. When there is no regular hierarchy, vicars apostolic are appointed, with episcopal character, from a list of three names drawn up by the superiors of the religious institute or Order to which the care of the faithful has been already committed. In the absence of such action the Pope appoints a vicar apostolic on recommendation of the Propaganda. On account of the rapid growth of Catholicism, chiefly in English-speaking countries, the office of Cardinal Prefect of the Propaganda has become one of the most important and responsible of the great curial offices; he is often called the 'Red Pope.'

The *College of the Propaganda* is an institution attached to the Congregation for the purpose of training its missionaries from their very youth. It owes its first beginnings to the Spaniard John Baptist Vivés, who bequeathed to it his palace at Rome and made it his heir. Since 1622 the original foundation has been greatly enlarged. Urban VIII. was a notable benefactor of the work (1641); hence it bears the name of *Collegium Urbanum*. Some canons of the Lateran Church were the first teachers of the young missionaries, but the college soon passed into the complete control of the new Congregation. It was endowed with many privileges by the popes. They exempted it from all ordinary ecclesiastical and civil jurisdiction. and several special distinctions were granted it; among others, the right of giving degrees in theology and philosophy. Its present quarters were designed by Bernini, and the chapel is the work of Borromini. Seven months after their entrance the candidates for the missions are required to take an oath of obedience to the Congregation; among other things, they promise to go directly to their respective missions after ordination. Those who remain as missionaries in Europe (e.g. in the British Isles, the northern kingdoms, Switzerland) are required to report annually to the Prefect of the Congregation; those whose missions are elsewhere must write to him biennially. Not a few candidates, especially from the Orient, come at a very early age. Such youths do not take the 'missionary oath' until after they have reached their fourteenth year. In this college the training is the usual seminary training. Only, for the beginners, Greek and Latin, and especially the suitable Oriental languages, make up the curriculum. The college owns near Rome its own country-seat or villegiature, whither the students go during the heated season. On Pentecost one of the students of the college preaches before the Pope and the cardinals. Its students at the end of the eighteenth century were about 140; at present they do not exceed 120. The French Revolution caused it to close its doors; but since 1809-17 it has been opened for its former work, and many distinguished men have graduated from its classes. From 1836 to 1848 the teaching and discipline were under the control of the Jesuits. Since then they are provided for directly by the Congregation itself, which names a rector and vice-rector with other officials, and provides for the programme of studies. Several national colleges attend the lectures of its professors—thus, the North American, Canadian, Irish, Greek, Ruthenian, and other national ecclesiastical schools frequent its class-rooms. Yearly an *Accademia Polyglotta* is held on the first Sunday after Pentecost. Discourses, poems, and addresses are then read in a great variety of languages, chiefly Oriental, and the ceremony is graced by the presence of many dignitaries of the Roman Court. Lately new and commodious quarters have been secured for the academic needs of the college.

The Congregation has long owned and managed a printing-press that is unique on account of the many kinds of type it possesses for the Oriental languages. In the last two centuries a multitude of Oriental texts have come from its offices—liturgical, ascetic, literary, theological, patristic, historico-religious. There is perhaps nowhere else in the world an Oriental printing-press so well equipped and so scientifically conducted. It issues regularly a catalogue of its publications, and is officially known as the *Stamperia di Propaganda Fede.*

The Congregation of the Propaganda governs all Catholic missions according to the general law of the Church, the decrees of the Council of Trent, the decisions of other Roman Congregations, the Papal rescripts, and the conciliar legislation. But, over and above the ordinary law there is a certain amount of special legislation for the missions and missionaries. As early as 1669 the Propaganda issued its *Advice to Missionaries*, that has been lately reprinted (*Monita ad Missionarios*, Rome, 1874). The details of its extensive legislation are to be found in the collection of its document known as the *Bullarium* of the Congregation (Rome, since 1839, 5 vols., folio; with an index, 1858). Another collection is that of Raphael de Martinis (7 vols., folio, Rome, 1889-1900). The particular legislation of the Propaganda affecting the Oriental missions is found in the work entitled *Collectanea Constitutionum*, etc. (Paris, 1880), and in the *Apparatus Juris Ecclesiastici* of Zephyrin Zitelli (Rome, 1886). Occasionally the Congregation issues a legislation that modifies the regular canonical procedure in justice; e.g. in the trial of matrimonial cases, clerical delicts, and other judicial processes. Such documents then become norms of ecclesiastical government in the land for which they are issued. The current public documents of the Congregation may be easily found in the Roman canon law periodical entitled *Acta Sanctæ Sedis*, and those of the Pope in the annual series of Pontifical documents respectively known as *Acta Pii IX.*, *Acta Leonis XIII.*, etc.

Usually the establishment of a remote and difficult mission begins with the sending of a Prefect Apostolic by the Pope, at the suggestion of the Congregation of the Propaganda. As a rule this missionary is only a priest, but he receives certain special authorizations from the Holy See; e.g. the right to administer confirmation. As soon as the conditions of the mission warrant, a vicar apostolic is appointed to take charge of its interests. Such a missionary is made a titular bishop; i.e. he is given the 'title' of some see, extinct or suppressed. No specific seat of residence is fixed for him; he organizes the mission as best he can. In time sees are established with territorial limits, and canonical obligation of residence for the bishop; thus a quasi-normal condition arises in which the administration of spiritual affairs gradually grows quite like that of the older Catholic States of Europe, and the regular ecclesiastical law tends to obtain as against the temporary and opportunist administration of an earlier date. Nevertheless, for various reasons, the Holy See often continues to govern such well-developed churches through the Congregation of the Propaganda, instead of incorporating them in the ordinary system of its administration. The Propaganda is thus one of the busiest of the Roman congregations. There come before it all questions that arise in 'missionary lands' concerning the creation of dioceses, their dismemberment, division, union, and transformation; the nominations to episcopal office; the relations, in last resort, of bishop and clergy; all questions between bishops and religious Orders, and between Orders themselves in matters of their mission work; the discipline and supervision of national missionary colleges, theological seminaries in missionary lands; the regular reports of its bishops, their special needs or plans, and similar things. It is in close contact with all other Roman congregations, to which it acts as a kind of clearing-house for the missions and missionaries. Its juridical decisions are final, authoritative, and reversible only by the Pope, to whom they are always submitted beforehand when the gravity of the occasion or the nature of the problem in question warrants. The Congregation has a permanent secretary, generally an archbishop, who goes weekly to the Vatican with the proceedings of the Congregation, to submit them to the approval of the Pope and give such explanations as are needed. This office is looked on as 'cardinalitial,' i.e. as leading directly to the dignity of cardinal—hence it is always filled by an ecclesiastic of learning and experience.

A large and valuable library is connected with the Congregation, for its own use, and for the needs of the college and the printing-press. It is especially rich in ancient theology and philosophy, and in all kinds of Orientalia, both printed and manuscript. It is accessible to students and writers. The archives of the Congregation are kept with care, and are of great value for the ecclesiastical and civil history of the missionary lands. They are partially accessible under certain conditions, and are now being used by historians of the sixteenth, seventeenth, and eighteenth centuries, especially for the period of the Counter-Reformation in Germany, Switzerland, and the Netherlands.

Besides the institutions described, the Propaganda possesses a valuable museum, called the Borgian Museum, after a former Prefect of the Congregation, Cardinal Stephen Borgia, who was its principal benefactor in the latter half of the eighteenth century. This museum contains numerous rare and ancient charts and maps of the missionary lands, curios of all kinds, coins, documents, and relics, that are often useful for purposes of archæology or ethnology. Many valuable manuscripts, especially Coptic and Arabic, are kept there. Since 1882 the Congregation has recommended to its missionaries, in a very special way, the interests of the museum.

Until 1862 the affairs of all the missionary churches, East and West, were treated in one and the same Congregation of the Propaganda. In that year Pius IX. established a special section of the Congregation for the administration of the Oriental churches (*Sacra Congregatio pro Negotiis Ritus Orientalis*). It has its own chief, a *Cardinalis Ponens*, and its own officials and counselors. To each curial (resident) cardinal of this section is allotted the conduct of the religious affairs of some one of the Oriental rites united with the Holy See; he is called the *Cardinalis Relator*.

(2) National and Particular Direction. The principal national missionary enterprises of Roman Catholics are carried on from Paris and Lyons in France. The most venerable of them is the *Seminary for Foreign Missions* (*Missions Etrangères*), founded at Paris, 1658-63, and located in the Rue du Bac. Its missionaries are under the guidance of 33 local superiors (bishops) throughout China, Corea, Tibet, Turkey, Siam, Burma, and Hindustan. Since 1840 the Seminary has sent out nearly 2000 priests; at present about 1200 French priests carry on its work, with the aid of some 600 native clergy. Between three and four hundred mission candidates study in its school at Paris. In twenty years its personnel has increased from 480 to 1200—a phenomenon noticeable in nearly all other French missionary enterprises. In the Seminary is a curious and touching *Muséum des Martyrs*. The annual departure of its missionaries from Paris gives occasion for a remarkable popular ceremony and demonstration. Since 1822 the *Work of the Propagation of the Faith* (*Œuvre de la propagation de la foi*) has been administered from Lyons. Its scope is not to send out missionaries, but to collect and distribute to existing missions the funds received from private generosity. This is done without distinction of nationality or location. In 1898 the association collected (mostly in France) nearly seven million francs. In fifty years it has distributed over twenty million dollars for Catholic foreign missions. The *Work of the Holy Childhood* (*Œuvre de la sainte enfance*), a related enterprise, has collected and spent about ten million dollars. Other French associations for missionary help are the *Work of the Oriental Schools*, the annual collection on Good Friday for the Holy Land, the *Work of the African Missions*, the *Anti-Slavery Association*, the *White Fathers*, the *Fathers of the Holy Ghost*—all works established originally in France.

There are many religious Orders and institutes in France which send numerous members to the mission fields; thus, there are some 750 French Jesuits in the Orient, and they carry on excellent colleges at Beirut, Cairo, and Alexandria. In Syria they have some 180 schools with 13,000 children. Similarly Lazarists, Dominicans, Assumptionists, and others have numerous missionaries scattered through the Orient. The Christian Brothers have many well-attended schools in Egypt, Syria, Asia Minor, at Constantinople, and in the Levant. Owing to colonial expansion, Catholic Germany has shown more interest in missions during the last three decades, though the earlier French 'Works' always found sympathy in Germany. The *Bonifacius-Verein* (1849) for home missions has spent in the fifty years of its existence some seven million dollars. The *Ludwigs-Verein* (1839), the *Leopolds-Verein* (1839), the *Afrika-Verein* (1894), the *Association for the Holy Land* (1893), and other enterprises have kept alive the zeal of German Catholics for the conversion of the heathen. In 1900 there were in all some 1100 German Catholic missionaries, of whom 489 were Jesuits. This figure includes the 364 'Sisters' who labored in the same field. Within the last few years an increasing missionary activity is manifest, especially in China and Brazil, in which latter country the German colonists increase at a rapid rate.

The French 'Sisterhoods' give generously of their members to the Oriental missions. Most of the missionaries to the credit of Catholicism are Frenchmen; a still larger proportion of the Catholic 'Sisters' on these missions is made up of French women. Perhaps 10,000 is not too high a number; in 1899 they were more than 9000. Of these the 'Sisters of Charity' alone furnished about 1500. Of the 100 to 120 'congregations' of men and women that labor in Catholic missionary fields, over 80 are of French tongue, or have their home in France.

While the Spanish missionaries have nearly all taken their way to the Philippines, the Italian missionaries carry on, in an hereditary way, certain lines of work in the Orient, notably in the Levant. Statistics of their number and work are not easily reached. The Salesian Fathers (Turin) of Don Bosco turn their energy toward South America, and the society founded by Bishop Scalambrini, of Piacenza, is especially interested in the Italian population of South America and our North American cities. Holland has had a house for foreign missions at Steyl since 1875, with about 120 missionaries. At Mill Hill, in England, the English Catholics support a seminary for missions among the blacks. The College of All Hallows at Dublin draws its missionaries from Ireland; many of them come to the United States and merge into the American clergy; Ireland makes provision also for a few missions in Africa and India. The Catholics of the United States support in part the missions for Indians and negroes by an annual collection since 1884. It reaches yearly a figure of sixty to seventy thousand dollars.

As to the civil relations of the Catholic missions in the Orient, France is still their official intermediary with the local governments. This ancient privilege, which begins to be contested by Germany and other powers, is still in force, and is recognized by late acts of the Prefect of the Propaganda and the Holy Father. It was also recognized anew by the Chinese Emperor in March, 1899. Among the notable acts in the history of Oriental Catholic missions is the establishment by Leo XIII. of a regular hierarchy in India (1886) and in Japan (1891).

The support of Catholic missions comes almost entirely from private sources. The money salary of each missionary is a very modest one. The Work of the Propagation of the Faith at Lyons allots annually from one hundred to one hundred and twenty dollars to each missionary that it supports. Nearly all the money comes from small contributions, but through a well organized system of collection.

In all, there are 32 'congregations' of men devoted to the Catholic missions, with some 12,000 members, not to speak of native clergy and helpers. About 5000 'Brothers' are engaged as teachers and catechists, mostly in the Orient; 44,000 'Sisters' are occupied with works of charity and teaching. It is calculated that the whole army of Catholic missionaries, men and women, now reaches the figure of 60,000, and that few areas of heathendom remain unvisited by them.

(3) Some Important Events and Facts in the History of Modern Roman Catholic Missions. As a result of the loss of its East Indian possessions, the Crown of Portugal became involved, during the last century, in long and serious conflict with the Holy See. From 1834 to 1838 the latter cut off from the original Portuguese Archdiocese of Goa four Vicariates Apostolic, that coincided with English territory. Though absolutely just and necessary, this act of Gregory XV. was resented by Portugal. A schism followed which lasted more or less acutely and continuously until 1886, when peace was brought about by Leo XIII. Goa was made a titular patriarchate with four suffragans, Damão, Archbishop also *ad honorem* of Crangaror, Cochin, Saint Thomas of Meliapur, and Macao. Elsewhere in India, the former Vicariates Apostolic of Agra, Bombay, Varapoli, Calcutta, Madras, Pondichery, and Colombo (Ceylon) were raised to the archiepiscopal rank and freed from all subjection to the Archbishopric of Goa.

During the whole nineteenth century the Catholic missions in Tonkin and Annam suffered very frequently from popular uprisings and government persecution, until the establishment of the French civil protectorate in 1885-86.

Until 1880 the Catholic missions in Korea were almost continuously the object of similar maltreatment; nevertheless, they now number 36,000 Catholics in 28 districts; they have one bishop, 31 missionaries, and 554 chapels. In 1839 three French bishops were put to death as martyrs, and in 1860 nine bishops suffered the same fate.

The modern Catholic missions in Japan began tentatively in 1832-58. An impetus was given by the discovery of a number of crypto-Catholics (1858-72), who had retained some souvenirs of the faith as preached to their ancestors in the sixteenth and seventeenth centuries. With the gradual enlargement of religious liberty since 1872 the disestablishment (1886) of Shintoism and Buddhism, and the proclamation of a constitutional monarchy (1889), the conditions have been more favorable for the Catholic missions. In 1891 Leo XIII. established a regular hierarchy in Japan, with one archbishop at Tokio. The three suffragans are at Nagasaki, Osaka, and Hakodate. There were in 1899 112 missionaries, 26 native priests, and 284 lay catechists. The Catholic population is 53,872.

The labors of the Catholic missionaries in China during the last century were largely directed to gathering back into the Christian fold the families scattered by the former persecutions. The opium war, the Taiping rebellion, political manœuvres, the weakness of the central authority, and the native hatred of the Chinese for 'foreign devils' caused the destruction of many promising Christian communities in spite of the treaties of 1844-45 and 1858-60. In 1898 there were in China, according to the almanac of the Propaganda (*Missiones Catholicæ*), 532,448 Catholics, with 39 bishops, 739 missionaries (Jesuits, Franciscans, Dominicans, Lazarists), and 373 native priests distributed over 40 missions.

In Central Africa the most important events have been the labors of Fr. Libermann and his society (*Fathers of the Holy Ghost*) since 1840, and the foundation of the *Pères Blancs* of Cardinal Lavigerie. The African missions have been helped lately by the formation of anti-slavery societies. Among the most remarkable of Catholic missionaries in Africa was Father Daniel Comboni. In Ethiopia the central figure has been the late Cardinal Massaia, a venerable Capuchin, who devoted thirty years of his life to the work. In French Africa the See of Algiers was founded in 1838, and in 1867 became an archbishopric, with Constantine and Oran for suffragans. The French protectorate over Tunis (1881) brought with it, in 1884, the restoration of the famous ancient See of Carthage. Since 1885 the French protectorate over Madagascar has affected somewhat favorably the Catholic missions among the Malagasies.

In South America there are nearly ten million Indians in the various Catholic missions, with some three million more unconverted. The separation from Spain, the abolition of slavery in Brazil (1888), the frequent violent expulsion of various religious Orders, the movement of immigration from Europe, and the Patagonian missions of the Salesian Fathers since 1875, have been among the principal events that affected the missionary work.

Throughout the islands of Polynesia there are about 180,000 Catholics, with 13 bishops, 259 priests, and 419 churches or chapels.

In 1885 Archbishop Moran, of Sydney, was made a cardinal, and in the same year he held the first council in Australia. There are in Australia at present 6 archbishops, 16 bishops, about 1300 priests, and nearly 800.000 Catholics.

In 1899 there were subject to the authority of the Congregation of the Propaganda 16,107,723 Catholics in America, Asia, Africa, and Oceanica, as against 15,268,400 in 1895. These figures include only Catholics of the Latin rite. At the same period (1899) there were subject to the authority of the Propaganda 5,511.782 Catholics of these Oriental rites that recognize the jurisdiction of Rome. Of this number 30,000 were Ethiopians, 20,500 Copts, 107,000 Armenians, 1.048,710 Greek-Rumanians, 3,543,593 Greek-Ruthenians, 13,000 Greek-Bulgarians, 250 Hellenes, 22,700 Syrians, 72,000 Syro-Chaldeans, 277,000 Maronites, 260,329 Syro-Malabars, 116,700 Greek-Melchites.

In Asiatic territory, the Catholics of Latin rite are divided as follows: Asiatic Turkey, 120,680; Hindustan, 1,178,325; Indo-China, 827,630; Malay Archipelago, 50,280; Chinese Empire, 532,648; Korea, 30,000; Japan, 53,872. In Africa the missions to the savages count 458,170 converts.

The most active missionary body of the Roman Catholic Church is the Society of Jesus. A quasi-official statement found in the *Lettres des missionnaires jésuites* (Paris, 1903) gives the exact number of Jesuit missionaries at 3249. The following distribution by nationalities is given in the same source, with an indication of the countries for which each nationality is chiefly employed. There are 790 Frenchmen, working principally in Madagascar, Egypt, Armenia, Syria, China, Ceylon, and India; 222 Belgians, in India, Ceylon, and the Congo region; 535 Germans and Austrians, in India and North and South America; 65 Dutchmen, in Java, Sumatra, and Flores; 69 Americans, in Jamaica, British Honduras, and among the North American Indians; 590 Italians, in India, Brazil, and the western part of the United States; 785 Spaniards, in Cuba, South America, and the Philippines; 41 Portuguese, in Goa, Macao, and the Zambezi country; 152 Englishmen and Irishmen, in South Africa, British Guiana, and Australia. These numbers, of course, only include those Jesuits who are engaged in strictly missionary work. The *Année de l'Eglise* (Paris, annually) gives similar details not only for the Society of Jesus, but also for the foreign missions of the Dominicans, Franciscans, Lazarists, and the Picpus Society. The annual statistics of the *Séminaire des Missions Etrangères* are likewise published in it. Besides the *Lettres* quoted above, the Jesuits have published at Freiburg since 1873 a periodical entitled *Die katholischen Missionen*, which gives full details of their own work in this direction.

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French Missions: The best account of the missions of the Roman Catholic Church in France is that of Kannengiesser, *Les missions catholiques: France et Allemagne* (Paris, 1900). For a summary of this work, consult Shahan, "The Catholic Missionaries in France and Germany," in the *Catholic World* (New York) for October, 1900. Before the publication of this work, Keller, *Les congrégations religieuses en France* (Paris, 1880), was the standard work on the details of the missionary labors of the congregations. Piolet, *Les missions catholiques françaises au XIXe siècle* (Paris, 1900-03), may also be consulted.

German Missions: The work of Kannengiesser gives the statistics of German Roman Catholic missions to 1900. Consult, also, the *Schematismus der römisch-katholischen Kirche des deutschen Reiches* (Freiburg, annually); and for Austria, *Schematismus des gesammten katholischen Reiches Oesterreich-Ungarns* (Vienna); also the *Kloster-Schematismus für das deutsche Reich* (3d ed., Paderborn, 1899); Goyau, *L'Allemagne religieuse* (Paris, 1899); and Kannengiesser, *Les catholiques allemands* (Paris, 1893).

Mission Periodicals: The Congregation of the Propaganda publishes from time to time (1886-98) the *Missiones Catholicæ*, containing official statistics of its missions. The Work of the Propaganda of the Faith publishes frequently each year the *Annales de la propagation de la foi* (Paris), and a similar *Annales* is published by the Work of the Holy Childhood (Lyons). For the African missions there are the *Bulletin des missions d'Afrique,* and the *Société antiesclavagiste,* both published annually at Paris. The details of Roman Catholic education in the Orient are found in the periodical *Œuvres des Ecoles de l'Orient* (Paris, annually). An illustrated monthly entitled *Catholic Missions* appears in English, French, and German, and offers popular information concerning all Catholic missionary work (London). The *Année de l'Eglise* (Paris, annually) frequently gives a summary of the events connected with the Catholic missions.

United States Missions: The statistics of the native Roman Catholic missions are found since 1864 in the *Reports of the Commission for Negro and Indian Missions* (Baltimore, annually). Previous to that year the voluminous work of O'Shea, *History of the Catholic Church in the United States* (New York, 1886 sqq.), may be consulted; also the same author's *History of the Catholic Missions Among the Indian Tribes* [1592-1854] (ib., 1876), and his *Discovery and Exploration of the Mississippi* (ib., 1858), as well as the numerous writings of Father de Smedt, a Belgian missionary among the Indian tribes of the Far West. Their bibliography is to be found in O'Shea, *Western Missions and Missionaries* (New York, 1878). Consult, also, O'Gorman, *History of the Roman Catholic Church in America* (ib., 1895), and Engelhardt, *The Franciscans in California* (ib., 1887).

For the Farther Orient, consult: Launay, *Atlas des missions de la Société des Missions Etrangères* (Paris, 1890); id., *Nos missions, album des missions catholiques* (Lyons, 1900); De l'Huys, "Le Christianisme au Tonkin," in *Le Correspondant* (Paris) for November 10, 1889. On the late troubles in China consult articles in *Le Correspondant* for July 25 and August 10, 1900: Lamy, "La Chine, l'Europe, et le Saint-Siège;" Cochin, "La Chine et le gouvernement francais;" Fauvel, "Nos missionaires patriotes et savants en Chine." All the details of the 'Boxer' movement from the Roman Catholic standpoint may be seen in the current *Annales de la Sainte Enfance,* those of the Propagation of the Faith in the pages of *Catholic Missions.* For details of earlier Catholic missions in China one may consult the Abbé Huc, *Le Christianisme en Chine, en Tatarie et en Thibet* (Paris, 1859). It covers the period from 1772 to the Peace of Tien-tsin (1858). The work of Hübner, *Ein Spaziergang um die Welt* (Leipzig, 1875), contains details of the Catholic missionary life in the East. On Catholic missions in Australia, consult Lemire, *Le Catholicisme en Australie* (Paris, 1900).

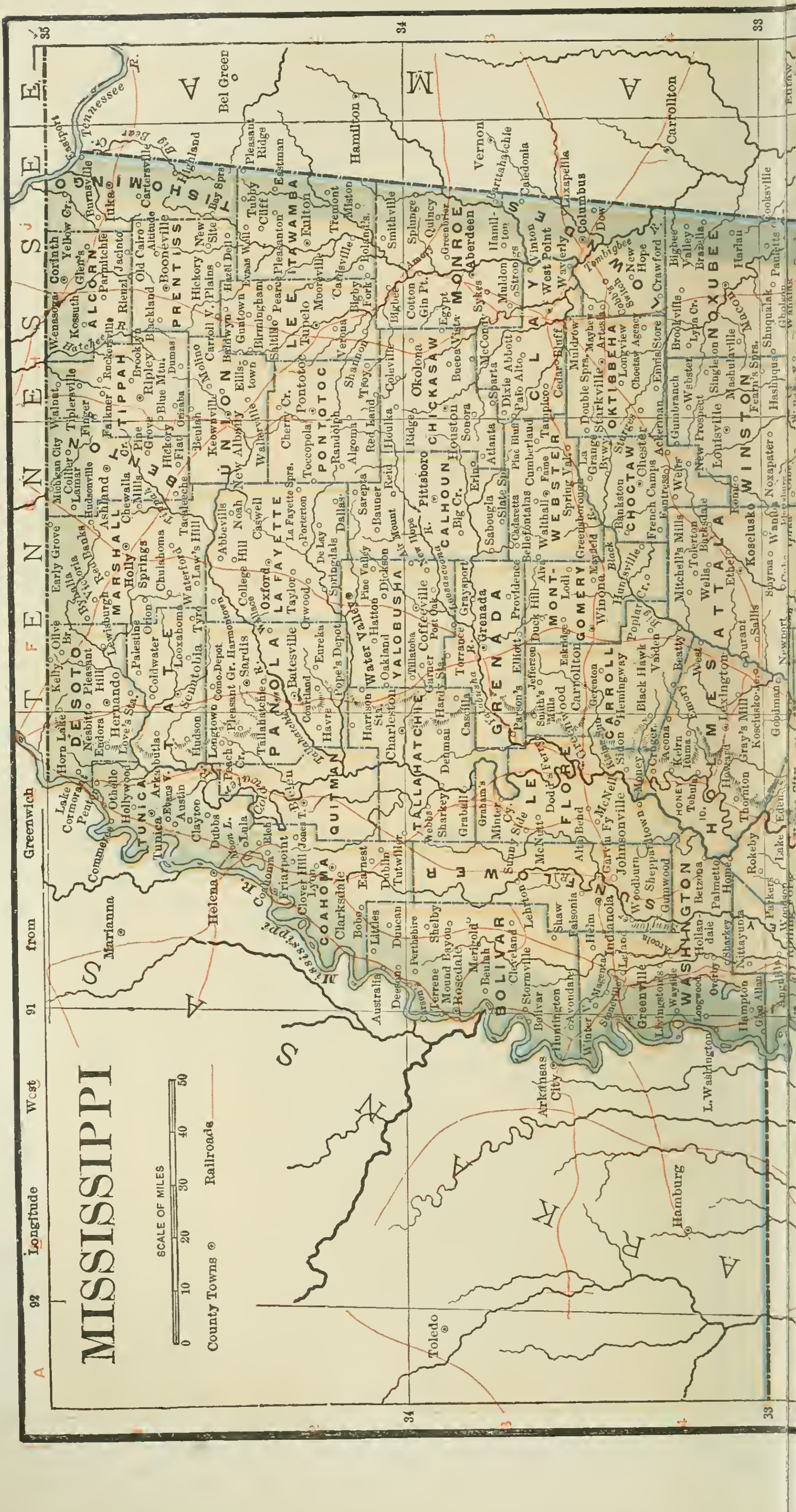
MISSIS'AGA. An Algonquian tribe residing east and south from Lake Ontario, Ontario, Canada. They are closely connected with the Ojibwa, of whom they are an offshoot. The name is said to mean 'great mouth,' referring to the mouth of the Missisaga River, but an educated member of the tribe says that it refers to an eagle, claiming that the Missisaga are derived principally from the Eagle clan of the Ojibwa. At a treaty in 1764 they signed with an eagle as their tribal mark. When first known to the French, early in the seventeenth century, the Missisaga were living upon the lower part of the river which bears their name and upon the adjacent Manitoulin Island. Soon afterwards they moved east and south into the country left unoccupied by the dispersion of the Huron and Ottawa, and soon spread over the whole peninsula of Lower Ontario. At the close of the Revolution they even had one village on the south side of Lake Erie in what is now Ohio. The land on which the Iroquois are now settled on Grand River, Ontario, was bought from the Missisaga. In 1746 they were admitted as the seventh tribe of the Iroquois confederacy, being then settled in five villages near Detroit, but the alliance lasted only until the outbreak of the French and Indian War, a few years later. On account of the former loose distinction between the Missisaga and Ojibwa, it is impossible to give exact figures of population. Those now officially classed as Missisaga number about 750, on small reservations at New Credit, Alnwick, Mud Lake, Rice Lake, and Scugog, Province of Ontario, Canada. They are all members of the Methodist Church, and support themselves by farming, fishing, trapping, gathering wild rice, basket-making, and outside labor. They are generally prosperous and comfortable and are universally commended by their agents for industry, morality, sobriety, and general progress. The statistics show them to be a healthy people.

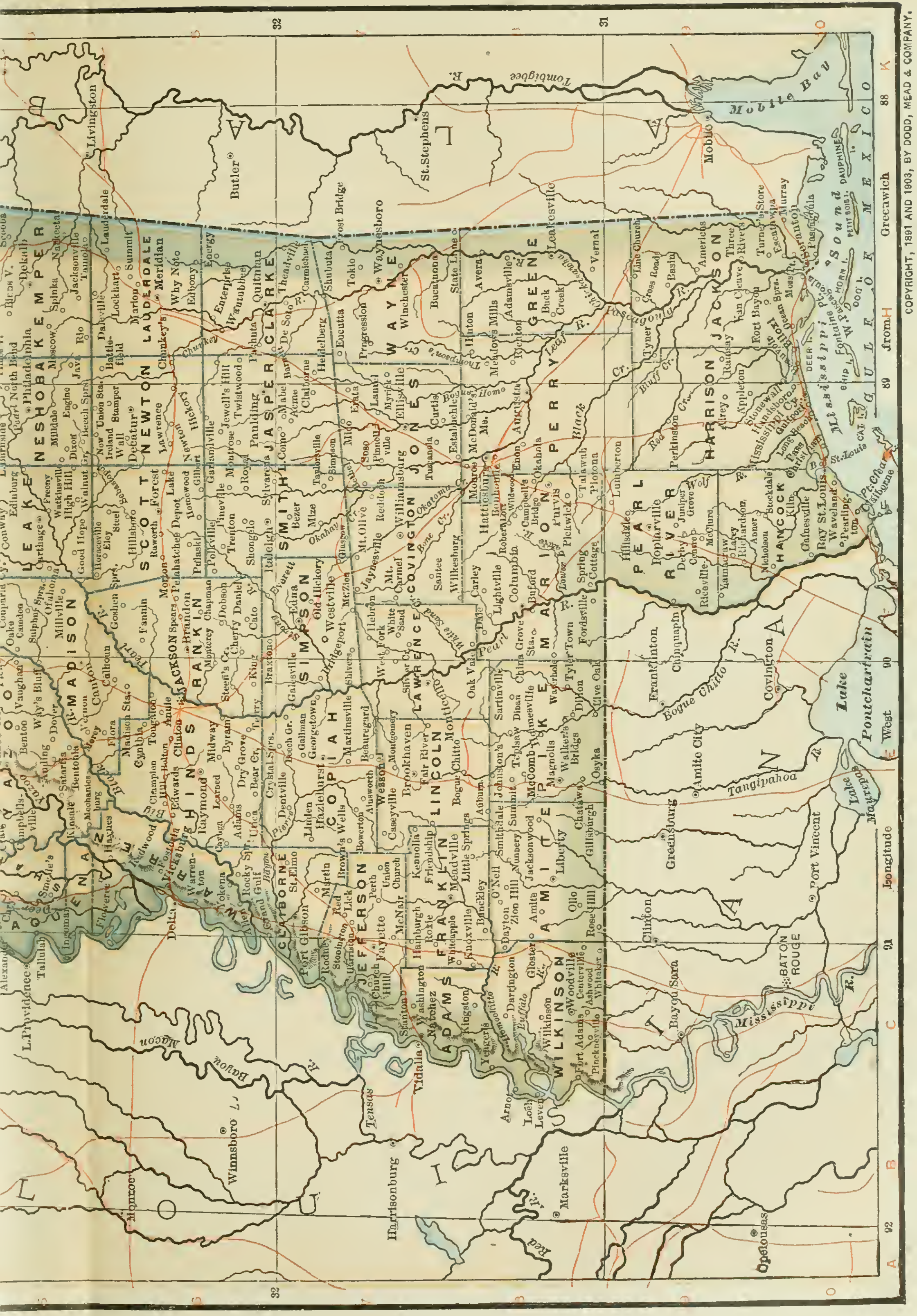
MISSISSIPPI. One of the South-Central States of the American Union. It takes its name from the river which forms its western boundary for a distance of about 500 miles, and separates it from the States of Louisiana and Arkansas. It lies between Tennessee on the north and Louisiana on the south, being separated from the former by the thirty-fifth parallel of north latitude and from the latter by the thirty-first parallel from the Mississippi River to the Pearl River, a distance of 110 miles. Thence following the Pearl River southward, the boundary line is completed on the south by the Gulf of Mexico. The Tennessee River cuts off a small portion from the northeastern corner, but the eastern boundary separating the State from Alabama runs southward in a nearly straight line to the Gulf. Mississippi has an extreme length of 330 miles and an extreme width of 188 miles, and comprises an area of 46,810 square miles, of which water occupies 470 square miles, the land amounting to 46,340 square miles. Mississippi includes, in addition to the mainland territory, the islands Ship, Horn, Cat, Petit Bois, and others, separated from the mainland by the Mississippi Sound.

Topography. The highest ridges in the northeast reach an altitude of about 1000 feet. Throughout most of the State the elevations range from 500 to 600 feet down to 150 feet a few miles from the Gulf. A moderate uplift of the region has allowed the rivers to carry the work of dissection to maturity, all gradients now being low, nearly or quite at base level, the streams having their lower courses in valleys opened wide, from a few hundred yards to several miles, and wandering in sinuous courses upon silted bottoms. These river bottoms cover a total of 7560 square miles, or nearly one-fifth of the entire State. Of this the Yazoo bottoms occupy the greater part. The flood plains of the Yazoo and Mississippi rivers are lined on the east by bluffs from 100 to 300 feet in height, caused by the lateral corrosion of the swinging meanders of the great river. These bluffs are capped throughout with a deposit of

AREA AND POPULATION OF MISSISSIPPI BY COUNTIES.

County.	Map Index.	County Seat.	Area in square miles.	Population.	
				1890.	1900.
Adams	C 8	Natchez	428	26.031	30.111
Alcorn	H 1	Corinth	402	13.115	14.987
Amite	D 8	Liberty	708	18.198	20.708
Attala	G 4	Kosciusko	707	22,213	26.248
Benton	C 1	Ashland	409	10.585	10,510
Bolivar	D 3	Rosedale	913	29.980	35.427
Calhoun	G 3	Pittsboro	588	14.688	16,512
Carroll	E 4	Vaiden	612	18,773	22,116
Chickasaw	G 3	Houston	507	19.891	19,892
Choctaw	G 4	Chester	372	10.847	13,036
Claiborne	D 7	Port Gibson	505	14.516	20,787
Clarke	H 6	Quitman	664	15,826	17,741
Clay	H 3	Westpoint	399	18.607	19.563
Coahoma	D 2	Clarksdale	592	18.342	26.293
Copiah	D 7	Hazlehurst	748	30.233	34.395
Covington	F 7	Williamsburg	577	8,299	13.076
De Soto	E 1	Hernando	551	24,183	24.751
Franklin	D 8	Meadville	555	10.424	13.678
Greene	H 8	Leakesville	819	3,906	6,795
Grenada	F 3	Grenada	435	14,974	14,112
Hancock	G 9	Bay St. Louis	611	8,318	11,886
Harrison	H 9	Mississippi City	982	12.481	21.002
Hinds	E 6	Raymond & Jackson	847	39.279	52.577
Holmes	E 4	Lexington	825	30.970	36.828
Issaquena	D 5	Mayersville	473	12.318	10.400
Itawamba	J 2	Fulton	526	11.708	13.544
Jackson	J 9	Scranton	1,073	11,251	16.513
Jasper	G 6	Paulding	647	11.785	15,394
Jefferson	C 7	Fayette	519	18.947	21,292
Jones	G 7	Ellisville	674	8.333	17.846
Kemper	H 5	Dekalb	704	17,961	20,492
Lafayette	G 2	Oxford	673	20,553	22.110
Lauderdale	H 6	Meridian	677	29.661	38,150
Lawrence	E 7	Monticello	638	12.318	15.103
Leake	F 5	Carthage	561	14.803	17,360
Lee	H 2	Tupelo	449	20,040	21.956
Leflore	E 3	Greenwood	578	16.869	23.834
Lincoln	D 7	Brookhaven	574	17,912	21.552
Lowndes	J 4	Columbus	504	27.047	29,095
Madison	E 5	Canton	714	27,321	32,493
Marion	F 8	Purvis & Columbia	1,095	9,532	13.501
Marshall	F 1	Holly Springs	707	26.043	27,674
Monroe	H 3	Aberdeen	762	30,730	31.216
Montgomery	F 3	Winona	391	14,459	16,536
Neshoba	G 5	Philadelphia	543	11,146	12,726
Newton	G 6	Decatur	561	16,625	19.708
Noxubee	H 4	Macon	659	27.338	30.846
Oktibbeha	H 4	Starkville	435	17.694	20,183
Panola	E 2	Sardis & Batesville	699	26.977	29.027
Pearl River	F 9	Poplarville	663	2,957	6.697
Perry	G 8	Hattiesburg & Augusta.	1.091	6,494	14.682
Pike	E 8	Magnolia	697	21,203	27.545
Pontotoc	G 2	Pontotoc	496	14.940	18,274
Prentiss	H 1	Booneville	420	13,679	15.788
Quitman	E 2	Belen	409	3,286	5,435
Rankin	E 6	Brandon	777	17.922	20.955
Scott	F 6	Forest	584	11,740	14.316
Sharkey	D 5	Rolling Fork	438	8.382	12,178
Simpson	E 7	Westville	578	10.138	12,800
Smith	F 7	Raleigh	610	10.635	13.055
Sunflower	D 4	Indianola	703	9.384	16,084
Tallahatchie	E 3	Charleston	636	14,361	19,600
Tate	E 1	Senatobia	407	19.253	20,618
Tippah	H 1	Ripley	456	12.951	12.983
Tishomingo	E 2	Iuka	433	9.302	10.124
Tunica	E 1	Tunica	449	12.158	16,479
Union	G 1	New Albany	418	15.606	16,522
Warren	D 6	Vicksburg	601	33.164	40.912
Washington	D 4	Greenville	925	40.411	49,216
Wayne	H 7	Waynesboro	788	9.817	12.539
Webster	G 3	Walthall	409	12.060	13.619
Wilkinson	C 8	Woodville	664	17.592	21,453
Winston	G 4	Louisville	577	12.089	14,124
Yalobusha	F 2	Coffeeville & Water Valley	501	16,629	19,742
Yazoo	F 5	Yazoo City	1,018	36.394	43.948


MISSISSIPPI
SCALE OF MILES
0 10 20 30 40 50
County Towns
Railroads
Longitude West from Greenwich
92
91
35
34
33
TENNESSEE
ARKANSAS
ALABAMA
Mississippi R.
Tennessee R.
Tombigbee R.
DE SOTO
MARSHALL
TIPPAH
ALCORN
TISHOMINGO
TUNICA
TATE
PANOLA
LAFAYETTE
UNION
PRENTISS
LEE
ITAWAMBA
PONTOTOC
COAHOMA
QUITMAN
TALLAHATCHIE
YALOBUSHA
CALHOUN
CHICKASAW
MONROE
BOLIVAR
SUNFLOWER
LEFLORE
GRENADA
MONTGOMERY
WEBSTER
CLAY
LOWNDES
OKTIBBEHA
CHOCTAW
CARROLL
WASHINGTON
HOLMES
ATTALA
WINSTON
NOXUBEE
Corinth
Holly Springs
Oxford
Tupelo
Columbus
Aberdeen
West Point
Starkville
Grenada
Greenville
Kosciusko
Lexington
Helena
Marianna
Hamburg
Toledo
Carrollton
Vernon
Hamilton
Bel Green



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loess. Extending through the middle of the Yazoo bottoms is a flat ridge, standing above flood level, and this and the banks of the various streams are available for cultivation, being the best cotton lands in the world. The bottom is being steadily reclaimed for plantations. The swamp and marsh area are occupied by cypress trees very valuable as lumber, while the drier lands are covered with cane brakes and rich forests of many species of timber trees.

Hydrography. The principal rivers of the State are the Mississippi, flowing the entire length of the western margin, the Tombigbee, Big Black, and Pearl. The Yazoo River is a distributary of the Mississippi, and the whole area of its bottoms is a mesh of interlacing streams, bayous, and oxbow lakes. About one-half the area of the State drains directly into the Mississippi River. The bottom lands of the Mississippi and other rivers are liable to overflow when the rivers are flooded. To guard against this, levees or artificial banks are built to restrain the rivers. Occasional breaks or 'crevasses' occur, causing much damage to the plantations, and in times of exceptional high water whole counties may be flooded. The injury, however, is alleviated by the fact that a layer of rich silt is left over all the bottom by the receding flood. The levees are built by the State partly from a fund derived from a special tax on the land, and partly with moneys derived from the sale of swamp lands set aside for the purpose by the General Government. See Levee, and Mississippi River.

Climate. Mississippi lies in the semi-tropical climatic belt and its climate is strongly influenced by reason of its proximity to the Gulf. The average January temperature is 55° F. in the islands off coast, 50° in the southern part of the mainland, and 40° near the northern boundary. The average July temperatures range from 82° to 80°. The average maximum shade temperature is 100°, while occasional anticyclones of winter bring a minimum temperature of 10° F. to the southern portion, and zero weather reaches below the northern quarter of the State. Such cold weather is, however, very transient. The frost-free growing season lasts seven months in the north and ten months in the south. This is of the very greatest importance to many of the crops, especially cotton. The average annual rainfall for the whole State is over 50 inches. The southern quarter has over 60 inches, this distribution being largely due to the prevailing southwestern winds, and to the influence of the Gulf. The heaviest rains occur in late winter or early spring, when the warm Gulf winds meet the cold north winds, but on the whole the precipitation is quite evenly distributed through the year. There is a slight snowfall as far south as Natchez. The atmosphere is humid at all seasons, the average annual relative humidity being not far from 70 per cent. in the northern half of the State and from 70 per cent. to 75 per cent. in the southern half. The average wind velocity for the whole year is seven miles per hour. The prevailing wind for January is north, while it is south for July. The cyclonic belt lies far to the north, and generally does not touch the State.

Flora. The result of the rather large annual rainfall and of the equable distribution through the year is best seen in the luxuriant forests, largely of deciduous trees. Over 120 species of forest trees are known. There are 15 species of oak, including the live oak. Cypress predominates on the bottom and swamp lands. The long-leafed pine is the chief forest tree of the southern half of the State. Tupelo, sycamore, persimmon, magnolia, holly, cucumber tree, sweet gum, black-walnut, and various species of hickory, elm, and maple are also present.

Geology. The Cumberland Ridge just reaches the northeast corner of the State with its outlying undulations, thus bringing a small outcrop of subcarboniferous rocks into its borders. From this corner as a focus, the younger strata dip away gently to the west and south. Cretaceous beds cover a belt radiating about 25 miles west and 75 miles south of the northeast corner. The four prominent members of the Cretaceous outcrop, in series from the oldest up, are the Coffee, Tombigbee, Rotten Limestone, and Ripley. The total thickness of these beds in the State is 2000 feet. At the close of Cretaceous time there was a deep gulf extending north to Cairo, Ill., which was slowly filled by fluvial and off-shore deposits. These beds are the Eocene and Neocene outcrops, covering the greater part of the State and extending from the Cretaceous on the northeast to the Yazoo bottoms and almost to the Gulf on the south.

Mineral Resources. Clay deposits are found widely distributed in Mississippi, and are utilized to some extent for brick. The total value of clay products in 1901 was $456,473. Marl and phosphatic rock are found extensively in many counties, but are used only locally. Hydraulic limestone and coal are found in Tishomingo County and gypsum in Rankin County, but none of these minerals are worked. Portable waters are found everywhere, except on river bottoms; even in the Rotten Limestone region artesian wells supply good water from the underlying Coffee series. Mineral springs are very numerous and are largely chalybeate. In some localities all the springs and wells are highly mineralized. The bluffs of the Yazoo and Mississippi rivers have many springs, the supply flowing through ocherous earths and pyritous clays, whence it is so strongly charged with iron sulphate as to make its use very deleterious. Many mineral springs are used locally in a medicinal way and a few have become well known resorts, as Ocean Springs, in Jackson County, and Iuka Springs in Tishomingo County.

Fisheries. The fisheries of Mississippi, never important, have decreased in recent years. In 1897, the last year for which statistics were compiled, the total value of the catch reported was $192,294, of which $110,964 represented the value of the oyster fisheries. Shrimp fishing is becoming more important. In the year mentioned 2565 men were engaged in the fishing industry.

Agriculture. The predominant industry in the State is agriculture and it is highly favored both by the nature of the climate and the soil. There is a variety of soil, including the brown loam of the central tableland, the rich, black, calcareous soil of the prairie region, the extremely fertile alluvium of the bottom lands, the sandy loam with a clayey or sandy subsoil, south of the central ridge, and the yellow loam of the northeast. They are all, except the last two, unusually rich. The most desirable region is included between the Yazoo and the Mississippi rivers. Very extensive areas are still covered with forests, but it is nearly all susceptible of cultivation. In 1900 there were 18,240,736 acres, or 61.5 per cent. of the total area, included in farms. Of this 41.6 per cent. was improved, the improved area having increased about 1,500,000 acres since 1860, while the unimproved area remains about the same. The change in the system of agriculture incident upon the cessation of slavery has decreased the average size of farms from 369.7 acres in 1860 to 82.6 in 1900. The number of colored farmers in Mississippi (128,679 in 1900), amounting to 58.3 per cent. of the total number in the State (tilling about 32.4 per cent. of the farm acreage), is much greater than in any other State. However, only 14.3 per cent. of these own their farms, as against 62.5 per cent. for the white farmers. The cash rent system is rapidly increasing, the farms rented according to this system already exceeding the number rented on the share system. Nearly two-fifths of the farms of the State are between 20 and 50 acres in area, this size of holding being very common among the negro cotton farmers. In no other State is cotton so dominant as in Mississippi. In 1899 the acreage of cotton was over half of the total crop acreage and contributed 63.6 per cent. of the value of farm crops. The State ranks third in the production of cotton. It was not until the last decade of the nineteenth century, however, that its cultivation regained the importance it held prior to the Civil War. The greatest production was reached in 1897-98, when the output amounted to 1,600,000 bales, and only once in that decade did the production fall below 1,000,000 bales. Aside from cotton the agricultural interest of the State is almost wholly centred in corn. The acreage of this crop in 1899 constituted 95.9 per cent. of the total area devoted to cereals. The acreage increased 33.4 per cent. in the last census decade. The production of oats decreased decidedly during the same period. Wheat had acquired some importance before the war, but its cultivation has almost wholly ceased. There are extensive alluvial areas that could be easily irrigated and devoted to rice culture, but little attention has been given to it. Compared with its sister State across the Mississippi River, remarkably little attention is paid to the growing of sugar cane, and the crop of late years is almost wholly converted into syrup and molasses. Small fruits and orchard fruits are not extensively raised. In the decade 1890-1900, however, the number of trees almost doubled. In the latter year the peach trees numbered 1,856,748, which was 53 per cent. of the total number. The following table shows the acreage of the leading crops for the census years indicated:

	1900	1890
Corn	2,276,313	1,706,352
Oats	87,066	133,361
Sweet potatoes	38,169	
Hay and forage	99,261	66,159
Cotton	2,897,920	2,883,278
Pease	69,490	

Stock-Raising. As in other States where cotton is predominant, stock-raising does not receive much attention. The total number of domestic animals has greatly increased over 1850, but the gain since 1870 is very marked. As compared with the latter year the horses and mules have increased in number about 2½ times, and swine, dairy cows, and other neat cattle have also gained. The decade 1890-1900 is characterized by a marked falling off in the number of sheep, and by an increase in the number of horses and mules. The following table gives the number of domestic animals on farms for the years indicated:

	1900	1890
Dairy cows	299,318	310,159
Other neat cattle	574,038	604,619
Horses	229,311	155,050
Mules and asses	216,032	156,755
Sheep	236,470	451.779
Swine	1,290,498	1,163,141

Manufactures. The manufacturing industry is probably less developed in Mississippi than in any other of the older States of the Union. On the other hand, the rate of the recent increase has been greater than that of most of the other States. Prior to 1837 some prominence had been attained in the manufacture of cotton, leather, liquor, and flour; but the financial panic of that year left these industries in a bad condition. There was a decided revival in the decade following 1850; but because of the Civil War and the depression following it, manufacturing remained almost stationary for twenty years. In the decade 1880-1890 the value of the manufactured product increased 148.8 per cent. and in the decade 1890-1900 increased 116.1 per cent. The value of the product in 1900 was $40,431,000, and 26,418 wage-earners, or 1.7 per cent. of the population, were engaged. Having no large transportation centre, and the water power and mineral resources being of little consequence, the State is at a comparative industrial disadvantage. But the products of her cotton fields and forests supply an abundance of raw materials. The recent development is largely in response to the encouragement extended by the State, through a law passed in 1882 exempting machinery of factories from taxation for ten years.

From the table appended the importance of the industries dependent upon cotton may be seen. The largest of these—the manufacture of cottonseed oil and cake—experienced an increase during the decade of 177.6 per cent. The State contained the first mill of this kind erected in the United States. A less absolute but much larger per cent. of increase was made in cotton-ginning. The largest increase in the cotton goods product was in the period 1870-90; the value in 1870 was only $234,400.

Forests and Forest Products. The State's timbered area in 1900 was estimated at 32,300 square miles, or seven-tenths of its area. The southern third and a narrow strip extending northward consists of pine, the Yazoo bottom of cypress, and most of the remaining portion of hard woods. Very little progress had been made in the exploitation of these forests until the last decade of the nineteenth century, in which period the value of lumber and timber products increased 171.3 per cent. (See table below.) In 1900 over three-fourths of the cut consisted of yellow pine, oak being the most important of the hard woods. The Pascagoula River and Hancock County districts, in the southern part of the

Comparative Summary of Eight Leading Industries

INDUSTRIES	Year	Number of establishments	Average number wage-earners	Value of products, including custom work and repairing.
Total for selected industries for State	1900	3,205	20,072	$31,372,422
	1890	963	9,584	12,638,534
Increase, 1890 to 1900	......	2,242	10,488	$18,733,908
Per cent. of increase	......	232.8	109.4	148.2
Per cent. of total of all industries in State	1900	67.2	76.0	77.6
	1890	56.7	66.3	67.6
Oil, cottonseed and cake	1900	41	1,521	$6,681,121
	1890	13	891	2,406,628
Cotton, ginning*	1900	1,901	2,422	2,214,949
	1890	130	547	130,387
Cotton goods	1900	6	1,675	1,472,835
	1890	9	1,154	1,333,398
Flouring and grist mill products	1900	225	208	932,816
	1890	408	777	1,249,669
Lumber and timber products	1900	844	9,676	15,656,110
	1890	366	4,427	5,770,387
Lumber, planing mill products, including sash, doors and blinds.	1900	34	748	1,315,775
	1890	8	92	136,450
Cars and general shop construction and repairs by steam railroad companies	1900	9	1,534	1,326,401
	1890	5	1,076	1,329,549
Turpentine and rosin	1900	145	2,288	1,772,435
	1890	24	620	282,066

* Does not include many ginneries operated in connection with saw, grist, and cottonseed oil mills, or for the use exclusively of plantations on which they are located.

State, showed most activity. The manufacture of turpentine and rosin was not important prior to the last decade of the nineteenth century, but made large gains during that period, as will be seen from the above table.

Transportation. The railroad mileage increased from 862 miles in 1860 to 1127 in 1880; to 2470 in 1890, and to 2934 in 1900. Among the important lines are the Illinois Central, the Southern, the Louisville and Nashville, the Mobile and Ohio, the New Orleans and Northeastern, and the Queen and Crescent. There is a board of railroad commissioners which is empowered to revise, fix, regulate, and approve the rates of charges of railroad companies. Having a considerable Gulf coast line and being bordered upon one side by the Mississippi River, the State has the advantages of navigation afforded by these waters. Of the two customs districts, Pearl River and Vicksburg, the former only is important in regard to foreign trade.

Banking. The Bank of Mississippi at Natchez was chartered in 1809. In 1818 it was created a State bank, with a capital of $3,000,000, the State participating in its management, and pledging to it a monopoly of the banking business of the State until 1840. In 1830, however, the Legislature broke the pledge by establishing the Planters' Bank of Mississippi, with a capital of $3,000,000, and making it the financial agent of the State. This forced the first bank into liquidation. For a few years the Planters' Bank had a practical monopoly of the banking, but from 1835 new banks followed in rapid succession. The most daring venture was the organization of the Mississippi Union Bank in 1838, with a capital of $15,500,000, which made it the largest State bank in the United States at that time. These bold undertakings in the very midst of a financial crisis could but lead to one result. There were numerous failures in 1838-45; in 1855 there was but one chartered bank in the State. A revival came in the eighties, when national banks were introduced. Stringent banking laws have given to the State banks the confidence of the people, and their number has increased tenfold since 1888. In 1902 there were 17 national banks with a capital of $1,530,000, surplus $549,000, cash, etc., $561,000, loans $4,957,000, and deposits $5,257,000; 92 State banks with capital of $5,468,800, surplus $971,857, cash, etc., $1,550,929, loans $19,467,101, and deposits $16,297,325. There are no savings banks in the State.

Finance. The early financial history of Mississippi is closely connected with the organization of the banks in the State. A large State debt of $2,000,000 was created in 1830 in order to acquire shares in the Planters' Bank and in 1838 $5,000,000 for shares of the Union Bank of Mississippi. The financial crisis of the thirties brought the banks to insolvency in 1840; this involved the State in an enormous debt. Infringements upon the Constitution in the floating of the debt led to its repudiation by a popular vote in 1852, which was finally disposed of by a clause in the Constitution of 1875. The Civil War again involved the State in serious financial difficulties and also reduced the general economic condition of the State. The 'carpet bag' régime which followed aggravated the situation: the expenditures grew from about $500,000 in 1867-69 to more than $1,500,000 in 1871-75, and the tax rate was increased in these years proportionately from 1 mill to 14 mills. An organized protest from the taxpayers in 1874 was the result, and a gradual diminution of the State debt, expenditures, and rate of taxation followed. In September, 1901, the payable debt was $676,799 and the non-payable debt, for the interest on which alone the State is responsible, was $2,210,227, making the total indebtedness $2,887,026. Total receipts for the year ending September 30, 1901, were $2,436,048; total disbursements, $2,229,996, leaving a surplus of $206,052, and the cash balance was $828,453. The main source of income was a direct State property tax which yielded almost 85 per cent. of the total income; of the disbursements 30 per cent. were for common school purposes and 15 per cent. for redemption of the State debt.

POPULATION. The following figures show the growth of population: 1800, 8850; 1830, 136,621; 1850, 606,527; 1860, 791,305; 1870, 827,922; 1880, 1,131,597; 1890, 1,289,600; 1900, 1,551,270. The rank of the State was advanced from 20 in 1810 to 14 in 1860, and receded to 20 in 1900. The greatest absolute gain was made in the decade 1870-80. In the last decade the increase was 20.3, or nearly the same as for the United States. The foreign-born population in 1900 numbered only 7981, or less than that in any other State except the two Carolinas. The colored population in 1900 numbered 907,630, or about 58 per cent. of the total population, which is a larger per cent. than is found in any other State, although Georgia contains a larger absolute number. The per cent. of increase for the decade 1890-1900 was 22.2 for the negroes and 17.7 for the whites. The negroes are most numerous in the western or Mississippi Valley counties, in some of which they are five times as numerous as the whites. The Indians number about 2200; they are of the Choctaw tribe. Only 10 places in the State exceed 4000 in population, and together constitute but 5.3 per cent. of the total number of inhabitants, being the smallest per cent. of urban population found in any State. The largest towns in 1900 were: Vicksburg, 14,834; Meridian, 14,050; and Natchez, 12,210.

EDUCATION. In 1846 a law providing for a public school system was passed. Although educational matters have shown signs of improvement of late, they still suffer from causes peculiar to the South, and the present facilities are far from adequate. Like most Southern States, Mississippi has no compulsory attendance law, and there is a complete separation of the races. The census of 1900 gives Mississippi a total school population (five to twenty years of age) of 633,026, including 379,873 colored. The illiterate population amounted to 351,461, or 32 per cent. of the total population of the State ten years of age and over, the native whites numbering 36,038, or 8 per cent. of the total native white population, and the colored 314,617, or 49.1 per cent. of the entire colored population. The total enrollment in 1900 was about 387,500, and the average attendance 258,995—133,098 whites and 125,897 colored, the proportion of school attendance to school population in the case of the whites and the colored being about 53 and 33 per cent. respectively. The length of the school term in 1900 was 105 days, as compared with about 86 days in 1889-90. Out of the 8515 teachers employed in the public schools in 1900, 5147 were white and 3368 colored. The proportion of male teachers fell off from 61.2 per cent. in 1879-80 to 39.4 in 1898-99. The State Board of Education is composed of the Secretary of State, Attorney-General, and the Superintendent of Education. This board and the Senate appoint school superintendents in each county. Before 1886 licenses to teach were granted practically without any examinations. In that year a law was passed providing for uniform State examinations, payment of salaries according to licenses held by the teachers, and for the establishment of teachers' institutes. The maintenance of the public school system in 1900 cost the State $1,472,432, or 95 cents per capita of population. The State taxes which formerly yielded the bulk of the revenue for school purposes have been decreased and now amount only to about one-half of the total revenue, the rest being derived chiefly from local taxes. In 1899-1900 there were 4052 secondary students (including 394 colored) attending the public high schools; in the same year 1977 students (including 166 colored) were in private high schools. The chief higher educational institutions of the State besides the State University, near Oxford, and the Agricultural and Mechanical College at Agricultural College, are the Mississippi College (Baptist) at Clinton, Millsaps College (Methodist) at Jackson, Whitworth Female College at Brookhaven, and Woman's College at Oxford. The principal higher educational institutions for the colored youth are Tougaloo University at Tougaloo, near Jackson, Rust University at Holly Springs, the State Normal School at Holly Springs, and Alcorn Agricultural and Mechanical College at Westside.

CHARITABLE AND PENAL INSTITUTIONS. The State institution for the deaf and dumb (white and colored) is located at Jackson; and the school for the blind (white) is also at that place. There are two State hospitals for the insane, one at Jackson and the other at Meridian. The State aids in the support of hospitals at Vicksburg and Natchez. The penitentiary is located at Jackson. Most of the prisoners are employed in farm labor, or in the production of articles of necessity in the prison administration. Some of the prison farms are owned by the State, others are rented. The farm labor system is considered very satisfactory and does not incur any financial loss. Prisoners committed to the county jails are also put to labor upon farms.

RELIGION. Over half of the Church population of the State belong to the Baptist Church, and the majority of the remainder to the Methodist. Of the lesser denominations the more important are the Presbyterian, Catholic, Christian, and Protestant Episcopal.

GOVERNMENT. The present Constitution was adopted in 1890. If two-thirds of the members of each House vote each day for three several days in favor of a proposed amendment, the same will be submitted to the people of the State, and it becomes a part of the Constitution if approved by a majority of the qualified electors voting. Voters must have resided in the State two years, in the election district one year (six months for ministers of the Gospel), and have paid taxes legally required. Registration is necessary, and the would-be voter, in order to register, must be "able to read any section of the Constitution of the State; or he must be able to understand the same when read to him, or give a reasonable interpretation thereof."

LEGISLATIVE. Representatives and Senators are elected for terms of four years. The regular session of the Legislature meets on the first Tuesday after the first Monday of January, every fourth year after 1892; special sessions of the Legislature are held on the corresponding day every fourth year, beginning with 1894, unless sooner convoked by the Governor. Special sessions cannot continue longer than thirty days unless the Governor extends them by proclamation. Compensation is prescribed by law, but at the special session not more than $5 per day and mileage can be allowed. Revenue bills and bills providing for the assessment of property for taxation shall not become laws except by a vote of at least three-fifths of the members of each House present and voting. Vetoed bills or parts of appropriation bills may be carried over the Governor's head by a two-thirds vote. General elections of State and county officers are held on the first Tuesday after the first Monday in November.

Mississippi sends eight members to the United States House of Representatives. The capital is Jackson.

EXECUTIVE. The Governor and Lieutenant-Governor are elected for four years, and the former cannot be his own successor. The president of the Senate *pro tem.* and the Speaker of the House are in the line of succession to the Governorship in case of vacancy in that office. The Secretary of State, Treasurer, and Auditor are elected for terms of four years, and the two last named cannot immediately succeed themselves or each other.

JUDICIARY. The Supreme Court consists of three judges who are appointed by the Governor and the Senate for terms of nine years. Judges of the Circuit Courts and Chancery are similarly appointed for terms of four years. A clerk of the Supreme Court and an Attorney-General are elected for terms of four years. A district attorney for each Circuit Court district is selected as determined by law for a term of four years.

LOCAL GOVERNMENT. In each county an assessor, surveyor, coroner, sheriff, and treasurer are elected for four years, the two latter not being eligible to succeed themselves or each other. Each county is divided into five districts, in each of which a resident freeholder is selected as a member of the board of supervision of the county. This board has jurisdiction over roads, ferries, and bridges. Justices of the peace and constables are elected in each district for terms of four years.

MILITIA. According to the census of 1900 the population of militia age in the State amounted to 289,599. The aggregate strength of the militia in 1901 was 1373 men.

HISTORY. In 1539 Hernando de Soto, with a band of Spanish adventurers, crossed the northeastern part of what is now the State, and in the early part of 1541 reached the Mississippi River, near the present site of Memphis, Tenn. In 1673 the French explorers Joliet and Marquette, passing down the Mississippi, sailed as far as the mouth of the Arkansas. In 1681-82 La Salle sailed down the river to its mouth, and, taking formal possession for the King of France, Louis XIV., named the country Louisiana after him. The first attempt to found a colony was made in 1699 by Iberville, who brought 200 immigrants from France to Biloxi, on the eastern shore of the Bay of Biloxi. This was the germ of the subsequent settlement of New Orleans (1718). In 1716 Iberville and Bienville, with a large body of immigrants and a military force, ascended the Mississippi to the present site of Natchez, where they founded a settlement named Rosalie, in honor of the Countess of Pontchartrain. Attempts to plant colonies were soon after made at Saint Peter's (on the Yazoo), at Pascagoula, and elsewhere. The small colonies in Mississippi, however, grew but slowly, New Orleans attracting many of the settlers. Under Bienville, who was Governor of Louisiana from 1718 to 1724, friendly relations with the Indians were preserved; but under his successor, Perriez, the hostility of the Natchez Indians was awakened. In 1729 a sudden assault was made on the line of French posts. At Fort Rosalie 200 persons were killed and more than 500 were taken prisoners. In the smaller settlements many of the inhabitants were butchered. Retribution followed swiftly. Aided by the Choctaw tribes, the French succeeded in defeating the Natchez, the greater part of whom fell in battle, while most of the survivors were sold as slaves. When Bienville became Governor again in 1733 he found the colony at war with the Chickasaws, allies of the English, and the conflict continued for several years. There was a peace, followed in 1752 by another Indian war, instigated, it was said, by English adventurers. The French commander sought to retaliate, but without much success. Under French rule the country failed to prosper, and the number of inhabitants at the end of the period was less than one thousand. In 1763 France ceded its possessions east of the Missisippi to Great Britain, which received also Florida from Spain. Immigrants flocked thither in considerable numbers from the English colonies on the Atlantic Coast as well as from Scotland.

That part of the territory south of a line drawn through the mouth of the Yazoo River eastward to the Chattahoochee had been erected into the Province of West Florida soon after the establishment of English rule in 1763. In 1781 West Florida was conquered by Spain, and passed under Spanish rule. By the Peace of Paris, in 1783, the thirty-first parallel of latitude was recognized as the southern boundary of the United States, and Spain was therefore considered as an intruder in that part of Mississippi to the north of the line. By the treaty of 1795 between the United States and Spain, Spain ceded her claims to the disputed territory, but continued to occupy it until 1798. In 1798 the Territory of Mississippi was extended to Tennessee, and in 1813 the district south of 31° and east of the Pearl River, taken from Spain, was annexed. At first a Governor and three judges appointed by the President were the chief authorities for the government of the Territory, but in 1800 provision was made for a legislature, the Lower House consisting of nine members representing the three counties into which the Territory was then divided. In 1802 Washington became the capital of the Territory. In the Creek War Mississippi took a conspicuous part, several hundred inhabitants of the Territory being massacred at Fort Mims (q.v.). In the War of 1812 the Territory was well represented at the battle of New Orleans. In March, 1817, Congress passed an enabling act for the admission of Mississippi to the Union, and the State was formally admitted December 10, 1817. The most notable features of the first Constitution of Mississippi were the high property qualifications for holding office, the short tenures of offices, and the large appointing power of the Governor and Legislature. The first Governor was David Holmes, and during his administration the capital was permanently located at Jackson, near the headwaters of the Pearl River.

By the treaties of 1830 and 1832, with the Choctaw and Chickasaw Indians, who inhabited all the northern part of the State, the lands occupied by those tribes were incorporated into the State, subjected to its jurisdiction, and thrown open to settlement by the whites. In 1832 a new Constitution was adopted for the State. Its most notable features were the abolition of property qualifications for office-holding, the requirement that all officers, both State and county, including the judges, should be chosen by the people. It also created a High Court of Errors and Appeals and abolished the office of Lieutenant-Governor. During the 'flush times' of this period Mississippi, like many other Southern and Western States, fell a victim to financial extravagance and speculation, one of the results of which was the repudiation by the State of five million dollars in bonds which it had issued for the purpose of acquiring stock in the Union Bank. The Supreme Court of the State decided in favor of the liability of the State for the payment of the bonds, but the people, in an election in which this was the main issue, decided otherwise, and the Legislature refused to make any appropriation for the purpose. A little later two million dollars of the Planters' Bank bonds were repudiated under similar circumstances. Upon the outbreak of the Mexican War Mississippi was called upon to furnish one regiment of volunteers, but more than enough men for two regiments responded. The first regiment was commanded by Col. Jefferson Davis, who won great distinction at the battle of Buena Vista. In 1851 occurred the first important struggle in Mississippi over the slavery question, which had become serious on account of the enactment by Congress of the so-called Compromise Measures of 1850. The Democratic Party in Mississippi adopted a platform favoring secession and nominated Jefferson Davis for Governor, while the Whigs declared their attachment to the Union and nominated United States Senator Foote as their standard-bearer. The Union Party won a substantial victory and the slavery question rested until 1856, when the question of secession was again agitated on account of the fear that Frémont would be elected President. The news of John Brown's raid in 1859 led the Legislature to appropriate $150,000 for the purchase of military supplies and for the organization of the militia. It was left, however, for the election of Lincoln to bring the secession movement to a head. An ordinance of secession was passed on January 9, 1861, by a convention, by a vote of 84 to 15, and the State Constitution was amended to bring it into conformity with the Constitution of the Confederate States. During the Civil War the people of Mississippi suffered greatly, and in 1863 and 1864 especially, a large part of the State was devastated by the contending armies. Almost all semblance of government had disappeared. (For the military operations in Mississippi, see CIVIL WAR; IUKA; CORINTH; VICKSBURG.) In June, 1865, Governor Clarke was removed and a provisional Governor was appointed by President Johnson. On July 21st, slavery was abolished by a State convention, and on the following day the ordinance of secession was repealed. In December the State Government was given over into the hands of the duly elected officers, who proceeded to reorganize the State militia for the public defense, a course in which they were upheld by the President. Limited civil rights were conferred on the freedman, but the Fourteenth Amendment was rejected in January, 1867, and in March the State came under military government.

In January, 1868, a convention framed a new Constitution, conferring the suffrage on negroes. The conservative element vehemently opposed the Constitution because of the severe penalties it imposed on members of the Government and armies of the Confederacy, and brought about its rejection at a popular election. Resubmitted in November, 1869, with the test oath and disfranchisement clauses to be voted on separately, the Constitution was adopted almost unanimously, while the independent clauses were as unanimously rejected. In January, 1870, the Fourteenth and Fifteenth Amendments were ratified, and on February 17, 1870, the State was readmitted into the Union. The period before 1875 was marked by a spirit of bitter hatred between the old Democrats and the newly enfranchised negroes, together with their leaders, the white Republicans. The feeling of animosity was intensified by the unhappy financial condition of the State, and by the dishonesty and incapacity of its officers, very many of whom were ignorant negroes, the tools of scheming politicians. Bloody collisions between whites and negroes were frequent in 1874 and 1875, in one of which, at Vicksburg, 29 negroes and several whites were killed. The desperate attempts of the 'conservatives' to restore the supremacy of the white population proved finally successful in 1875, when the Democratic Party captured the Legislature. The Republican Governor and Lieutenant-Governor and the Superintendent of Education were driven from office by impeachment or threats of impeachment, and since then the Democratic Party has retained an overwhelming predominance. The twenty years after 1865 were a period of economic depression, the result of the havoc wrought by the war and of the difficulties encountered in readjusting production to the new conditions of labor, but later the rise of manufactures marked the beginning of a bright era. The racial problem assumed a momentous aspect in 1844, when a vast migration of colored men into the swamp lands of Mississippi seemed to threaten the rise of a negro State within the State of Mississippi. The policy of fortifying the white race in power was continued. By the Constitution of 1890 the suffrage was restricted to those able to read a section of the Constitution, or to interpret any passage, if read aloud, a provision aimed against the negro voter, and sufficiently successful in attaining its aim. In national elections Mississippi has been a Democratic State with the exception of the year 1840, when it voted for the Whig candidate, and of 1872, when its vote was given to Grant. In 1864 and 1868 its vote was not counted. The Governors of Mississippi have been the following:

TERRITORIAL

Winthrop Sargent	1798-1801
John Steele, act. gov.	1801
William C. C. Clairborne	1801-03
Cate West, act. gov. and governor *ad int.*	1804
Robert Williams	1805-09
David Holmes	1809-17

STATE

David Holmes	Democrat-Republican	1817-20
George Poindexter	Democrat	1820-22
Walter Leake	"	1822-25
Gerard C. Brandon (*ad int.*).	"	1825
David Holmes (*ad int.*)	"	1826
Gerard C. Brandon	"	1827
Gerard C. Brandon	"	1828-32
Abram M. Scott	"	1832-33
Charles Lynch (*ad int.*)	"	1833
Hiram J. Runnels	"	1833-35
John A. Quitman	Whig	1835

Charles Lynch	Democrat	1836-38
Alexander G. McNutt	“	1838-42
Tilghman M. Tucker	“	1842-44
Albert G. Brown	“	1844-48
Joseph W. Matthews	“	1848-50
John A. Quitman	“	1850-51
John J. Guion (*ad int.*)	“	1851
James Whitfield (*ad int.*)	“	1851
Henry S. Foote	Union Democrat	1852-54
John J. McRae	Democrat	1854-58
William McWillie	“	1858-60
John J. Pettus	“	1860-64
Charles Clarke	“	1864-65
W. L. Sharkey	(provisional)	1865
Benjamin G. Humphreys	Democrat	1865-68
Adelbert Ames	(provisional)	1868-70
James L. Alcorn	Republican	1870-71
Ridgley C. Powers (acting)	“	1871-74
Adelbert Ames	“	1874-76
John M. Stone	Democrat	1876-82
Robert Lowry	“	1882-90
John M. Stone	“	1890-96
Anselm J. McLaurin	“	1896-1900
A. H. Longino	“	1900 —

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MISSISSIPPI, University of. A State university chartered in 1844 and opened in 1848, at Oxford, Miss., and maintained until 1880 by annual grants by the Legislature. From 1861 to 1865 exercises were suspended owing to the resignation of the faculty. In 1872 the policy of separate schools, with optional studies and with courses leading to other degrees besides that of B.A., was adopted. The work of the university is organized in seven undergraduate courses, partially elective, leading to the bachelor's degree in arts, science, pedagogy, philosophy, mining, and both civil and electrical engineering. The university also maintains a law school and a summer school, and confers the degree of M.A. and Ph.D. In 1894 the preparatory education was discontinued at the university; and the requirements for admission are those adopted by the Association of Colleges and Preparatory Schools of the Southern States, of which the university is one of the original members. Students from approved high schools are admitted without examination. Since 1882 women are admitted to the classes, but are not permitted to lodge on the campus. The faculty consisted in 1902 of 20 instructors, and the students numbered 243. The library contained 19,000 volumes. The total endowment was $780,000, with a gross income of $47,640. The buildings and grounds were valued at $250,000, the total value of the property being $1,070,000.

MISSISSIPPI AGRICULTURAL AND MECHANICAL COLLEGE. A State institution at Agricultural College, Miss., founded in 1880 on the Federal land grant of 1862. It has a preparatory department and three courses of instruction, agricultural, mechanical, and textile, with provision for graduate work and summer sessions. It confers the degrees of Bachelor and Master of Science, and the honorary degree of Master of Progressive Agriculture. Tuition is free to students residing in the State; others pay an annual fee of $20. The college has a military organization, and all students are required to wear a prescribed uniform within five miles of the college buildings. The attendance of women is permitted. In 1902 the faculty and officers of administration numbered 41, and the attendance was 250 in the preparatory department and 354 in the academic. The library contained 8958 bound volumes. The total value of the college property in 1902 was $455,335, and its income from all sources was $196,841.

MISSISSIPPIAN SERIES. A group of limestones outcropping in the upper Mississippi Valley, and also in Arkansas and Texas. It is the equivalent of the Lower Carboniferous in the Appalachian States. See Carboniferous System.

MISSISSIPPI CATFISH. The largest of North American catfish (*Ameiurus lacustris*, or *Ictalurus ponderosus*), which may reach 150 pounds in weight, is sold in all the markets of its region, and is regarded by many as good food. It inhabits the Great Lakes, and all the larger waters of the Saskatchewan, Mississippi, and Missouri valleys. In color it is greenish slate, growing darker with age, the sides paler, without spots. (See Catfish.) Among its many local names in the South are ‘flannel-mouth’ and ‘mud cat.’

MISSISSIPPI COLLEGE. An institution of learning at Clinton, Miss., founded in 1826. It has a preparatory and a collegiate department with an attendance in 1902 of 292 students and a faculty of nine instructors. The library contained about 3000 volumes. The college buildings were valued at $40,000, and the property of the institution at about $110,000. The endowment was $62,000, and the gross income $12,000.

MISSISSIPPI RIVER (Algonquin *Missi Sepe*, great river; literally, father of waters). The principal river of the North American continent; counting as a part of it the longest branch of the drainage system, the Missouri, which far overtops the central stem, it is the longest river in the world. Its course is entirely within the United States. Popularly, the name is applied to the main north and south stem of the system, which rises in the highlands of Minnesota, in Elk Lake, just south of Lake Itasca, in latitude 47° 10′ N., longitude 95° 10′ W. Its sources are 1462 feet above the Gulf of Mexico, into which it empties. Its general course is southerly, with numerous windings, giving it a length of about 2500 miles to its mouth in latitude 29° N., longitude 89° 15′ W. Following up the Missouri branch, and the Jefferson to its head in southwestern Montana, the total length of the Mississippi-Missouri, from its source to the Gulf of Mexico, is fully 4200 miles. The Mississippi and its branches drain the entire western slope of the Appalachian, and nearly the whole eastern slope of the Rocky Mountain system within the United States. Its drainage basin covers an area of about 1,257,000 square miles, or over two-fifths of the total area of the United States, exclusive of Alaska. It is navigable to the Falls of Saint Anthony at Minneapolis, 2161 miles, and by smaller boats above the falls. Its tributaries large enough to be mapped on a chart of comparatively small scale number 240, among which are 45 at present navigable. The most important of its tributaries navigable by large or small boats are the Missouri, navigable to the Great Falls in Montana, 2300 miles; the Arkansas, navigable to Wichita, Kan.; the Red River, navigable to Gainesville, Tex.; the Ohio, navigable to Pittsburg, Pa., 963 miles. The total navigable length of the Mississippi and its tributaries is over 14,000 miles following the river windings, and 9000 miles measured in straight lines. The river forms a portion of the boundaries of ten States, having the southern part of Minnesota, and the States of Iowa, Missouri, Arkansas, and most of Louisiana on the west bank; and Wisconsin, Illinois, Kentucky, Tennessee, and Mississippi on the east. Twenty-one States and Territories are intersected by the navigable waters of this great system. The chief cities situated on its banks are New Orleans, Natchez, Vicksburg, Memphis, Cairo, Saint Louis, Quincy, Burlington, Rock Island, Davenport, Dubuque, Saint Paul, and Minneapolis.

Description of Natural Features. The sources of the river are in Lakes Elk, Itasca, Bemidji, Cass, Winnibigashish, Fishing, Leech, and Mud, lying among hills of drift and boulders, in the midst of pine forests and marshes. From Lake Itasca to Bemidji the stream is about 12 feet wide and 2 feet deep. It issues from the latter 120 feet wide, flowing to Cass Lake, which it leaves with a width of 172 feet, contracting and deepening below as it flows through marshes till it comes to a junction with Leech River, where it has rapids of 20 feet, called the Falls of Pokegama, 270 miles from the source. To this point small steamers navigate. The total descent to this point is 324 feet. Thence to the mouth of Crow Wing River, 247 miles, the river falls about one foot per mile. It is narrow through this distance and winds through oak and maple forests, marshes, and sandy hills, where the formation of rock is overlaid with the gravel and boulders of the drift period. Below, the river passes through a prairie country down to Elk River, and is stained slightly with the brownish color given by piney and marshy vegetation; 133 miles below the Crow Wing are the Sauk Rapids, one mile long, where Potsdam sandstone first outcrops on its banks and extends from that point down to Dubuque and Rock Island. The Falls of Saint Anthony at Minneapolis are 18 feet high, with a breadth of 1200. Up to this point the river is navigable for commercial purposes, though practically Saint Paul is the head of navigation. The river widens below Saint Paul into what is called Lake Pepin, studded with islands. From the Falls of Saint Anthony to the junction with the Missouri, near Saint Louis, the river flows through a valley of great beauty and uniform fertility. Cliffs and rocky bluffs, from 200 to 300 feet high, give a picturesque character to that part of the valley below Rock Island, where it strikes the Carboniferous strata, the geological formation of the valley, to about 100 miles below the Missouri. At Rock Island, 381 miles below Minneapolis, there is a small fall, but the river is navigable between the right bank and the island 3 miles long with the aid of a canal constructed by the Government. Similar improvements have been made at the rapids near the mouth of the Des Moines River, so that the navigation of the Upper Mississippi is uninterrupted below the Falls of Saint Anthony. The surging, muddy, eddying waters of the Missouri, for a long distance, flow side by side with the clearer waters of the Mississippi, joining but not blending, till thrown together by many a crook and turn and eddy between the bluffs of the great valley. Before the Ohio River joins them, the union is complete; but the waters remain turbid to their junction with the sea, and, where joined by the currents of the Arkansas and Red rivers, take a more reddish color.

From the Falls of Saint Anthony downward level flood plains or bottom lands begin to appear adjacent to the river on one or both sides, becoming gradually lower as we proceed down the stream. This vast flood plain lies from 300 to 500 feet below the surface of the bordering uplands. Above Cape Girardeau, Mo., 30 miles above the mouth of the Ohio, these flood plains are still clearly above the level of the river, though they are sometimes subject to inundations. These bottom lands, both high and low, are of the highest order of fertility, those farthest north being used for cereals. Some of the largest have been reclaimed from liability to overflow by dikes across the water-channels by which they were inundated. Sny Island, in Pike County, Ill., so reclaimed, is 40 miles in length. The American Bottom extends from the mouth of the Missouri 90 miles down the river on the east side with an average breadth of 6 miles. Below Cape Girardeau, on the west side, the whole country down to the Gulf is bottom land for an average width of 50 miles. But throughout this stretch, from Cairo, at the mouth of the Ohio, to the Gulf, the river flows in a channel on the summit of a low ridge, the land sloping gradually away from the banks on either side, so that the whole or the greater part of the bottom lands lie below the level of the river surface. Every water-course in this bottom land, whether stream or bayou, flows in a similar channel, on a ridge created by its own deposits. The slopes of these ridges are the cultivable lands of this region. The intervening areas are mainly marshy, and in Louisiana are entirely marsh, rising but a few feet above the Gulf level. From Cairo, Ill., as far south as Memphis, Tenn., the river impinges on the east bank, leaving its bottom land on the west side. Thence southward as far as Natchez, Miss., there is a broad extent of bottom land on the east side, known as the Yazoo Bottoms, which are intersected by many bayous, the chief of which is the Yazoo. On the west side is also a wide bottom land, which extends almost continuously to the Gulf of Mexico, widening southward. On the east side the river impinges against the bluffs for some distance south of Natchez, but below the boundary between Mississippi and Louisiana bottom land appears again on this side of the river and rapidly widens toward the Gulf. The entire valley of the lower section of the river is margined by bayous or arms, which leave the main stream to rejoin it farther down, and considerable parts of Louisiana, Mississippi, and Arkansas are intersected by them.

Another characteristic feature of the adjacent bottom lands are the countless crescent-shaped lakes, oxbows, as they are called, which line the river on either side, but are partly or wholly separated from it. These are formed by cut-offs. The river flows in great curves, which constantly tend to increase in diameter. Thus they encroach on one another, and finally at flood-time, when the impact of the current becomes strongest, cut through the narrow neck separating adjacent curves, thus shortening the course, and leaving the loop as a crescent-shaped lake.

Below the mouth of Red River, the Mississippi divides into branches, the Atchafalaya, Plaquemine, and Lafourche bayous being examples of such distributaries. In the lowlands near its mouth below New Orleans it divides still further, entering the Gulf by means of several passages known as passes, the principal of which are the Southwest and South Passes and the Pass à l'Outre. At the mouth of each of these passes, except the South Pass, where jetties have been built to prevent it, is a bar formed by the deposit of silt from the river on meeting the quiet waters of the Gulf. The quantity of sediment brought down by the river is enormous, being below the Missouri .0035 of the volume of water, which latter amounts to 145 cubic miles per annum. The area of the delta of the river is estimated at over 12,000 square miles. It is everywhere threaded with interlacing bayous and navigable channels, placing every cultivable acre of its lands near to steamboat navigation, one-tenth of the land being estimated as taken up by such water surfaces or channels. The timber in the delta region is mostly sycamore, cypress, and oak—the sycamore margining the streams, the cypress occupying the swamps, and the oaks the lands not liable to frequent inundation.

The climate of the Mississippi Valley ranges from semi-arctic to semi-tropical. At the Falls of Saint Anthony, and above, spirit thermometers must be employed to register the extreme low temperature in winter, which often touches 40° F. below zero; and yet the extreme of summer heat is but a few degrees less at Saint Paul than at New Orleans, 97° to 104°. The range between the extremes is about 65° more at the source than at the mouth of the river. The annual mean temperature at New Orleans is 69°; at Cairo, 45°.

Floods. The mean annual precipitation over the entire basin is estimated by Humphreys and Abbot at 29.8 inches. The estimated discharge of the river is 610,000 cubic feet of water per second. The precipitation, however, is subject to great variations at different seasons—which fact, together with the sudden melting of the stored-up snow in the spring, causes considerable variations in the volume of the various tributaries. Fortunately, all are not at their highest at any one time; for if they were, probably nothing artificial could resist the force of the accumulated waters. The regions from which the floods come are so far apart and differ so widely in climate that, as a rule, one flood passes before another comes. As it is, the volume of the floods that come is sufficient to make a variation of over fifty feet between high and low water marks. The greatest difference recorded at Cairo is 53.2 feet, and at Vicksburg there has been known to be a difference of 55 feet. At flood times the water at Cairo is 320 feet above the mean tidewater at the mouth of the river. At low water it is 274 feet above mean tide. This fall in a channel 1097 miles long fully accounts for the great velocity of the current, which varies from three to six feet a second, according to existing conditions. In high floods the river formerly overflowed nearly all the surface between the mouth of the Ohio and the Saint Francis River in southeastern Missouri and eastern Arkansas, filling the lakes and lagoons of that region, and then flowing by numberless channels to the White River and Arkansas, the Bayou Macon, Washita, Red, and Atchafalaya rivers into the Gulf. Even since the levees have been built (see below), the river sometimes breaks through these; its waters then flow down the slope of its ridge, and collect in the lowlands, forming lakes. These rise gradually, extending up the slope of the ridge, and so flooding the farms and plantations. In the spring of 1897 a flood created many crevasses in the levees and swept over a great tract of territory, causing heavy losses in stock, crops, and other property. On March 14th the water reached the highest point ever recorded at Memphis, Tenn. On April 5th, according to an official statement of the Department of Agriculture, the total area under water was 15,800 square miles, the submerged land being for the most part in Missouri, Mississippi, Tennessee, Arkansas, and Louisiana. Further damage was subsequently caused by breaks in the levee at Biggs and La Fourche Crossing, La., which resulted in the flooding of large tracts of land below Vicksburg, Miss. It was estimated toward the close of April that 20,000 square miles, containing 46,936 farms, according to the census of 1890, were under water. According to some estimates, from 50,000 to 60,000 persons suffered serious losses from the floods. The Citizens' Relief Committee of Memphis cared for large numbers of the refugees. The destitution was so widespread, however, that President McKinley sent a special message to Congress, which appropriated $200,000 for the immediate relief of the sufferers.

Early Measures of Relief. The first attempt to guard the lower part of the valley against the river floods was made early in the eighteenth century, when the French Governor, De la Tour, ordered embankments for the protection of New Orleans. In the old slave days, when labor was cheap, each planter erected barriers on or near the river front of his own ground. These were called *levees*, and were simply artificial mud banks, sometimes strengthened with ribs or foundations of timber, sometimes not. So long as they were watched carefully and kept in good repair, they afforded comparative safety to the grounds behind them, except in the highest floods, and as time went on the common interest of the Valley States dictated harmonious action all along both sides of the river. The development of the levee system brought about the enactment of such local laws as were best calculated to serve the public interest, and gradually the levees became recognized factors of public welfare and were jealously guarded. The most reckless and negligent planter was forced to keep his own levees in repair, and in places where private interest was not sufficiently strong to force the building of these earthworks, the town or the State assumed the burden. In 1828 the State of Louisiana began to take vigorous action for the more complete protection of its delta lands. In 1836 and 1838 several of the great side channels by which inundations had come were closed at the expense of the counties, and the question of the closing of all the overflow channels, so as to confine the stream to one bed in all stages of water, was the subject of much excited difference of opinion. The closure party prevailed, and one by one the side outlets of the Mississippi were cut off by levees, so that by 1844 every old bayou outlet for 600 miles up the west bank had been effectually closed. The results were even more satistory than had been expected, so that the levee system was entered upon with increased spirit by the States bordering the river, and the aid of the General Government was invoked to unify the work. Congress, in 1850, ordered thorough topographical and hydrographic surveys of the whole of the lower Mississippi Valley under the direction of Capt. A. A. Humphreys and Lieut. H. L. Abbot, who began work immediately; but the report was not submitted until August, 1861. It recommended confining the river to a single channel and making the levees higher at all points, and estimated the cost of carrying out this recommendation at $17,000,000.

At the outbreak of the Civil War these levees were in better condition than ever before. Substantial levees had been constructed on the east side up to the northern line of the State of Mississippi, including one of great magnitude across the Yazoo Pass—the largest of all the outlets closed. On the west side the levees had been completed to the mouth of the Arkansas. Louisiana alone had expended up to that time $18,000,000 on the levees of the main river; $5,000,000 more on its great side outlets, the Atchafalaya, Plaquemine, and La Fourche; and $1,000,000 on the shore of the Red River. The State of Arkansas had spent $1,000,000; Mississippi, on her water-front of 444 miles, $14,500,000; and the State of Missouri, on her front of 140 miles, $1,640,000. The total expenditure by individuals, parishes, and States up to that time, on about 2000 miles of the river shore, is estimated by C. G. Forshey, of New Orleans, at upward of $41,000,000, without counting the cost of maintenance. Before the four years' struggle began to draw to a close, however, the levees had fallen into decay. There were breaks here and there that destroyed the system, and the planters were too poor to hire the necessary labor to rebuild. Something had to be done to meet the difficulty, and that too before dire disaster had fallen upon the people living in the valley.

The Mississippi River Commission. A commission under this name was created by act of Congress of June 28, 1879, and consists of seven persons, three of whom are army officers selected from the Corps of Engineers, one from the Coast and Geodetic Survey, and two civil engineers and a lawyer from civil life. The commission was directed by the act to complete surveys of the entire river, from headwaters to mouth, and to take into consideration such plans and estimates as will correct, permanently locate, and deepen the channel and protect the river banks. The prevalent idea, therefore, that the work of the commission is confined to the lower river is erroneous. For the expenses of the surveys, examinations, and investigations conducted by the commission for the first ten years of its work, considerably over a million dollars were appropriated and expended. This is entirely independent of the appropriations made for the actual works of improvement, which were begun in 1881, and which have cost thus far, in round numbers, over $14,000,000. In the various appropriation bills for this purpose the commission has been restricted carefully in the scope of the work to the exact purposes defined in the creating act. In making the preliminary surveys ordered by Congress, the commission found it had to deal with a work of most extraordinary difficulties. The main portion of its labor was called on for the lower river; that is, from Cairo to the Gulf. The distance in a straight line is less than 600 miles, but by the windings and twistings of the river it is some 500 miles longer. Forever bringing down its own obstructions and dropping them in its own path, the river is forever attacking or running around those same obstructions, changing its course continually. The difficulty due to the enormous amount of detritus in the river may be realized when it is said that the amount of sediment brought down annually is estimated by C. C. Babb at 406,280,000 tons, and other geologists have made similar estimates. Straightening the river, as has been at various times popularly suggested, would, on account of the huge volume of water, turn it into an uncontrollable torrent. Dredging is not practicable, as the river frequently deposits as much as fifteen feet of silt in one place in the course of a single year, and as frequently removes it in the course of a single week or less. The quality of the soil itself also makes diking and revetting peculiarly difficult. The force of the tremendous current of the river directed against the foundation of any work that may be placed on its banks is likely at any time to remove that foundation. When the report of the commission was made in 1880 it was decided to combine the jetty and levee systems. There were few natural advantages to be utilized, and it was recognized that nothing could be done that could be declared absolutely permanent, and that the actual river bed could never be made to hold all the flood waters that were certain to come down. What has been attempted, and in some measure accomplished, is to take advantage of the river's own peculiarities, and by strengthening natural obstructions, here and there, rather than by removing obstacles, to persuade the stream, instead of force it, to follow a given route.

Jetties or Contraction Works. The system will be given more in outline than details, as the latter are far too numerous to be more than barely mentioned. The natural banks of the river, in those places where the current sets against them, and is likely to wear them away, are strengthened by revetment work. The character of this revetment varies somewhat according to circumstances, but, generally speaking, is of two kinds. The first is a kind of soft bottom put on the bed of the stream at the point of greatest erosion. This consists of what are called mattresses or hurdles, which are constructed of mats of brush woven and fastened together with wire strengthened with a sort of lattice-work of heavy timbers placed on the banks and secured by a substantial ballast of rubble-stones. A crib of timbers is first constructed in sections, amounting in all to dimensions sufficient to cover the place which is to be protected. Over this is laid a carpet of heavy brush, with the twigs of fibre running generally in parallel lines. Over this is laid another carpet of similar construction, with its fibres crossing that of the first at an angle usually less than a right angle, and the two are knitted or sewed together with strong wire. Sometimes a third carpet may be laid, with the brush lying at still another angle. Then another crib or lattice-work of heavy timber is laid on these carpets, and the whole is bound together with wire, or another series laid on top if extra strength and weight are needed. The entire contrivance is then placed in position, covering the bottom of the river from the centre of the channel to the margin of the bank. As a matter of course it is necessarily handled in sections, but the sections are placed and fastened together so as to form a continuous carpet when laid, and they are then heavily ballasted with rubble-stone, laid systematically to form an uncemented pavement over the carpet. It is found that this practically secures the mattress in position for a considerable time under ordinary circumstances, and actually prevents the eating away of the banks by diverting the course of the current back to the desired channel. Generally it occurs that the action of the river before this treatment is applied to it has made the bank uneven. Sometimes it will even overhang the river a little, and it is necessary to smooth the surface to afford an even bed or floor on which to lay the mattress. Instead of digging this away, the familiar method of hydraulics is utilized. With a powerful engine a stream of water is pumped through a hose, and the soft earth is readily washed into shape. The ultimate purpose of these mattresses and other devices is to secure an approximately uniform width between the banks of about 3000 feet. When this is done it is believed that the bottom will be scoured out by the current, so that a depth of not less than sixteen or eighteen feet will be secured throughout the lower river. The permeable dike is a contrivance used in many places where it would be impossible to lay mattresses, where there may be, in fact, no bank to lay them on, but a wide stretch of slack water reaching out into a lagoon. These dikes are of simple construction, consisting of rows of piles driven as firmly as may be in the soft bottom. The piles are placed from two to five feet apart, and between the rows quantities of brush are placed and fastened. The water passes through these works freely at first, but being checked by the partial obstruction, it drops the sediment with which it is so heavily charged, and itself completes the dam which confines its course. These dikes are found to be very effective substitutes for complete dams, and are put where it would be difficult, if not impossible, to build a solid dam in the first place. More substantial, or rather more compactly built dams are placed at some points where there is a tendency on the part of the river to form cut-offs. (See above, under DESCRIPTION.) This tendency is perhaps the thing most dreaded and most carefully guarded against.

LEVEES. It has been found that, in order to meet the whole question scientifically, it would be necessary to build a double line of levees on each side of the river. The inner line is built to define the course of the channel and to prevent floods; the outer line, which is located far down the river ridge, is designed to protect the farms and plantations from the invasion of the back water in case the front levee is broken. The levee is in certain places the only possible safeguard. Cairo, Ill., affords a conspicuous instance of this. No revetments or dikes could possibly guide the current so that it would flow past the city without overflowing it, for the simple reason that the city is below high-water mark. It is of necessity entirely surrounded by a levee that rises some fifty-five or sixty feet above low-water mark, or 'zero,' as it is called on the Government records. The keeping of the works in repair is a matter of vital importance; constant watching and constant strengthening are the only things that can successfully combat the action of the rushing stream.

OTHER PROBLEMS. The characteristics of the banks are so different that the various localities offer special problems in themselves, and must be handled without reference to conditions that obtain elsewhere. The bluffs are threatened in one place, while in another the opposite low bank is attacked, and the river devotes its energies toward cutting a new channel. Revetments are sometimes on the bluff side, then again on the opposite; basins are occasionally cut in the soft bottom ground where the old river bed used to be, and spur-dikes are in other places the only remedy.

The mouth of the Red River brought several vexed questions before the commission, and the practical result of their conclusions will not be known until the works now in progress are completed. It is feared that the bed of the Atchafalaya, the present main outlet of the Red River, will enlarge sufficiently to convert the entire country between it and the Mississippi into an arm of the sea. The only safeguard seems to be by a series of dikes and submerged dams to turn the low-water flow of the Red River all into the Mississippi.

Another serious problem was presented by the bars at the mouths of the delta, which have been a serious obstacle to vessels entering the river. This was solved by the celebrated engineer James B. Eads. He selected the South Pass, and by the construction of jetties which narrowed the channel at its mouth, and thus increased the velocity of the current, he made the river cut its own bar away, and obtained a depth through the bar and throughout the pass of 34 feet, with width adequate for all purposes of navigation. This improvement has resulted in establishing New Orleans as the leading seaport of the South. See Jetties, above.

It is well understood that the whole work of regulating the river is likely to prove a slower process than was at first supposed, and that to be efficient it can only be gradual and progressive. It is a work of great magnitude; it is supposed that not less than $75,000,000 will be needed to put it even in approximately good shape. The work has, however, suffered greatly from inadequate and intermittent appropriations, which have interfered with a systematic and economical administration of its affairs.

For the history of the discovery and first settlements of the Mississippi, see De Soto, Hernando; Hennepin, Louis; Iberville, Pierre; Joliet, Louis; La Salle, René; Marquette, Jacques; Schoolcraft, Henry R.; New Orleans; Saint Louis; Saint Paul, etc. For navigation and commerce of the Mississippi, see *Transportation*, under United States; Memphis; New Orleans; Saint Louis. See, also, articles on the principal tributaries.

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MISSISSIPPI SCHEME. A gigantic banking and commercial scheme projected in France by the celebrated Scotch financier John Law (q.v.), at the beginning of the reign of Louis XV. The primary object of the scheme was to resuscitate the French finances by removing some of the debt and disorder which had followed on the wars of Louis XIV. Money was to flow into France by developing the resources of the Province of Louisiana and the country bordering on the Mississippi—a tract at that time believed to abound in the precious metals. The company was incorporated in 1717, under the designation of the Compagnie d'Occident, and started with a large capital. Two hundred thousand shares were placed on the market and eagerly bought up. The company obtained exclusive privileges of trading to the Mississippi for twenty-five years, of farming the taxes, and of coining money. In 1719 it obtained a monopoly of trading to the East Indies, China, the South Seas, and all the possessions of the French East India Company, and the brilliant vision opened up to the public gaze was irresistible. The Compagnie des Indes, as it was now called, created fifty thousand additional shares; but there were at least three hundred thousand applicants for these, and consequently shares rose to an enormous premium. The public enthusiasm became absolute frenzy, and while confidence lasted, a fictitious impulse was given to trade in Paris; the value of manufactures was increased fourfold, and the demand far exceeded the supply. The population of Paris is said to have been increased by hundreds of thousands, many of whom were glad to take shelter in garrets, kitchens, and stables. But the Regent Orleans had meanwhile caused the paper circulation of the national bank to be increased as the Mississippi scheme stock rose in value, and paper currency to the face value of 2,700,000,000 livres flooded the country. The result was that many wary speculators, foreseeing a crisis, secretly converted their paper and shares into gold, which they transmitted to England or Belgium for security. The increasing scarcity of gold and silver in France becoming felt, a general run was made on the national bank, which in March, 1720, had been incorporated with the Compagnie des Indes. On May 21st the Government issued an edict which reduced the value of bank notes and of shares in the company by one-half. Law was now controller-general of finances, and he made several unavailing attempts to mend matters. Those suspected of having more than a limited amount (fixed by a law passed at the time) of gold and silver in their possession, or of having removed it from the country, were punished with the utmost vigor. The final crisis came in July, 1720, when the bank stopped payment, and Law was compelled to flee the country. A share in the Mississippi scheme now with difficulty brought 24 livres. An examination into the state of the accounts of the company was ordered by Government; much of the paper in circulation was canceled; and the rest was converted into 'rentes' to an enormous amount.

MISSISSIPPI SOUND. A lagoon-like strait, 8 to 14 miles wide, washing the coasts of Alabama and Mississippi from Mobile Bay to the entrance of Lake Borgne, a distance of about 90 miles (Map: Mississippi, H 10). It is formed and separated from the Gulf of Mexico by several long and narrow islands or sand bars, one of which is fortified. It is moderately deep, generally tranquil, and is navigated chiefly by the steamers and coasting vessels running between Mobile and New Orleans by way of Lake Pontchartrain.

MISSOLONGHI, mĭs′sȱ-lŏn̲′gė̄, or Mesolonghi. One of the principal towns of Western Greece, the capital of the Nomarchy of Acarnania and Ætolia (Map: Greece, C 3). It is situated on the north shore of the Gulf of Patras, in a low, marshy, and unhealthful locality. The harbor is shallow and inaccessible for large vessels. The town is the seat of an archbishop and of a high school. It has a statue of Lord Byron, who died here in 1824, and a mausoleum which contains the heart of the poet-hero. Population, in 1896, 8394. The town is famous as the chief western stronghold of the Greek patriots during the war of liberation (1822-26). It withstood two prolonged sieges by the Turks until April, 1826, when the survivors of the garrison destroyed the town and cut their way through the Turkish lines. In May, 1829, the town was evacuated by the Turks and restored to Greece.

MISSOULA, mĭ-zo͞o′lȧ. A city and the county-seat of Missoula County, Mont., 125 miles west by north of Helena; on the Hell Gate River, and on the Northern Pacific Railroad (Map: Montana, C 2). It is the seat of the State University, and has a public library and hospitals, one maintained by the Northern Pacific Railroad. The city is in a farming and fruit-growing, lumbering, and mining region, for which it is an important distributing centre, and controls a considerable trade in grain, fruit, and produce. There are a brewery and bottling works, and railroad shops of the Northern Pacific. Founded in 1864, Missoula was first incorporated in 1887, the charter of that year now operating to provide for a mayor, chosen biennially, and a unicameral council. Population, in 1890, 3426; in 1900, 4366.

MISSOURI, mĭz-zo͞o′rĭ, *local pron.* mĭz-zo͞o′rŭ. A central State of the American Union, situated about midway between the Rocky Mountains and the Atlantic Ocean, and midway between the Dominion of Canada and the Gulf of Mexico. It lies west of the Mississippi River, which separates it from Illinois, Kentucky, and Tennessee. Iowa, separated by the parallel of latitude 40° 30′ N., is on the north, and Arkansas, separated by the parallel of latitude 36° 30′ N., except for a small projection of Missouri between the Mississippi and Saint Francis rivers, which extends 34 miles south between Tennessee and Arkansas, is on the south. On the west, Missouri is separated from Indian Territory and Kansas by the line of longitude 94° 43′ W., as far north as the junction of the Missouri and Kansas rivers, from which points the Missouri River completes the western boundary, separating Missouri from Kansas and Nebraska. The distance between the northern and southern boundaries is 285 miles, and the greatest extension from east to west is slightly more. It contains a total area of 69,415 square miles, of which water comprises 680 square miles and land 68,735 square miles. It ranks fifteenth in size among the United States.

Topography. The northern portion of the State was covered by the glacial ice sheet, the southern limit of which was bounded by the line of the Missouri River. It is a wide expanse of gently rolling plains, generally of treeless prairie, belts of timber occurring only along the streams. South of the Missouri the land rises gradually to the broad flat dome-like elevation of the Ozark Mountains. This range extends in a southwesterly direction and rises to a height of 1700 feet in the west, and in the east to 1800 feet in the peaks of Pilot Knob and Iron Mountain. The uplands are marked by a series of escarpments of harder strata standing out in precipitous bluffs from 200 to 300 feet high, but sloping off gently on the opposite sides in the direction of the dip of the strata. The lower ground between represents the softer strata which have worn down to the lower level since the post-Cretaceous uplift. West and north of the broken and rugged Ozark Plateau extends prairie country, and prairie areas are also found scattered through the eastern part. The southeastern portion is bottom land, marshy in character. Here the levees along the Mississippi are required to protect the low-lying land from inundation.

Hydrography. The whole State is drained into the Mississippi, either directly or through its tributary, the Missouri, which traverses the State from west to east. Through the extreme southern portion flows the White River, which enters the Mississippi in the State of Arkansas; the southwestern corner drains westward into the Arkansas River. The importance of the large rivers, with regard to navigation, however, is not commensurate with their size. The river beds of the Ozark region were worn to base-level during Cretaceous time. At the close of that period the region was uplifted, and the meandering rivers lowered their gradients *in situ*, so that they now cross and recross the ridges regardless of structure. The Osage River is a classical instance of entrenched meanders.

Climate. Missouri lies in the milder half of the warm temperate zone. Being far inland, the State is subject to the extremes of a continental climate, which are all the more accentuated by the fact that it is in the path of frequent cyclonic storms. The average January temperature ranges from 35° F. in the southeastern to 20° in the northwestern corner. For July the average temperature is 80° in the extreme south and 75° in the extreme north. The southwestern winds from the arid plains in summer sometimes send the mercury up to 105°, while the anticyclones of winter carry a minimum of 10° below zero to the southern border, and 20° below to Saint Louis, thus giving that city an annual range of 125°. The southeastern extremity of the State has not a day in the year with the average temperature below freezing, but the record rises rapidly northward, there being 30 such days at Springfield, 60 at Jefferson City, and 90 at Rockport. The summers are pleasantly tempered in the Ozark Plateau. The rainfall ranges from 35 inches per year in the north to 60 inches at the Arkansas line. While this is well distributed through the year, there is a marked minimum in the winter season, and maximum in the summer season. Droughts lasting thirty days sometimes occur. Snow falls on the average to the depth of 20 inches in the latitude of Saint Louis, and less than 10 inches at the Arkansas line, though it rapidly disappears and seldom covers the ground many days. The average relative humidity for the year is less than 70 per cent. over the whole State. The prevailing winds are west and northwest in January, and south in July. There are on the average 30 thunder storms in the year, with a maximum frequency in June. The northern part of the State is in the area of maximum tornado frequency, and very severe and destructive tornadoes occasionally occur.

Geology. The geological history of Missouri covers a lapse of time from Algonquian into late Carboniferous, giving surface outcrops of Algonkian, Cambrian, Ordovician, Silurian, Devonian, Subcarboniferous, and Carboniferous, with a subsequent absence of deposits until Pleistocene time. The old land, which now outcrops in the southeastern quarter of the State, in Saint Francis, Iron, Madison, Wayne, and Reynolds counties, is made up of porphyritic eruptives, but with lavas often bedded; the clastics are sometimes porphyry conglomerates, the materials of which have evidently been derived from the underlying porphyry flows. At Pilot Knob the iron ores are associated with the conglomerates. These old lands show analogies with the Upper Huronian of the Lake Superior region, though they may represent an erosion period between Upper Huronian and Keweenawan (Van Hise). Around this old island the Cambrian seas made their deposits, and in wider circles the later Ordovician and Silurian beds were laid down, until the Devonian shore line lay roughly from Saint Louis along the Missouri River to Jefferson and on to Sedalia, and thence south into Arkansas. There are scant deposits of the Devonian age, and the Carboniferous seas and later marshes had about the same margin, leaving the area to the north and west of the line described as an outcrop of the coal measures. From a period late in the Carboniferous time, the whole State seems to have remained above the sea continuously to the present time.

SOIL. Over all of the glaciated area and for some miles south of the Missouri River, the surface is covered with loess, which caps the bluffs and the country adjacent with a coating many feet in thickness, furnishing a soil of great fertility. The soils of the State outside of the glaciated area are largely residual, their quality determined by the character of the country rock and its slopes. The hard ridges have a thin soil, unsuitable for agriculture; but the inner low lands, on the softer limestone, and the flood plains of the rivers, have a soil of great fertility.

FORESTS. The State north of the Missouri River is essentially a rolling prairie with timber lands mostly restricted to the river valleys. The woodland of the State, including stump land, in 1899 occupied 41,000 square miles, or 60 per cent. of the entire area. The State south of the Missouri River is normally a forest area, thinning out westward, being occupied most largely by mixed hard woods, cypress dominating in the Mississippi bottom lands at the southeast.

For FAUNA, see paragraph under UNITED STATES.

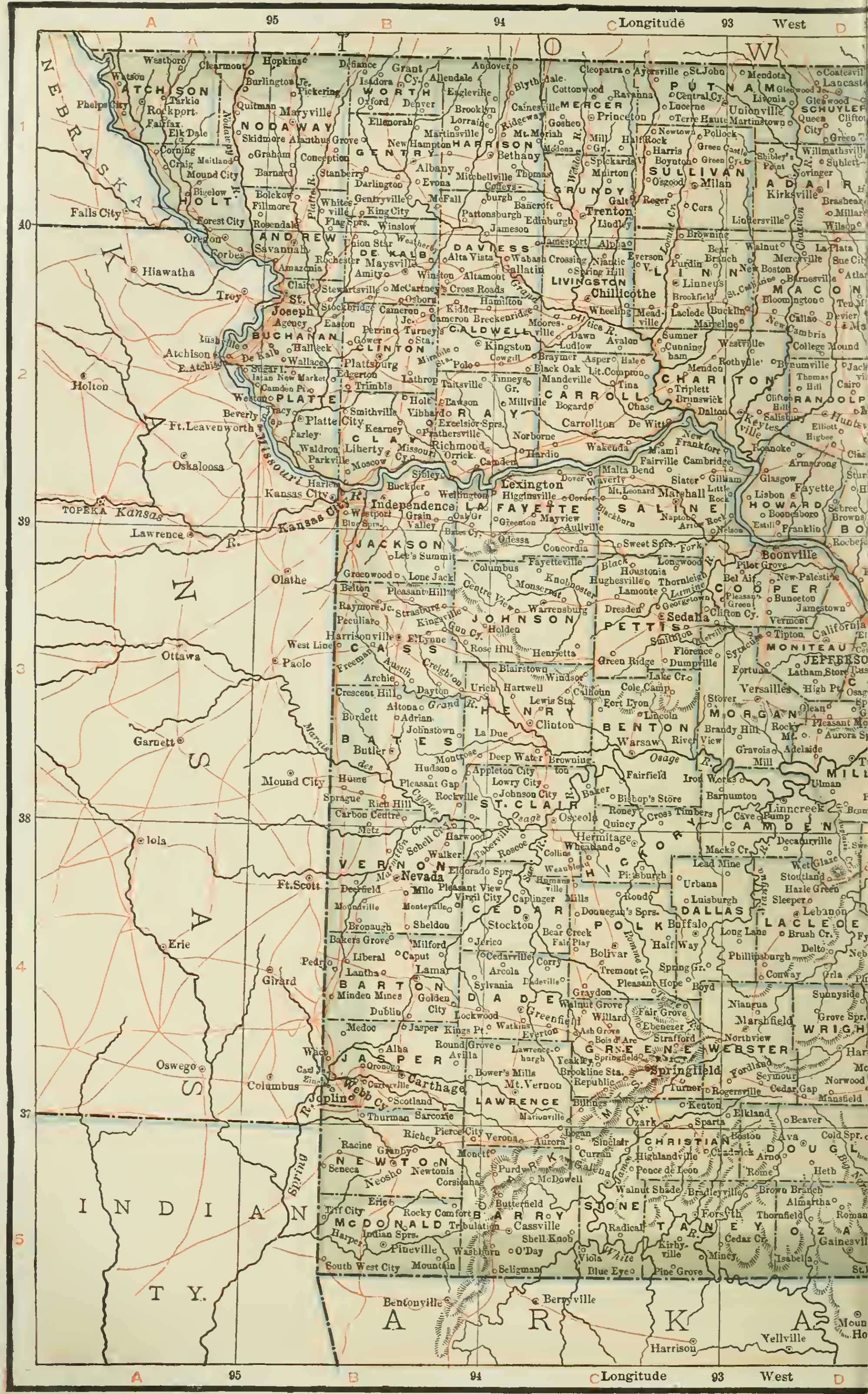
MINERAL RESOURCES AND MINING. The principal mineral deposits of Missouri are zinc and lead. These minerals, usually occurring together, are confined to the area south of the Missouri River and the zinc is confined to the Galena-Joplin District, covering about a dozen counties in the southwestern corner of the State, and extending westward into Kansas. Lead is also found in a large area about Jefferson City, and in another about the old lands of the Pilot Knob region. The lead ores are galena and lead carbonate; the zinc ores are calamine and smithsonite. They all occur in the joints of limestone rocks, chiefly of the Cambrian system, and in cavities where the limestone has been dissolved out. The origin of the metals is in doubt, with some evidence, however, suggesting a deep-seated source in volcanic rocks.

The output of zinc rose from 2500 short tons in 1882 to 19,533 short tons in 1898, but it fell to 13,083 in 1901. Missouri is the third zinc-producing State, being exceeded by Kansas and Illinois. The zinc is largely smelted in the gas belt of Kansas, and from there transported to the Gulf ports. The output of lead ore in 1901 was over 29,000 short tons, and the total value of the zinc and lead output of the State for that year was nearly $7,000,000. Missouri is believed to have considerable coal deposits, but its output is kept within narrow limits by the competition of neighboring coal fields. The coal output shows an increase from 784,000 short tons in 1873 to 3,802,088 in 1901. The product is used principally for local consumption. The output of iron, gold, and manganese is insignificant, but during the third quarter of the nineteenth century the deposits of Iron Mountain (q.v.) were famous for their large output of hematitic ore, which has up to the present amounted to 5,000,000 tons. Limestone was obtained in 1901 to the value of $1,362,272, and the products of clay (chiefly brick and tiles) in the same year were worth $4,474,553.

AGRICULTURE. Agriculture is the leading industry. In 1900, 33,997,873 acres, or 77.3 per cent. of the total area, was included in farms. In every decade from 1850 to 1900 there was a decided gain in the farm acreage, the increase since 1860 being wholly in the acreage of improved land, which in 1900 amounted to 67.4 per cent. of the total farm area. The average size of farms decreased from 215.4 acres in 1860 to 119.3 in 1900. In the latter year 31.1 per cent. of the farm acreage was included in farms ranging in size from 100 to 174 acres. The per cent. of farms rented was slightly greater in 1900 than in the preceding census years, the farms leased on the share system being 19.5 of all farms, and those rented for cash 11 per cent. The crop production is characterized by the great attention given to corn, which constitutes over 71 per cent. of the total cereal crop, and places Missouri among the leading corn States. The area devoted to corn increased continuously from 1870, the increase in the acreage during the decade 1890-1900 being 22.3 per cent. Wheat is the next most important of the cereals. Its production had increased steadily until about 1880, but since then the acreage has remained almost stationary. The acreage of oats continued to gain until 1890, but in the following decade it decreased 45.4 per cent. The production of rye decreased over one-half between 1880 and 1900, while barley and buckwheat have become quite unimportant. A largely increasing acreage is devoted to hay and forage, which together rank next to corn in area. A great deal of flax is raised near the western border of the State south of the Missouri River, and the acreage devoted to this crop increased 78.9 per cent. between 1890 and 1900. In the lowlands in the southeast corner of the State cotton is the leading crop. Potatoes and sorghum cane are grown throughout Missouri. The State ranks third in the production of watermelons, and is prominent also in the production of tomatoes, cabbages, and other vegetables. The tobacco crop has decreased every decade since 1860, and between 1890 and 1900 it decreased 61.6 per cent. Broom corn and castor beans receive some attention. Both small fruits and orchard fruits are grown in abundance. In 1900, 7494 acres were devoted to strawberries alone. In the same year there were over 20,000,000 apple trees, these constituting 75.2 per cent. of the total number of fruit trees and exceeding the number in every other State. Between 1890 and 1900 the number of apple trees increased 145.9 per cent., peach trees 127.9 per cent., and most other varieties a still greater per cent. The gain in apple and peach culture was greatest in the southwestern corner of the State. The following table of acreages is self-explanatory:

AREA AND POPULATION OF MISSOURI BY COUNTIES.

County.	Map Index.	County Seat.	Area in square miles	Population.	
				1890.	1900.
Adair	D 1	Kirksville	561	17,417	21.728
Andrew	B 2	Savannah	420	16.000	17.332
Atchison	A 1	Rockport	532	15.533	16.501
Andrain	E 2	Mexico	680	22,074	21.160
Barry	C 5	Cassville	790	22.943	25.532
Barton	B 4	Lamar	590	18,504	18,253
Bates	B 3	Butler	874	32.223	30,141
Benton	C 3	Warsaw	820	14,973	16.556
Bollinger	F 4	Marblehill	610	13.121	14,650
Boone	D 2	Columbia	680	26,043	28,642
Buchanan	B 2	St. Joseph	417	70.100	121,838
Butler	F 5	Poplarbluff	702	10,161	16,769
Caldwell	B 2	Kingston	426	15.152	16.656
Callaway	D 3	Fulton	830	25,131	25,984
Camden	D 3	Linncreek	702	10,040	13.113
Cape Girardeau	G 4	Jackson	570	22,060	24.315
Carroll	C 2	Carrollton	686	25.742	25.455
Carter	E 5	Vanburen	506	4.659	6.706
Cass	B 3	Harrisonville	712	23.301	23.636
Cedar	B 4	Stockton	491	15.620	16,923
Chariton	C 2	Heytesville	740	26,254	26,826
Christian	C 5	Ozark	551	14.017	16,939
Clark	E 1	Kahoka	504	15.126	15,383
Clay	B 2	Liberty	407	19.856	18.903
Clinton	B 2	Plattsburg	417	17,138	17.363
Cole	D 3	Jefferson City	390	17.281	20,578
Cooper	D 3	Boonville	562	22.707	22.532
Crawford	E 4	Steelville	747	11,961	12,959
Dade	B 4	Greenfield	493	17.526	18,125
Dallas	C 4	Buffalo	530	12.647	13.903
Daviess	B 2	Gallatin	531	20.456	21.325
Dekalb	B 2	Maysville	420	14.539	14,418
Dent	E 4	Salem	768	12.149	12,986
Douglas	D 5	Ava	809	14,111	16,802
Dunklin	F 5	Kennett	531	15.085	21,706
Franklin	E 3	Union	880	28.056	30,581
Gasconade	E 3	Hermann	518	11.706	12,298
Gentry	B 1	Albany	492	19,018	20.544
Greene	C 4	Springfield	668	48,616	52,713
Grundy	C 1	Trenton	432	17,876	17.832
Harrison	B 1	Bethany	730	21.033	24,398
Henry	C 3	Clinton	740	28,235	28.054
Hickory	C 4	Hermitage	408	9,458	9.985
Holt	A 1	Oregon	160	15,469	17,083
Howard	D 2	Fayette	450	17,371	18,337
Howell	D 5	Westplains	907	18.618	21.834
Iron	F 4	Ironton	555	9.119	8.716
Jackson	B 3	Independence	607	160.510	195,193
Jasper	B 4	Carthage	632	50.500	84.018
Jefferson	F 3	Hillsboro	687	22,484	25,712
Johnson	C 3	Warrensburg	835	28,132	27,843
Knox	D 1	Edina	501	13.501	13,479
Laclede	D 4	Lebanon	729	14 701	16,523
Lafayette	B 2	Lexington	604	30.184	31,679
Lawrence	B 4	Mount Vernon	612	26,228	31,662
Lewis	E 1	Monticello	500	15.935	16,724
Lincoln	E 2	Troy	613	18 346	18,352
Linn	C 2	Linneus	620	21.121	25.503
Livingston	C 2	Chillicothe	532	20.668	22.302


A
95
B
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C Longitude
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West
D
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39
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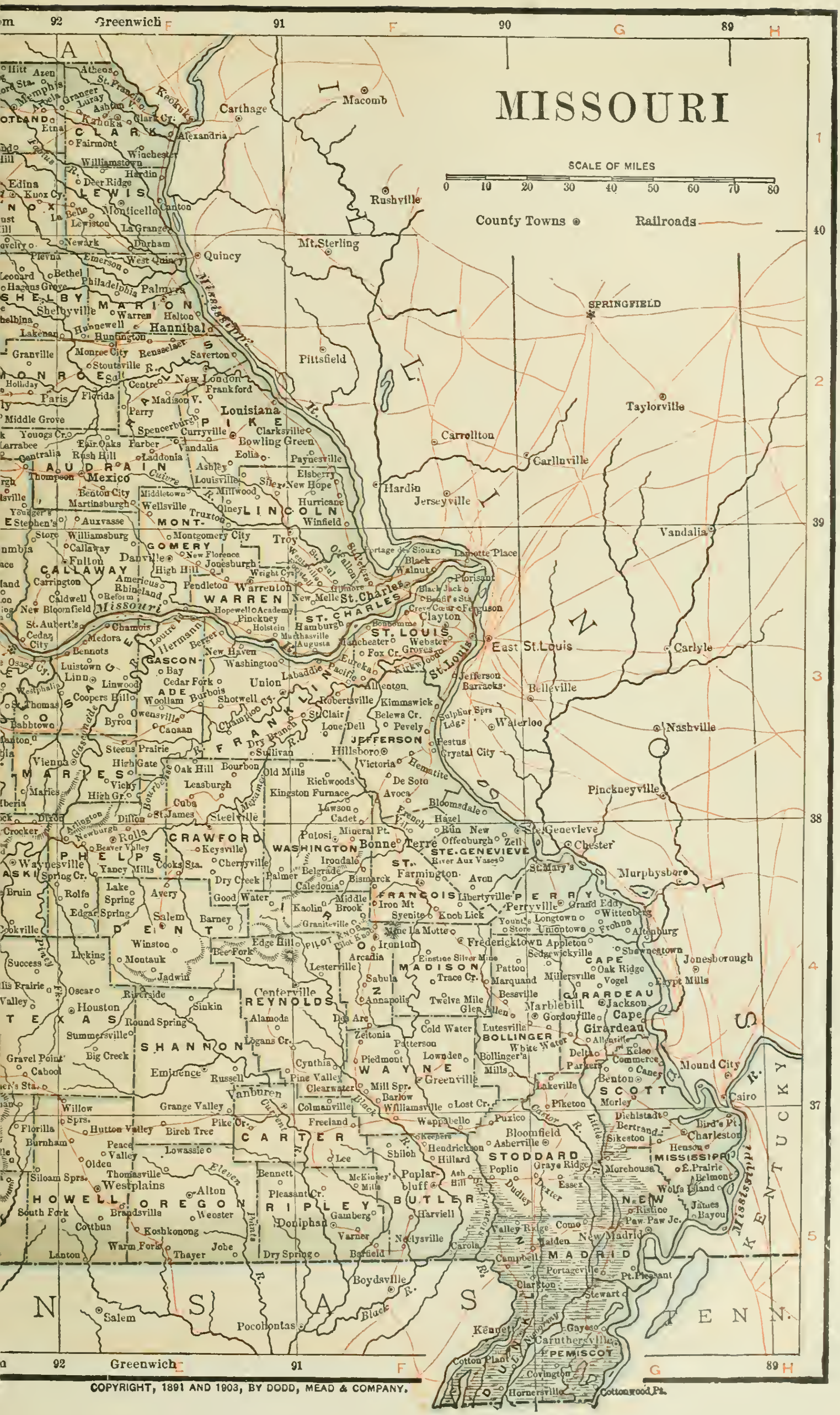
NEBRASKA
KANSAS
INDIAN TY.
IOWA
ARK
ATCHISON
NODAWAY
WORTH
HARRISON
MERCER
PUTNAM
SCHUYLER
HOLT
ANDREW
GENTRY
DE KALB
DAVIESS
GRUNDY
SULLIVAN
ADAIR
BUCHANAN
CLINTON
CALDWELL
LIVINGSTON
LINN
MACON
PLATTE
CLAY
RAY
CARROLL
CHARITON
RANDOLPH
JACKSON
LAFAYETTE
SALINE
HOWARD
BOONE
JOHNSON
PETTIS
COOPER
MONITEAU
CASS
HENRY
BENTON
MORGAN
BATES
ST. CLAIR
HICKORY
CAMDEN
VERNON
CEDAR
POLK
DALLAS
LACLEDE
BARTON
DADE
GREENE
WEBSTER
WRIGHT
JASPER
LAWRENCE
CHRISTIAN
DOUGLAS
NEWTON
BARRY
STONE
TANEY
OZARK
McDONALD
Missouri R.
Kansas R.
Grand R.
Osage R.
St. Joseph
Kansas City
Independence
Lexington
Sedalia
Boonville
Chillicothe
Trenton
Maryville
Springfield
Joplin
Carthage
Nevada
Clinton
Warsaw
Bolivar
Topeka
Lawrence
Atchison
Ft. Leavenworth
Olathe
Paola
Ottawa
Ft. Scott
Garnett
Iola
Erie
Girard
Oswego
Columbus
Mound City
Hiawatha
Troy
Holton
Oskaloosa
Falls City
Bentonville
Berryville
Harrison
Yellville



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AREA AND POPULATION OF MISSOURI BY COUNTIES.

(*Continued.*)

County.	Map Index.	County Seat.	Area in square miles.	Population.	
				1890.	1900.
McDonald	B 5	Pineviell	523	11,283	13.574
Macon	D 2	Macon	828	30,575	33,018
Madison	F 4	Fredricktown	495	9,268	9,975
Maries	D 3	Vienna	530	8,600	9.616
Marion	E 2	Palmyra	432	26.233	26,331
Mercer	C 1	Princeton	451	14,581	14.706
Miller	D 3	Tuscumbia	597	14.162	15,187
Mississippi	G 5	Charleston	417	10.134	11.837
Moniteau	D 3	California	410	15,630	15.931
Monroe	D 2	Paris	666	20.790	19,716
Montgomery	E 2	Danville	514	16,850	16,571
Morgan	C 3	Versailles	612	12.311	12,175
New Madrid	G 5	New Madrid	654	9.317	11,280
Newton	B 5	Neosho	629	22.108	27.001
Nodaway	A 1	Maryville	864	30,914	32.938
Oregon	E 5	Alton	787	10,467	13,906
Osage	D 3	Linn	605	13,080	14.096
Ozark	D 5	Gainesville	747	9.795	12,145
Pemiscott	G 5	Caruthersville	509	5.975	12,115
Perry	G 4	Perryville	468	13,237	15,134
Pettis	C 3	Sedalia	685	31.151	32.438
Phelps	E 4	Rolla	677	12.636	14,194
Pike	E 2	Bowling Green	620	26.321	25.744
Platte	B 2	Platte City	410	16.248	16,193
Polk	C 4	Bolivar	633	20,339	23,255
Pulaski	D 4	Waynesville	532	9.387	10,394
Putnam	C 1	Unionville	518	15.365	16,688
Ralls	E 2	New London	480	12,294	12,287
Randolph	D 2	Huntsville	489	24.893	24,442
Ray	B 2	Richmond	561	24.215	24.805
Reynolds	F 4	Centerville	830	6.803	8,161
Ripley	F 5	Doniphan	623	8.512	13,186
St. Charles	F 3	St. Charles	456	22.977	24,474
St. Clair	B 3	Osceola	705	16 747	17,907
Ste. Genevieve	F 4	Ste. Genevieve	493	9.883	10,359
St. Francois	F 4	Farmington	460	17,347	24,051
St. Louis	F 3	Clayton	483	36.307	50,040
St. Louis City	F 3	St. Louis	61	451,770	575,238
Saline	C 2	Marshall	820	33.762	33.703
Schuyler	D 1	Lancaster	302	11.249	10.840
Scotland	D 1	Memphis	453	12.674	13,232
Scott	G 4	Benton	416	11,228	13.092
Shannon	E 4	Eminence	993	8,898	11,247
Shelby	D 2	Shelbyville	509	15,642	16,167
Stoddard	F 5	Bloomfield	833	17.327	24.669
Stone	C 5	Galena	509	7.090	9.892
Sullivan	C 1	Milan	648	19,000	20.282
Taney	C 5	Forsyth	648	7,973	10,127
Texas	D 4	Houston	1,157	19.406	22,192
Vernon	B 4	Nevada	839	31.505	31,619
Warren	E 3	Warrenton	410	9.913	9,919
Washington	F 4	Potosi	744	13,153	14,263
Wayne	F 4	Greenville	770	11,927	15.309
Webster	C 4	Marshfield	579	15.177	16,640
Worth	B 1	Grant City	264	8,738	9,832
Wright	D 4	Hartville	673	14,484	17,519

CROPS	1900	1890
Corn	7,423,683	6,072,121
Wheat	2,056,219	1,946,785
Oats	916,178	1,676,706
Rye	21,233	24,283
Flax	100,952	56,421
Hay and forage	3,481,506	2,870,562
Cotton	45,596	57,260
Potatoes	93,915	96,356
Sorghum cane	30,997	36,280

Stock-Raising. The number of horses and mules has increased in every decade since 1850. The number of dairy cows had gained steadily until 1890, but decreased in the following decade. The number of other cattle was greater in 1900 than in any other census year. Missouri is one of the largest swine-raising States, but the number of swine fell off somewhat between 1890 and 1900. The number of sheep has decreased over one-half since 1880. The milk, butter, and cheese product in 1899 was valued at $15,042,360, of which amount 34.9 per cent. was received from sales. Probably no State exceeds Missouri in the extent of its poultry industry. The value of the eggs produced in 1899 was estimated at $8,305,371. The following table shows the number of domestic animals on the farms:

DOMESTIC ANIMALS	1900	1890
Dairy cows	765,386	851,076
Other neat cattle	2,213,203	2,118,640
Horses	967,037	946,401
Mules and asses	292,296	251,714
Sheep	663,703	950,562
Swine	4,524,664	4,987,432

Manufactures. Missouri is the leading manufacturing State west of the Mississippi. The development in this direction has been favored by the variety and extent of its resources—agricultural, mineral, and forest—and by its location on the Mississippi and Missouri rivers. The industry, however, has been of a fluctuating character. In 1850 2.3 per cent. of the population engaged in manufactures. At the end of each subsequent decade the per cent. of population engaged was respectively 1.7, 3.8, 3, 4.6, and (1900) 4.3. In the decade 1880-90 the actual number increased 94.1 per cent.; in the following decade the gain was only 8.7 per cent. The value of all products, including custom work and repairing, in 1900 was $385,492,000. Of this, 52.8 per cent. was included in the fourteen leading industries, as shown in the table appended. The manufactures dependent on agricultural produce stand out prominently in relative importance. Slaughtering and meat-packing products attained the greatest value, and represented the highest per cent. of increase (134.9) between 1890 and 1900. The industry is centred principally in Saint Joseph and Saint Louis. The growing of tobacco in the State gives rise to extensive manufactures of this product, especially chewing and smoking tobacco and snuff. The industry is almost wholly confined to Saint Louis, and is also in a flourishing condition. The other two leading industries—the manufacture of flour and grist-mill products, and of liquor—though important, are declining in value. The decrease in the case of the latter is due to the depreciation of price. The increase of flour-milling in the Southwest has notably reduced the patronage of Saint Louis by that section. The forest resources of the State are being more heavily drawn upon than ever before, and the abundance of supply constitutes an important source of wealth. In the swampy region in the southeast cypress prevails, but elsewhere hard woods are predominant. There is a larger cut of white oak than of any other one species. There was between 1890 and 1900 an increase of 33.7 per cent. in the value of the lumber and timber products.

The influence of the coal resources of the State is reflected in the establishment of foundries and machine shops. The railroad interests have developed a rapidly increasing industry of car construction, etc. The manufactures of clothing and boots and shoes are also prominent, the latter being a comparatively new industry, but already raising the State to the eighth rank among the boot and shoe manufacturing States. The printing and publishing industry is also prominent. The three largest manufacturing centres are Saint Louis, Kansas City, and Saint Joseph, the former on the Mississippi and the two last on the Missouri. The manufactured products of Saint Louis in 1900 amounted in value to 60.6 per cent. of the total for the State, but the increase during the last decade was only 2.0 per cent. Saint Joseph, on the contrary, made an increase of 161.9 per cent. The increase in the manufactures of Kansas City was largest on the Kansas side of the line, and is therefore credited to that State.

The following table shows the relative importance of the fourteen leading branches of manufacturing and their later tendencies.

Transportation and Commerce. A network of railroads covers the northern half of the State, in contrast with the southern half, where the mileage is small and a number of counties have no rail communication. The northern half has the advantage in that it lies in the course of some of the great transcontinental lines, and furthermore is less broken than the southern part of the State. A large number of lines cross the Mississippi at Saint Louis, while Kansas City and Saint Joseph on the western border are also large railroad centres. In 1860 there were 817 miles of railroad in the State; in 1880, 3965 miles; in 1890, 6142 miles; and in 1900, 6887 miles. Some of the leading lines in Missouri are: The Missouri Pacific, the Atchison, Topeka and Santa Fe, the Saint Louis and San Francisco, Saint Louis Southwestern, the Chicago, Burlington and Quincy, Chicago and Alton, the Wabash, the Saint Louis, Iron Mountain and Southern. In recent years there has been a marked development in the railways connecting the State with the Southwest and the Gulf. The State has a board of railroad commissioners, who hear and determine complaints against the railroads; but their decision is subject to revision by the courts. The water traffic between Saint Louis, the terminal for the larger river steamers, and the Gulf is large. Before the building of railroads the Missouri River was important as a means of transportation; but in recent years the trans-State traffic, which is extensive, is almost wholly by rail. The grain and animal produce of the West reaches its market in great part by way of Missouri.

Banks. The Bank of Saint Louis, chartered in 1813 and opened in 1816, was the first in the State. It went into liquidation in 1819. Next came the Bank of Missouri, which opened in Saint Louis in 1817 and failed in 1822. This left the State without any chartered banks until

INDUSTRIES	Year	Number of establishments	Average number wage-earners	Value of products, including custom work and repairing
Total for selected industries for State	1900	5,139	59,057	$203,494,824
	1890	3,667	50,674	155,920,549
Increase, 1890 to 1900	......	1,472	8,383	$47,574,275
Per cent. of increase	......	40.1	16.5	30.5
Per cent. of total of all industries in State	1900	27.4	43.8	52.8
	1890	26.1	40.8	48.0
Slaughtering: Total	1900	37	3,102	$43,040,885
	1890	68	1,264	18,320,193
Tobacco: Total	1900	602	5,231	27,847,432
	1890	430	4,411	17,583,646
Flouring and grist-mill products	1900	1,145	1,654	26,393,928
	1890	710	3,011	34,486,795
Liquors, malt	1900	49	3,150	13,776,905
	1890	30	2,834	16,954,137
Lumber and timber products	1900	1,197	6,043	11,177,529
	1890	830	6,703	8,359,925
Carriages and wagons	1900	377	2,583	5,583,364
	1890	425	3,026	5,233,324
Foundry and machine shop products	1900	261	7,084	15,073,005
	1890	186	6,754	13,680,773
Cars and general shop construction and repairs by steam railroad companies	1900	43	5,581	6,524,121
	1890	27	2,859	2,890,542
Cars, steam railroad, not including operations of railroad companies	1900	4	2,772	7,722,768
	1890	5	1,854	3,974,173
Clothing, men's, factory product	1900	148	6,129	8,925,088
	1890	59	6,113	8,113,852
Boots and shoes, factory product	1900	50	5,915	11,253,202
	1890	29	2,716	4,841,004
Printing and publishing: Total	1900	1,100	7,256	15,355,949
	1890	778	7,423	13,004,440
Coffee and spices, roasting and grinding	1900	27	499	5,266,264
	1890	15	252	3,892,792
Confectionery	1900	99	2,058	5,554,384
	1890	75	1,454	3,584,953

1829, when the United States Bank opened a branch in Saint Louis. The branch was discontinued in 1833. The Bank of the State of Missouri, chartered in 1837, was a large institution with five branches in the State, and was both a bank of issue and discount. For twenty years it had almost a monopoly of the banking business, but its circulation was insufficient and in 1857 seven more banks of issue were chartered. Many more followed. All were forced to conform to the law which allowed the issue of only three dollars for every dollar of specie. The law of 1857 provided also for a bank commissioner, who should visit and examine the various institutions. This office was soon abolished, and there sprang up a number of small speculative banks, all of which collapsed in the panic of 1873. The system of national banking extended very slowly, but the largest institutions sooner or later became national banks. In 1868 the Saint Louis Clearing House Association was organized with 35 members. Trust companies were first formed in 1889, and became very popular. There always have been many banks bearing the word 'savings' in their titles, but none of them conformed to the general plan of a savings bank. This is explained by the fact that all the banks usually pay interest on deposits.

The condition of banks in the State in 1902 is shown in the following table:

	National Banks	State Banks	Trust Co.'s	Private Banks
Number of banks	77	589	16	46
	In	thousa	nds of d	ollars
Capital	$21,543	$18,332	$19,150	$864
Surplus	10,267	6,436	14,715	266
Cash, etc	24,154	7,566	933	799
Loans	146,913	88,099	67,450	16,633
Deposits	92,028	104,070	64,501	7,647

GOVERNMENT. The present Constitution was adopted in 1875. A proposed amendment becomes a part of the Constitution if approved by a majority of the members elected to each House, and in turn by a majority of the qualified voters of the State. The General Assembly may at any time authorize by law a popular vote upon the question, "Shall a Constitutional Convention be held to revise and amend the Constitution?" If a majority of the popular vote approves, the convention will be held. Voters must have resided in the State one year, and in the county, city, or town sixty days. General elections are held biennially on the Tuesday after the first Monday in November of even years. The State is represented in the National House of Representatives by 16 members. The capital is Jefferson City.

LEGISLATIVE. Members of the Senate (34) are elected for four years, and Representatives for two years. The Legislature meets on the first Wednesday after the first day of January of odd years. Compensation of members includes mileage, and not exceeding $5 per day for the first seventy days of the session, and $1 per day for the remainder of the session. A two-thirds vote of all the members elected to each House overrides the Governor's veto. The power of impeachment rests with the House, and the trial of impeachment with the Senate.

EXECUTIVE. A Governor, Lieutenant-Governor, Secretary, Auditor, Treasurer, Attorney-General, and Superintendent of Public Schools are elected for terms of four years each. The Governor and Treasurer cannot succeed themselves to office. The Lieutenant-Governor, president of the Senate, and Speaker of the House are in the line of succession to the Governorship in case of vacancy.

Judicial. The Supreme Court, consisting of seven judges, elected for ten years, is divided into two divisions, which sit separately. Kansas City and Saint Louis each have appellate courts, consisting of three judges, who are elected for terms of twelve years. Judges of the Circuit Courts are elected for six years. Criminal courts may be established in counties having a population exceeding 50,000. Each county has a probate and a county court. Justices of the peace are elected in the smaller civil divisions.

Local Government. A county-seat may be removed with the consent of two-thirds of the qualified voters. No new county can be created with less than 410 square miles. The transference of a portion of one county to an adjoining county must first have the approval of a majority of the electors in the counties affected. The General Assembly provides for the organization and classification of cities and towns, but the Constitution places a maximum limit of four to the number of classes that may be created. Sheriffs and coroners are elected for terms of two years, and are not eligible for more than four years in any period of six years. Under certain conditions cities having over 100,000 inhabitants may frame charters for their own government.

Finances. The first public debt was created for the sake of acquiring stock in the banks of the State. In 1835 it amounted to $1,397,000, against which the State held $1,250,000 of bank stock. Missouri was more fortunate than many other States, its banking enterprises not involving it in any financial difficulties. Up to 1850 Missouri remained free from the general tendency toward expensive public improvement, but when the era of speculative railroad construction came, was no exception to the rule. Within eight years many railroads were chartered and received from the State loans in the shape of guaranteed bonds amounting to about $24,000,000. The roads were expected to pay the interest, but almost all failed to do so, and the State became bound for the entire debt, which in 1862 was $27,370,090. Until 1880 it remained above twenty millions, but since then was reduced by skillful management to $12,213,000 in 1890, and to $6,280,839 in 1900. Most of the bonds have been acquired by the school fund and other funds.

The payment of interest on the large debt and into the sinking funds was a heavy burden on the budget, and constituted a large part of the expenditure between 1870 and 1900. The revenue of the State is derived partly from a tax on property, and partly from special taxes on railroads, various public franchises, and corporations. For the two years ending December 31, 1900, the total receipts were $4,640,751 for the State revenue fund, $2,622,692 for the State interest fund, and various sums for the numerous funds. The balance in the treasury in 1901 was $1,078,931.

Militia. In 1900 the men of militia age numbered 662,928. The militia in 1901 numbered 2677.

Population. The population by decades has been as follows: 1810, 20,845; 1820, 66,586; 1830, 140,455; 1840, 383,702; 1850, 682,044; 1860, 1,182,012; 1870, 1,721,295; 1880, 2,168,380; 1890, 2,679,184; 1900, 3,106,665. The rank of the State rose rapidly until 1870, when it reached fifth, at which point it has since stood. The increase between 1890 and 1900 was a little less than for either of the four preceding decades, and amounted to 16 per cent., as compared with 20.7 for the United States. The negro population, which is largely confined to the Missouri River counties, amounted, in 1900, to 161,234. The foreign-born population numbered 216,379—the largest for any of the States which are usually classed as Southern. Saint Louis was an early centre of German immigration, and the Germans still constitute over one-half of the total foreign born. In 1900 there was an average of 45.2 people to the square mile—a greater density than is shown in any other State west of the Mississippi. Missouri contains the largest centre of population located on the Mississippi River, and the percentage of urban population is therefore high. In 1900 the 35 places which exceeded each 4000 inhabitants contained collectively 34.9 per cent. of the total population.

Cities. In 1900 the six largest cities were: Saint Louis, 575,238; Kansas City, 163,752; Saint Joseph, 102,979; Joplin, 26,023; Springfield, 23,267; Sedalia, 15,231.

Religion. The two leading denominations, the Methodists and the Baptists, are of almost equal strength. The Catholics also have a strong representation. Probably the most rapidly developing denomination is that of the Disciples of Christ. It ranks third among Protestant denominations. The largest of the remaining denominations are, in the order named, the Presbyterians, Lutherans, Protestant Episcopalians, and Congregationalists.

Education. In 1900 6.4 per cent. of the population ten years of age and over were illiterate. The percentage of illiteracy for the negroes alone was 28.0 per cent., which was a decided decrease over 1890, when the corresponding per cent. was 41.7. Although the Constitution of 1820 provided for a public school system, it was not until 1833 that a school was organized which could legally enforce support. The office of State Superintendent of Common Schools was first created in 1839. The State Board of Education consists of the Governor, Secretary of State, Attorney-General and Superintendent of Education. As is common in States which have a large rural population, the country schools are often in a very backward condition, in marked contrast with the town schools, which are generally very efficient. In many districts there has been a decrease in the rural population, resulting in an increasing number of very small schools. The wealth of many districts is too small to support a long term school. Short terms, inefficient teaching, irregularity of attendance, and lack of gradation and superintendence, therefore, characterize many country districts. However, the average length of the school term for the State—144 days in 1900—compares favorably with the corresponding term in the neighboring States. In 1900 the number of children between the ages of five and eighteen was 966,400, the number enrolled in the public schools, 719,817, and the average attendance for the school year, 460,012. The State has no compulsory attendance law. The attempt to articulate the high schools with the university has necessitated the appointment of an inspector to examine the work of the high schools. In 1900 about 70 of these schools were upon the approved list of the universities, but there are in all about 500 schools doing from two to four years of high school work. In 1900 there were 16.201 teachers, of whom 10.104 were females. The State maintains normal schools at Kirksville, Warrensburg, Cape Girardeau, and at Lincoln's Institute in Jefferson City. The public school fund was begun with the Congressional donation to the State of saline funds in 1812. The original sum has been increased by additions from various sources until, in 1900, the total school fund amounted to $12,548.963. The total receipts for school purposes in 1900 were $9.554.384. over two-thirds of which was from railroad district, back taxes, and tuition fees. The amount paid for teachers' wages for that year was $4.684,250. the incidental expenses amounted to $1,294,784. and the money used for building purposes $1,837,014. The average State levy upon $100 valuation for school purposes was 51 cents. Higher education is afforded by the State at the University of Missouri, located at Columbia. This institution includes among other departments those of law, medicine, agriculture, and mechanic arts, and mines and metallurgy. There are within the State also a very large number of private and denominational institutions which bear the name of college or university, but the enrollment at most of these is very small. Washington University, at Saint Louis (non-sectarian), has the benefit of a large endowment, and the Saint Louis University (Roman Catholic) also has a large endowment. Lincoln Institute is a well-equipped manual training school for the colored.

Charitable and Penal Institutions. The State maintains insane hospitals, located respectively at Farmington. Saint Joseph. Fulton, and Nevada. There is also a colony for feebleminded at Marshall. A State Federal soldiers' home is located at Saint James, and a State Confederate home at Higginsville. The State school for deaf and dumb is at Fulton, and the school for the blind at Saint Louis. A boys' reform school is located at Boonville, a girls' reform school at Chillicothe, and the State prison, for both men and women, at Jefferson City. A large number of prisoners are employed under the contract system, but their work is confined within the prison walls. In some of the counties male prisoners within the county jails are worked on the public roads or at quarrying stone.

History. Missouri was part of the vast area of Louisiana claimed by the French on the ground of the discoveries of La Salle, who descended the Mississippi to its mouth in 1681-82. A few years before La Salle, in 1673, Marquette and Joliet had sailed down the river as far as the mouth of the Arkansas. The territory included within the present State was traversed before 1720 by parties of French explorers in search of mines of lead and silver, and in 1723 a certain Lieutenant Renaud received the grant of a large tract of land in that region. The foundation of Old Saint-Genevieve is sometimes placed in the year 1735. The second settlement within the State was Saint Louis, established as a trading-post in 1764, a year after the cession of Louisiana to Spain by the Peace of Paris. Many French residents removed from the villages east of the Mississippi to Saint Louis, which became, under the French and the Spanish, a prosperous little capital. The colonization of the region was greatly accelerated by the ordinance of 1787, which, in excluding slavery from the Northwest Territory, diverted the stream of southern immigration to Missouri. The Spaniards also encouraged immigration by the offer of liberal bounties to settlers. In 1800 Louisiana was retroceded to France, which, however, retained it only three years. After the acquisition of Louisiana by the United States, in 1803, the entire territory was divided into two by the line of the 33d parallel of latitude, the northern part being known as the District and Territory of Louisiana till 1812. and subsequently as the Territory of Missouri. At that time the population was over 20,000, and the chief occupations of the inhabitants were agriculture, fur-trading, and mining. The mass of the people were sturdy and unrefined; the rough backwoodsman and the fighting Mississippi boatman were picturesque types of the society of the period. After 1815 the volume of immigration increased markedly. In 1820 there were 60,000 inhabitants within the present limits of the State, of whom about 10,000 were slaves. The Indian titles to the land were extinguished rapidly. Between 1800 and 1824 the Osages and Sacs and Foxes ceded almost all their lands, though it was not till 1832 that the area of the State was rounded out by the so-called Platte Purchase.

In 1817 the Territorial Legislature applied to Congress for permission to prepare a State Constitution. (For the struggle in Congress concerning Missouri, see United States and Missouri Compromise.) In June, 1820, a convention framed a Constitution which sanctioned slavery and forbade any free negro or mulatto to take up his residence in the State; but Missouri was admitted (August 10, 1821) only after the Legislature had taken a pledge that the anti-freedmen clause should never be enforced. The period after 1820 was one of rapid, if not entirely sound, development. An era of wild speculation in lands set in, accompanied by the usual inflation of the currency (the Bank of Saint Louis had been established in 1816), and the inception of an elaborate system of internal improvements. Within twenty years after 1835 the State pledged its credit for $28.000.000 to various railroad companies, and found itself saddled with a debt of over twenty millions. The system of public education was quite inefficient before the Civil War, though Saint Louis University had been incorporated in 1832, and the State University at Columbia eight years later. Respect for the law was often sadly wanting in the western part of the State, as was shown in the history of the Mormons. They had settled at Independence in Jackson County, and had made the beginning of a prosperous community, when they were driven out by mob violence, for which it is probable they were less responsible than their enemies. They established themselves anew in Caldwell County: but there, too, they came into conflict with the authorities and the inhabitants, who forced them to depart once more in a destitute condition, leaving valuable farms and other property behind them. See Mormons.

In the first half of the nineteenth century Missouri, though a slave State, was not an ardent defender of slavery, and a very large proportion of its citizens were interested in movements looking toward the gradual emancipation of the slaves. With the rise of the abolitionists, however, Missouri became decidedly a pro-slavery

State. It favored the annexation of Texas in 1845, and took a very prominent share in the Mexican War, General Kearny's army of invasion consisting largely of Missourians. In 1849 the Legislature adopted the so-called Jackson Resolutions, in which the right of Congress to regulate slavery in the Territories was trenchantly denied, and the principle of squatter sovereignty was asserted. The Jackson Resolutions, however, did not represent the unanimous feeling in the State, when they covertly threatened secession. In the election of 1860 the vote in the State for Douglas and for Bell was nearly equal, while Breckenridge and Lincoln received a far smaller vote than the others. The Legislature thereupon issued a call for a convention to consider the relation of the State to the Union. In the elections for the convention, the secessionist delegates were defeated by a popular majority of 80,000, and when the convention met—February to April, 1861—it declared that it could find no cause to dissolve the connection between the State and the Federal Union, and expressed the hope that some compromise might be effected between the North and the South. In reply to President Lincoln's call for troops, Governor Jackson, who, with the rest of the State Government, was in favor of secession, refused to participate in the 'unholy crusade,' and summoned the State militia to arms. Between the State militia and the Federal troops, under Colonel Lyon, aided by the volunteer bands which the loyalists of Saint Louis had organized, civil war ensued. The Governor, together with a majority of the Legislature, fled to the southern part of the State, and the supreme power was assumed by the convention, which declared all the offices vacant and proceeded to install a provisional government. The fugitive Legislature responded by declaring Missouri a member of the Southern Confederacy. (For military operations in Missouri, see Civil War.) In 1863 the convention passed an ordinance of emancipation of doubtful legality, which was to go into effect in 1870. With the fall of the Confederate power in Missouri the regular State Government was reorganized (1864), and in January, 1865, a constitutional convention controlled by the radical union party assembled in Saint Louis. The new Constitution provided for the immediate emancipation of the slaves and imposed severe political disabilities on all who had participated in the rebellion; all teachers, physicians, lawyers, and ministers were required to take a searching oath of loyalty. The qualifications for the franchise deprived a vast proportion of the citizens of the right to vote and continued in force till 1871, when a more liberal registration law was adopted. A third Constitution went into effect in 1875. Since the war the prosperity of the State has been greatly increased by the development of its mineral industries, and the growth of railroads. The improvement of the navigation of the Mississippi and the Missouri was carried on actively for many years. In the matter of public education there has been exceedingly rapid progress, the school fund of the State being one of the largest in the Union. Preparations are now (1903) nearly completed for an exposition to be held at Saint Louis to commemorate the one hundredth anniversary of the acquisition of Louisiana. See Louisiana Purchase Exposition.

From 1824 to the Civil War Missouri was always Democratic, but the Whig minority was very strong. From 1864 to 1872 the Republicans were in power, but the defection of a large body of Liberal Republicans who were opposed to the vindictive policy pursued against those who had participated in the Rebellion led to the reëstablishment of Democratic supremacy, which has remained unbroken since, save for the election of 1894, when the Republicans secured a majority in the Legislature and the Congressional delegation. The following is a list of the Governors of the State with their party affiliations:

Alexander McNair	Democrat	1820-24
Frederick Bates	“	1824-25
Abraham J. Williams (acting)	“	1825
John Miller	“	1825-32
Daniel Dunklin	“	1832-36
Lilburn W. Boggs	“	1836-40
Thomas Reynolds	“	1840-44
M. M. Marmaduke (acting)	“	1844
John C. Edwards	“	1844-48
Austin A. King	“	1848-52
Sterling Price	“	1852-56
Trusten Polk	“	1856-57
Hancock Jackson	“	1857
Bobert M. Stewart	“	1857-61
Claiborne F. Jackson	“	1861
Hamilton R. Gamble	(Provisional)	1861-64
Willard P. Hall (acting)		1864-65
Thomas C. Fletcher	Republican	1865-69
Joseph W. McClurg	“	1869-71
B. Gratz Brown	Liberal Republican and Democrat	1871-73
Silas Woodson	“ “ “ “	1873-75
Charles H. Hardin	Democrat	1875-77
John S. Phelps	“	1877-81
Thomas T. Crittenden	“	1881-85
John Marmaduke	“	1885-87
A. P. Morehouse	“	1887-89
David R. Francis	“	1889-93
William J. Stone	“	1893-97
Lon V. Stephens	“	1897-1901
Alexander M. Dockery	“	1901 —

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MISSOURI, mĭz-zōō′rē. A small tribe of Siouan stock. When first known to the whites they occupied the territory about Grand River, a northern affluent of the Missouri, in what is now the State of Missouri, and contiguous to the Iowa and Oto (q.v.) on the north and west, all three tribes speaking the same language. Their popular name is of Algonquian origin, and is said to mean 'great muddy,' referring to the Missouri River. They call themselves *Niutachi* or *Nudacha*, 'those who come to the mouth' (of the river). According to their tradition the three tribes migrated together from the vicinity of Green Bay, Lake Michigan. The Missouri are named upon Marquette's map of 1673, and some years afterwards a French fort was established in their territory. Throughout the colonial period they were generally on the French side, as opposed to the English, although on one occasion they attacked and massacred the French garrison. In 1725 a number of their chiefs visited France and attracted much attention. At one time in the eighteenth century they were estimated at from 1000 to 1200; but having been greatly reduced by smallpox the Sauk made war upon them and compelled them to abandon their territory about 1798 and take refuge west of the Missouri. In 1805 they were living near the mouth of the Platte River and numbered about 300. In 1823 they were again so decimated by smallpox that the remnant, about 80 persons, incorporated with the kindred Oto. The confederated tribes removed in 1882 from Nebraska to a reservation in Oklahoma, where they now reside, numbering altogether only 360. They are still steadily decreasing, and their agent reports that they have practically ceased all effort at self-support, owing to the money they receive in the shape of treaty and lease payments.

MISSOURI, University of. A State institution of learning founded in 1839 at Columbia, Mo. Academic work began in 1841. In 1867 a department of education was established, to which women were admitted in 1869, and soon after all departments were opened to them. The university comprises a graduate department, established in 1896, an academic department, and departments of education, law (1872), medicine (1873), military science and tactics (1890), a College of Agriculture and Mechanic Arts (1870), embracing a school of agriculture, an experiment station (1888), a school of engineering (1877), and a school of mines and metallurgy, situated at Rolla (1870). The university confers the bachelor's and master's degrees in arts, law, and science, the doctor's degree in medicine and philosophy, and the degrees of civil, electrical, mechanical, and sanitary engineer and engineer of mines. The only honorary degree conferred is that of Doctor of Laws. The university accepts the certificate of approved schools for admission. The faculty in 1902 numbered 102. The enrollment, including duplicates, was 1286, of whom 393 were women. The campus includes 32 acres in the southern part of the town, and near it are the experiment farm, of 618 acres, and the horticultural grounds, of 30 acres. The grounds, buildings, and equipment were valued at over $1,000,000. The endowment was about $2,500,000. The university library, including the departmental libraries, contained about 50,000 volumes.

MISSOURI COMPROMISE. In American history, an arrangement between the free and slave States, embodied chiefly in an act of Congress approved March 6, 1820, which provided for the admission of the State of Missouri into the Union with a constitution allowing slavery, but which forever prohibited slavery in all the rest of the Louisiana territory lying north of latitude 36° 30′ N., that being the southern boundary line of Missouri. To balance the admission of Missouri as a slave State, Maine was admitted as a free State at the same time. In February, 1819, in the debate in Congress on the bill to admit Missouri into the Union, James W. Tallmadge, of New York, moved to amend the Missouri bill to the effect "that the further introduction of slavery or involuntary servitude be prohibited, and that all children of slaves born within the State after the admission thereof in the Union shall be free." The admission of Alabama in the same year without any prohibition against slavery made the number of 'slave' States and of 'free' States equal. The admission of Missouri as a 'free' State, therefore, would disturb the equilibrium. The bill with the Tallmadge amendment passed the House February 17, 1819, by a vote of 87 to 76. On March 2d the Senate passed the bill without the Tallmadge amendment. Two days later Congress adjourned and the question of Missouri went over to the next session. In December, 1819, another bill for the admission of Missouri was introduced, whereupon John W. Taylor, of New York, offered an amendment in the House which provided that as a condition of admission the State should be required to adopt a constitution forever prohibiting slavery within its limits. This gave rise to a prolonged and vigorous debate on the power of Congress to impose conditions upon the admission of a State into the Union. Those who upheld the power of Congress in the premises based their argument on the provision of the Constitution which empowers Congress to admit new States, the implication being that it may admit under any conditions which it may see fit to impose. Their opponents relied chiefly upon the doctrine of the equality of the States in the Federal system, and declared that Congress had no constitutional power to destroy that equality by attaching onerous conditions to admission of the new States. Meantime the situation was complicated by the application of Maine to be admitted with a constitution prohibiting slavery. The House of Representatives promptly passed a bill for this purpose, and when this bill came up for discussion in the Senate in January, 1820, the friends of slavery in Missouri, who were in a majority in the Senate, coupled the Maine bill with the bill to admit Missouri with slavery, and the Senate steadily refused to disconnect the two measures. In this situation the substance of the compromise was proposed by Senator Thomas, of Illinois, in an amendment which provided that Missouri should be admitted with a constitution allowing slavery, but that in all the rest of the Louisiana territory north of latitude 36° 30′ N. slavery or involuntary servitude should be forever prohibited. The bill with this amendment finally passed the Senate, February 18, 1820. The bill thus amended was coupled with the bill to admit Maine, and in this shape was sent to the House for concurrence. The House refused to agree to the combination, and the matter was then referred to a conference committee of the two Houses, which recommended that the Maine bill be passed separately, and that the Missouri bill should be passed with the Thomas amendment. To this report the House agreed. The separation of bills as distinct subjects was thus secured, and recognition was given to the claim of the Southerners that Congress had no power to impose such limitations as it saw fit upon any State as a condition of its admission to the Union. President Monroe approved the Maine bill on March 3, and the Missouri bill on March 6, 1820. Henry Clay, who was Speaker of the House, exerted his influence to bring about this result. In the next session the Constitution of Missouri, including a paragraph making it the duty of the Legislature to prevent the immigration of free negroes into the State, was presented to Congress for approval. This provoked a heated debate concerning the duty of the Federal Government to protect the citizens of each State in the exercise of their civil rights of citizenship in every other State.

After protracted negotiation, in which Henry Clay took a leading part, a bill was finally introduced providing that Missouri should be considered admitted as a State only after its Legislature had declared that no law would ever be passed, nor any construction placed upon the obnoxious paragraph which would justify any law which might abridge within Missouri the rights guaranteed to all citizens by the Federal Constitution. The bill involving this second compromise was approved March 2, 1821, and in accordance with its terms Missouri became a Commonwealth. Consult: Burgess, *The Middle Period* (New York, 1897); Carr, *Missouri* (Boston, 1888); Dixon, *History of the Missouri Compromise* (Cincinnati, 1899); and Woodburn, "The Historical Significance of the Missouri Compromise," in the *Report of the American Historical Society* for 1893 (Washington, 1894). See United States; Slavery.

MISSOURI RIVER. The principal affluent of the Mississippi and the longest river of the United States (Map: United States, G 3). It is formed in southwestern Montana by the confluence of the Jefferson, Madison, and Gallatin rivers. The longest branch, the Jefferson, has its farthest source in Red Rock Creek, which rises on the slopes of the Red Rock range of the Rocky Mountains, in Madison County, Montana, a few miles from the headwaters of the North Fork of the Snake. The middle and largest branch, the Madison, rises in the Yellowstone Park near the source of the Yellowstone River. From the junction of the three forks, the Missouri flows north and east across Montana into North Dakota, where it describes a long curve toward the southeast and then crosses the whole width of South Dakota. After reaching the Nebraska boundary it divides this State from Iowa and Missouri, forms the northeastern boundary of Kansas, and finally takes an easterly course across Missouri, joining the Mississippi 20 miles above Saint Louis. Its length to the source of the Jefferson is about 2950 miles, and to the source of the Madison about 2910 miles. With the lower Mississippi, the river has a total length of about 4200 miles, which is equaled by no other river in the world. The Missouri is a swift and turbid stream, navigable only by flat-bottomed steamboats. During the flood period in early summer it can be ascended to Great Falls, Mont., about 2300 miles from the mouth, but in low water navigation is suspended above the junction of the Yellowstone. At Great Falls the Missouri passes over a series of cataracts, descending a vertical distance of 350 feet in 16 miles. The highest falls are 87 feet. About 145 miles above this point is the Gate of the Rocky Mountains, a narrow rock gorge 12 miles in length, whose perpendicular walls rise 1200 feet above the river. The lower course of the Missouri, lying within the great plains, has been graded so as to offer no interruptions. In this part it is often a mile or more wide. The chief tributaries are the Milk and Yellowstone, in Montana; Little Missouri, in North Dakota; Cheyenne, James, White, and Big Sioux, in South Dakota; Niobrara and Platte, in Nebraska; Kansas and Osage, in Kansas and Missouri. It drains the greater part of the territory between the Mississippi and the summits of the Rocky Mountains. The Arkansas and Red rivers are the only other large streams in this region that contribute their waters directly to the Mississippi. The area of the basin exceeds 500,000 square miles. A number of thriving cities are located on the Missouri, including Kansas City, Leavenworth, Atchison, Omaha, Sioux City, Pierre, Bismarck, and Great Falls, the last being the centre of a great copper-smelting industry which utilizes the power of the Falls. See United States.

MISSOURI SUCKER, or Gourdseed. See Black Horse, and Plate of Suckers.

MISSOURI VALLEY. A city in Harrison County, Iowa, 21 miles north of Council Bluffs, on the Chicago and Northwestern, the Fremont, Elkhorn and Missouri Valley, and the Sioux City and Pacific railroads (Map: Iowa, B 3). It has a public library of about 1900 volumes, and the fair grounds of the County Agricultural Society. The industrial interests are represented by extensive railroad machine shops, stock yards, and manufactories of flour, machine-shop products, bricks, coffins, creamery products, etc. The waterworks are owned and operated by the municipality. Population, in 1890, 2797; in 1900, 4010.

MIST. See Fog.

MISTAKE. An erroneous mental conception affecting the will, and hence leading to or preventing some act. The importance of the mistake in legal contemplation is its effect upon the act. In general a mistake of law produces no legal effect upon an act influenced or induced by it. Thus one is without remedy who has entered into a contract without knowing or understanding the legal effect, or who has voluntarily, and with full knowledge of the facts, paid a claim not well founded in law. The full acceptance of the doctrine is due to a misapplication of the measure *Ignorantia juris non excusat* ("ignorance of the law does not excuse"), which is applicable only in the criminal law or under statutes imposing quasi-criminal penalties where sound policy requires that ignorance of law should not excuse one charged with a crime. (See Intent.) Mistake of fact has a direct legal effect on many acts, and the law in many cases affords a remedy to one who has done a prejudicial act induced by mistake of fact.

The effect of mutual mistake as to a material term of a contract is to prevent the meeting of the minds, and thus prevent the formation of a contract (q.v.). The effect of mutual mistake of fact in case of sale is to prevent passing of title, and one who has given up the possession of personal property under mistake, preventing the passing of title, may recover the specific property by an appropriate action, or its value in an action of trover. In general, whenever money or property is delivered to another under material mistake of fact, its value may be recovered in an action based on the theory of quasi-contract (q.v.).

In the law of tort, the effect of mistake of fact varies considerably with the different branches of the subject. In the law of trespass, one is required to know his own, and he interferes with the property of another at his peril; hence mistake of fact does not affect his liability. The same is true of libel and slander.

Equity has jurisdiction to relieve one from the consequences of his mistake of fact, by compelling a reformation or rescission of a contract.

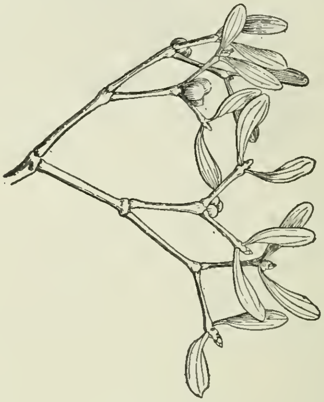
MISTASSINI, mĭs′tăs-sē′nê. A large lake in the Ungava district, Northwest Canada, latitude

50° N., longitude 72° to 74° W. (Map: Canada, Q 6). In 1672 French Jesuit missionaries visited it. The Indians claimed an extravagant length for the lake, saying that three days were employed in crossing the narrowest part from island to island, but an estimate based on surveys gives the length at 120 miles and the actual width at 20 miles in the widest parts. From the northeast and southeast it receives the drainage of a chain of smaller lakes, and discharges its own surplus into James Bay, the southern arm of Hudson Bay, by the Rupert River, 120 miles long. The Hudson's Bay Company has a post on Lake Mistassini, 333 miles north of Montreal. The lake is of great depth and abounds in fish; the surrounding country is level and well fitted for agriculture, while the woods are full of game. The winters are clear and cold, and the summers warm and short.

MISTELI, mĭs-tā′lė, Franz Josef (1841—). A Swiss philologist. He was born at Solothurn; studied at Zurich and Bonn; taught at Saint Gall and Solothurn; and in 1874 became professor of comparative linguistics at Basel. A follower of Steinthal, whose *Characteristik der hauptsächlichsten Typen des Sprachbaues* he reëdited in 1893, Misteli contributed to Kuhn's *Zeitschrift* and to the *Zeitschrift für Völkerpsychologie*; and wrote *Ueber griechische Betonung* (1875) and *Erläuterungen zur allgemeinen Theorie der griechischen Betonung* (1875). He is an authority on the dialects of the Ural and Altai.

MISTLE THRUSH, or **MISSEL THRUSH**. One of the most familiar and admired of European thrushes (*Turdus viscivorus*), named from its fondness for mistletoe berries, which are rejected by the majority of small birds. It is the largest and one of the most numerous of British thrushes, and is also well known throughout the Mediterranean region and Western and Northern Asia. Everywhere it is migratory, and is noted for its loud and pleasant song, which begins first of all bird-notes in the spring and lasts far into the summer; its habit of cheerfully singing on cold or rainy days, when most other birds are quiet, has given it the sobriquet 'stormcock.' Its plumage is soft grayish brown above and white below, the breast and abdomen thickly and sharply spotted. See Thrush.

MISTLETOE, mĭs′′l-tō (AS. *misteltān*, *mistiltān*, Icel. *mistilteinn*, from AS. *mistel*, birdlime, mistletoe, basil, Icel., OHG. *mistil*, Ger. *Mistel*, mistletoe + AS. *tān*, twig). A genus (*Viscum*) of small shrubs of the natural order Loranthaceæ. This order contains more than 400 known species, mostly tropical and parasitic. The leaves are entire, almost nerveless, thick, fleshy, and without stipules. The flowers of many species are showy. The common mistletoe (*Viscum album*), a native of the greater part of Europe, grows on many kinds of trees, particularly on the apple, and its close relatives, the service and hawthorn; sometimes, also, on sycamores, limes, poplars, locust trees, and firs, but rarely on oaks (contrary to the common belief). It is very plentiful in some parts of the south of England, its evergreen leaves giving a peculiar appearance to the orchards in winter, when the clusters of mistletoe are very conspicuous among the naked branches of the trees. The stems divide by forking; the leaves are opposite, of a yellowish-green color, obovate-lanceolate, obtuse. The flowers are inconspicuous, and grow in small heads at the ends and in the divisions of the branches, the male and female flowers on separate plants. The berries are about the size of currants, white, translucent, and full of a very viscid juice, which serves to attach the seeds to branches, where they germinate, and take root, the radicle always turning toward the branch, whether on its upper or under side. The mistletoe derives its nourishment from the juices of the tree on which it grows, and from which it seems to spring as if it were one of its own branches. The mistletoe was intimately connected with many of the superstitions of the ancient Germans and the British Druids. In the northern mythology, Balder is said to have been slain with a spear of mistletoe. Among the Celts the mistletoe which grew on the oak was in peculiar esteem for magical virtues. Traces of the ancient regard for the mistletoe still remain in some old English and German customs, as kissing under the mistletoe at Christmas. The mistletoe was at one time in high repute as a remedy for epilepsy and convulsions, but it seems to possess no decided medicinal properties. Loranthus Europæus, a shrub very similar to the mistletoe, but with flowers in racemes, is plentiful in some parts of the south of Europe, and very frequently grows on oaks. Loranthus odoratus, a Nepalese species, has very fragrant flowers. In the United States the mistletoe is Phoradendron, a genus of plants closely allied to and greatly resembling Viscum. The common species in the Eastern States is Phoradendron flavescens. It occurs upon various species of deciduous trees from New Jersey to Missouri and southward. In the southwestern part of the United States and in California are still other species. See Colored Plate of Parasitic Plants.



VISCUM ALBUM.

MISTLETOE BOUGH, The. A pathetic song by Thomas Haynes Bayly, based on a legend connected with various localities. The story is that of the young bride of Lord Lovel, who disappears during the Christmas festivities at her father's castle after proposing a game of hide and seek. The mystery is solved only after many years when her skeleton form is found in an old oaken chest which had closed with a spring and entombed her.

MISTRAL, mē̇′strȧl′, or **MAESTRAL**, mȧ′strȧl′ (Prov., master-wind). The Provençal name for the cold northwest wind on the southern coast of France and in other parts of the Mediterranean coast region. This wind is identical in origin with the Bora of the Caspian Sea and of Austria, Turkey, and Southern Russia. It is also perfectly analogous to the strong northwest winds of the United States. In both cases the atmosphere over a great extent of country is circulating about a region of low pressure or a so-called storm centre, moving along over the surface of the earth usually toward the east or northeast. When such a storm centre passes over Southern Europe the cold winds from Russia sweep southward with great force toward it. The warm southerly siroccos give place to cold northerly Boras and Mistrals, which are very dry; the cloudy hazy skies are replaced by cloudless transparent air. During the first few hours the wind seems to come in descending and violent gusts; afterwards it becomes more moderate, but is still very strong. When it descends over mountain slopes upon the water, as it does along the coast of France, Italy, and Austria, it makes navigation difficult and even dangerous to small craft.

MISTRAL, Frédéric (1830—). A French poet, the leader of the modern Provençal revival in Southern France. He was born at Maillane, Bouches-du-Rhône, September 8, 1830, and went to school in Avignon. Here he came under the influence of Joseph Roumanille (q.v.), who had already conceived the idea of raising the native speech to higher uses. Roumanille's Provençal poem *Li Margarideto* fired the youth's enthusiasm, and when he returned to Maillane, at the end of his school days, he wrote a poem in four cantos, *Li Meissoun,* the best parts of which he has preserved by insertion into his riper works. His father, seeing his intellectual superiority, had him study law at Aix. Mistral, however, did not practice law, but gave himself up heart and soul to the work of creating a literature in Provençal. With six friends he founded the society of the Félibres in 1854, and contributed to their annual organ, *L'Armana Prouvençau.* The publication in 1859 of *Mirèio* is the most important event in Mistral's life and in the history of the movement. It was a revelation to the Félibres, and through the enthusiastic praise of Lamartine it obtained a national success. *Mirèio* is a narrative pastoral poem in twelve cantos, a wonderful expression of what is most characteristic and best in the rural life of Provence. The language is the dialect of Saint-Remy, raised to the dignity of a literary language by a process of purification and enrichment strictly in accord with its genius. At this time also Mistral published some of his best lyrical poems, notably one called *The Countess,* a vigorous protest against the centralization prevailing in France. In 1867 he published a second long poem, *Calendau* (French, *Calendal*); it treats of mediæval legends and traditions, and abounds in symbolism. In 1875 appeared his only volume of lyrics, *Lis Iselo d'or.* In 1876 the Félibrige was formally organized into a great association with Mistral as *Capoulié* or chief. He next published *Nerto,* a fantastical tale in verse, the scene of which is laid at Avignon, in the days of the popes. Later he brought out his monumental dictionary of all the dialects of the *Langue d'oc, Lou Tresor dou Félibrige.* In 1890 appeared *La Rèino Jano* (Queen Joanna), which he calls a Provençal tragedy. It is brilliant in language, but of little dramatic power. In the same year he founded the quarterly *L'Aiòli.* In 1897 appeared a third long narrative poem, *Lou Pouèmo dou Rose,* his best work after *Mirèio.* It is a singularly felicitous combination of fanciful legends and realism. Consult: Gaston Paris, *Penseurs et poètes* (Paris, 1896); Welter, *Frédéric Mistral, der Dichter der Provence* (Marburg, 1899); Downer, *Frédéric Mistral* (New York, 1901). The best English translation of *Mirèio* is that of Harriet Preston (Boston, 1872). There are prose translations in French by Mistral of all his works, and these translations accompany the original text in all editions. See Félibrige.

MISTRETTA, mē-strĕt′tȧ. A town of Sicily, 50 miles northwest of Catania (Map: Italy, J 10). It is situated in one of the most fertile sections of the island, and is devoted to farming and cattle-raising. Lignite is mined in the vicinity. Population, in 1901 (commune), 13,481.

MISTRIAL. An invalid or illegal trial of an action, the result of which is without legal effect on the cause of action, and which leaves the parties in the same position as if there had been no attempt to try the case. Where the prosecution of a person charged with a crime results in a mistrial, the accused may be again tried, and cannot plead the constitutional defense that he has been twice in jeopardy, as that can be true only where the proceedings against him are valid and legal. See Trial; and compare Nonsuit.

MITANI, mē-tä′nē. See Amarna Letters.

MITAU, mē′tou. The capital of the Government of Courland, Russia, situated in a low region on the Aa, 25 miles southwest of Riga (Map: Russia, B 3). It has an immense palace erected by Biron in 1738 on the site of an older ducal palace and now used as a Government building. Two gymnasia, a provincial museum with a library, and a theatre are the principal educational establishments of the town. The industries of Mitau are unimportant; the chief manufactures are spirits, flour, chocolate, oil cloth, ink, and iron products. The trade in grain and lumber is rather extensive. Population, in 1897, 35,011, about 50 per cent. German, 30 per cent. Lettish, 15 per cent. Russian, and the remainder Jewish. The majority of the inhabitants are Protestants. Mitau was founded by the Knights Swordbearers, in the second half of the thirteenth century, and became a city in 1435. In 1561 it became the capital of the Duchy of Courland, and in 1795 it was annexed to Russia.

MITCH′AM. An important railway junction and suburb of London, England, in Surrey, four miles northwest of Croydon (Map: London, G 6). It is noted for its extensive gardens, the soil of which is especially adapted for the cultivation of roses, lavender, peppermint, and other medicinal herbs, which in the manufacture of essential oils and perfumes yield superior products. Mitcham Common, covering 480 acres, is a favorite recreation ground, especially for golfers. Population, in 1901, 14,904.

MITCH′EL, John (1815-75). An Irish Nationalist agitator. He was born in Dungiven, Ireland; was educated at Trinity College, Dublin; and studied and practiced law. Through his *Life of Hugh O'Neil, Prince of Ulster* (1845), he gained a reputation as a writer and a Nationalist. He became a contributor to the *Irish Nation*, and, after the death of Thomas Davis, was its chief editor. He withdrew from the *Nation* in 1848, and established the *United Irishman.* In the same year he was arrested under the Treason-Felony Act, was convicted and sentenced to transportation for fourteen years, and was sent to Bermuda for one year and then to Tasmania. Escaping from the convict colony in 1853, he came to the United States, and in the following year established at New York the *Citizen.* He removed to Knoxville, Tenn., in 1857, started the *Southern Citizen,* and advocated in its columns the revival of the slave trade. He lived in Paris in 1860-62, then returned to America, and for a time edited the Richmond *Enquirer.* He afterwards came back to New York and in 1867 started the *Irish Citizen,* which had only a short career, being discontinued in 1872. Returning to Ireland in 1874, he was elected to Parliament from Tipperary, but was declared ineligible and denied his seat on the ground that he was a convicted felon. He was elected a second time, but died before his case could be tested. Besides the work already mentioned, he published *The Last Conquest of Ireland (perhaps)* (1860), and *History of Ireland from the Treaty of Limerick* (1868); and edited *The Poems of Thomas Davis* (1856) and of *James C. Mangan* (1859), with biographies. For his life, consult Dillon (London, 1888).

MITCHEL, Ormsby McKnight (1810-62). An American astronomer, educator, and soldier. He was born in Union County, Ky., was a clerk for some time in a country store, and graduated at West Point in 1829. From 1829 to 1831 he was assistant professor of mathematics at West Point, and in 1832 he resigned from the service. He practiced law in Cincinnati from 1832 to 1834, and for the next ten years was professor of mathematics, philosophy, and astronomy in the Cincinnati College. In 1836-37 he was chief engineer of the Little Miami Railroad. He was an enthusiastic student of astronomy, and took an important part in procuring the erection of an observatory in Cincinnati, of which, when it was completed, he became the director, combining with this position in 1859 the directorship of the Dudley Observatory in Albany. On the outbreak of the Civil War he entered the Federal Army, was commissioned a brigadier-general of volunteers in August, 1861, and from September 19th to November 15th commanded the Department of the Ohio. In April, 1862, he was promoted to a major-generalship of volunteers in recognition of a brilliant movement into northern Alabama, whereby he secured the control of 120 miles of railway. On September 17, 1862, he was placed in command of the Department of the South, but before he had time to begin active operations he was attacked by yellow fever and died. He made several important astronomical discoveries, including, with exactness, that of the period of rotation of the planet Mars. He edited the *Sidereal Messenger* from 1846 to 1848, and published a number of works on astronomical subjects, including *The Planetary and Stellar Worlds* (1848) and *The Orbs of Heaven* (1851). *The Astronomy of the Bible* was published posthumously in 1863. Consult the biography by Frederick A. Mitchel (Boston, 1887).

MITCH'ELL. A city and the county-seat of Davison County, S. D., 70 miles west by north of Sioux Falls; the terminus of the Chicago, Saint Paul, Minneapolis and Omaha Railroad, and on two divisions of the Chicago, Milwaukee and Saint Paul Railroad (Map: South Dakota, G 6). It is the seat of Dakota University (Methodist Episcopal), established in 1888. The centre of a fertile agricultural region, Mitchell exports grain and live stock; it has a creamery, railroad and machine shops, grain elevators, brick and lumber yards, etc. Settled in 1879, Mitchell was incorporated in 1883 and is governed under a charter, secured by general legislative act of 1890, which provides for a mayor, elected every two years, and a city council of which the executive is a member. There are municipal waterworks. Population, in 1890, 2217; in 1900, 4055.

MITCHELL, Mount. See Black Mountains.

MITCHELL, Alexander (1817-87). An American financier and railroad president, born at Ellon, Aberdeenshire, Scotland. In 1839 he came to the United States at the request of George Smith, a Scotchman who was interested in the development of the West, and was made president of the Wisconsin Marine and Fire Insurance Company, at the new town of Milwaukee. Mitchell settled in Milwaukee, and his name is inseparably connected with the development of that city and region. In 1864 Mitchell effected a combination of several roads into the Chicago, Milwaukee and Saint Paul Railroad Company, of which he was president from its organization until his death. He was a Republican until after the war, but left the party on the reconstruction issue, in 1868 was elected to Congress as a Democrat, and served until 1875.

MITCHELL, Alexander Ferrier (1822-99). A Scottish divine and scholar, the historian of the Westminster Assembly. He was born at Brechin in Forfarshire, September 10, 1822, and after graduating from the University of Saint Andrews he became minister at Dunnichen (1847-48). He resigned to accept the professorship of Hebrew in the University of Saint Andrews. In 1868 he was transferred to the chair of ecclesiastical history and divinity. He held some of the highest offices in the Church of Scotland, and was an active member of the Scottish Text and History societies. Among his publications are: *The Westminster Confession of Faith* (1866); *Minutes of the General Assembly 1644-49* (1874); *The Westminster Assembly: Its History and Standards* (1883; new ed. 1895); *Catechisms of the Second Reformation* (1886); and *Reprint, with Introduction, of the First Protestant Treatise in Scottish Dialect* (1888). He died March 22, 1899.

MITCHELL, Donald Grant (1822—). An American author, well known by his pseudonym Ik Marvel. He graduated from Yale College (1841). In 1844 he went to Europe, bringing out on his return *French Gleanings, or a New Sheaf from the Old Fields of Continental Europe* (1847), and in 1850 *The Battle Summer,* sketches reminiscent of the outbreak in Paris two years before. In 1850 he produced *The Lorgnette, or Studies of the Town,* a series of mildly satirical papers in the manner of Irving's *Salmagundi.* The same year and the following year he wrote the books most popularly associated with his pseudonym, *A Bachelor's Reveries* (more recently renamed *Reveries of a Bachelor*) and *Dream Life*. In 1853 Mitchell became United States Consul at Venice. On his return, in 1855, he bought a farm (known as "Edgewood") near New Haven, Conn. From this place he has issued books dealing, in an agreeable mixture of philosophy, farming, and anecdote, with the joys of country life: *My Farm of Edgewood* (1863); *Wet Days at Edgewood* (1865); *Rural Studies, with Hints for Country Places* (1867); a novel of a religious sort, *Dr. Johns* (1866); and several books of travel and sketches, such as *Seven Stories, with Basement and Attic* (1864); and *English Lands, Letters, and Kings* (1889).

MITCHELL, Elisha (1793-1857). An American scientist, born in Washington, Conn. He graduated at Yale in 1813, and was ordained into the Presbyterian ministry in 1821. After teaching in Yale he became professor of mathematics and natural philosophy at the University of North Carolina in 1817, and in 1825 professor of chemistry, mineralogy, and geology at the same institution. In the capacity of State Surveyor he ascended a number of the North Carolina mountains, and was finally killed by a fall from a precipice on a mountain (now Mount Mitchell) which he had just ascertained to be the highest in the United States east of the Rockies. This summit is called Mitchell's Peak, or Beach Dome, and the discoverer's body is buried on the summit. His works include a series of reports on the geology of North Carolina (1826-27); *Elements of Geology with an Outline of the Geology of North Carolina* (1842); and various articles which he contributed to scientific publications.

MITCHELL, Henry (1830—). An American hydraulic engineer, brother of Maria Mitchell, the astronomer (q.v.). He was born in Nantucket, was educated in private schools, and early devoted himself to the study of tides and river currents, being first employed by the United States Coast Survey to report on the waters about Nantucket and Martha's Vineyard. After assisting the commissioners on harbor encroachments in New York City and discovering the underflow of the Hudson (1859), Mitchell was consulting engineer to the United States Commission on Boston Harbor (1860-67), and member of the commission; in 1867 was sent to study the decline of Greytown harbor, Nicaragua; and in 1874 was appointed a member of the board of engineers to improve the mouth of the Mississippi. In 1879 he visited the Suez Canal and reported on it. Mitchell was elected to the National Academy of Sciences in 1885, and in 1888 retired from active business. His papers on physical hydrology mostly appeared in the United States Coast Survey Reports.

MITCHELL, Hinckley Gilbert (1846—). An American Orientalist, born at Lee, N. Y., and educated at Wesleyan University (1873) and the Divinity School of Boston University (1876). After studying at Leipzig, he preached in the Methodist Episcopal church at Fayette, N. Y., taught at Wesleyan (1880-83), and in 1883 went to Boston University as instructor and (1884) professor of Hebrew and Old Testament exegesis. He became one of the foremost scholars of the Methodist Church. His publications include: *Hebrew Lessons* (1884 and 1897); *Amos* (1893), a translation of Piepenbring's *Theology of the Old Testament* (1893); and *Isaiah*, chapters i.-xii. (1900).

MITCHELL, John (?-1768). An Anglo-American physician. He settled at Urbana, Va., about 1700, and gained recognition as a botanist. It was after him that the *Mitchella repens* was named by Linnæus. He wrote, among various works: *Nova Plantarum Genera* (1741); and an *Essay on the Causes of Different Colors of People in Different Climates* (1744); but his name is best known in connection with *A Map of the British and French Dominions in North America* (1755), which was credited to him and was once standard.

MITCHELL, John Kearsley (1798-1858). An American physician, born in Shepherdstown, Va. He went to Scotland as a child and studied in Ayr and Edinburgh. After his return to the United States he graduated at the Medical College of the University of Pennsylvania in 1819. Before he settled in Philadelphia in 1822 as general practitioner he made three voyages to the Far East as ship's surgeon. In 1826 he became professor of medicine and physiology at the Philadelphia Medical Institute, and in 1833 professor of chemistry at the Franklin Institute. From 1841 to 1858 he was professor of the theory and practice of medicine in Jefferson Medical College. Besides contributions to scientific and medical periodicals his works include: *Saint Helena, a Poem by a Yankee* (1821); *On the Wisdom, Goodness and Power of God as Illustrated in the Properties of Water* (1834); *Indecision, a Tale of the Far West, and Other Poems* (1839); *On the Cryptogamous Origin of Malarious and Epidemic Fevers* (1849); and the posthumous *Five Essays on Various Chemical and Medical Subjects* (1858), brought out by his son, S. Weir Mitchell (q. v.).

MITCHELL, Margaret Julia (popularly known as Maggie Mitchell) (1832—). An American actress. She was born in New York, and when very young went upon the stage. She made her first regular appearance as Julia in *The Soldier's Daughter* at the Chambers Street Theatre, New York, in 1851. In 1868 she married Mr. Paddock, her manager. Her favorite rôles were Jane Eyre, Mignon, Little Barefoot, and Fanchon the Cricket, in which last she achieved a notable success.

MITCHELL, Maria (1818-89). An American astronomer, born at Nantucket, Mass. Her father, a school teacher in Nantucket, gave much attention to astronomy, in which subject she herself at an early age became greatly interested. She devoted herself especially to the study of nebulæ and comets, and in 1847 published an account of the discovery of a new telescopic comet, for which she received a gold medal from the King of Denmark. During the next ten years she was employed by the Coast Survey and assisted in compiling the Nautical Almanac. In 1857 she traveled in Europe, visiting the principal observatories and meeting the principal astronomers; and in 1865 she became professor of astronomy in Vassar. She was a member of the American Association for the Advancement of Science, and also of the American Academy of Arts and Sciences, of which she was the first female member admitted. Her numerous scientific papers still remain uncollected.

MITCHELL, Peter (1824—). A Canadian politician. He was born in Newcastle, Canada, was educated there, and in 1848 was called to the bar. He served two terms (five years) in the Provincial Parliament, and was appointed life-member of the Legislative Council. In 1858 he became a member of the executive Government of New Brunswick, and in 1865 suffered defeat with his Government on the question of a federal union of all British America. In 1865, associated with R. D. Wilmot, Mayor of Saint John's, he formed an administration in order to test the opinion of the province on the question of confederation, and was president of the executive committee. When the vote was taken, confederation was carried by 33 to 8. In 1867 he was appointed Senator, but in 1874 resigned. He was Minister of Marine and Fisheries in the Cabinet of the Dominion Government in 1867-73, and in 1882 was elected representative in the Dominion Parliament for Northumberland County, N. B. In 1885 he purchased the Montreal *Herald*, which he conducted for some years. He was in 1897 appointed Inspector of Fisheries for the Atlantic provinces. His publications include: *A Review of President Grant's Recent Message to the United States Congress, Relative to the Canadian Fisheries, and the Navigation of the Saint Lawrence River* (1870); and *Notes of a Holiday Trip* (1880).

MITCHELL, Samuel Augustus (1792-1868). An American geographer. He was born in Bristol, Conn., but removed to Philadelphia, where for forty years he devoted himself to cosmographical research. He prepared text-books of geography for the use of schools, as well as maps and treatises, which were considered superior to all others of their date. He published *General View of the World* (1846); *Traveller's Guide Through the United States* (1850); *Universal Atlas* (1851), and many other works.

MITCHELL, (Silas) Weir (1829—). A distinguished American neurologist and man of letters. He was born in Virginia, the son of John Kearsley Mitchell, a noted Philadelphia physician. After receiving his baccalaureate degree at the University of Pennsylvania, he was graduated in medicine in 1850 at Jefferson Medical College, Philadelphia. After a few years spent in general practice, Mitchell turned his attention almost entirely to diseases of the nervous system, a field in which he early achieved eminence. His special title to fame is derived from his elaboration of the system of "Rest Treatment" which has borne his name for many years and has been adopted, with modifications, the world over. His earliest work of importance consisted of researches upon the chemical composition and physiological action of the venom of snakes, in 1866, and later. He was assistant surgeon to the U. S. Hospital for Nervous Diseases during the War of the Secession, and from that time he has been a prolific contributor to medical literature. His scientific literary productions comprise more than 125 essays and monographs upon toxicology, comparative physiology, and clinical medicine. Besides these productions, which were contributed to medical journals, he has published the following books or pamphlets: "Researches upon the Venom of the Rattlesnake," in *Smithsonian Contributions to Knowledge* (1860); *Injuries of Nerves and Their Consequences* (1872); *Wear and Tear, or Hints for the Overworked* (4th ed. 1874); *Fat and Blood, and How to Make Them* (4th ed. 1885); *Lectures on Diseases of the Nervous System, Especially in Women* (2d ed. 1885); *A Doctor's Century* (1887); *Doctor and Patient* (1887); *Clinical Lectures on Nervous Diseases* (1897).

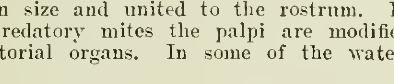
Dr. Mitchell first turned his attention to fiction and general literature during the War of the Secession, when he wrote *The Children's Hour*, to be sold during the great fair of the Sanitary Commission in Philadelphia. (See Sanitary Commission, United States.) Among other pieces of juvenile fiction was *The Wonderful Stories of Fuz-buz, the Fly, and Mother Grabem, the Spider* (1867). His first novels were *Hephzibah Guinness* (1880), *Thee and Thou*, and *A Draft on the Bank of Spain* (published in the same year). Others followed, including: *In War Time* (1885); *Roland Blake* (1886); *Far in the Forest* (1889); *Characteristics* (1892); *When All the Woods Are Green* (1894); *Hugh Wynne, Free Quaker* (1897); *The Adventures of François* (1899); *Dr. North and His Friends* (1900); and *Circumstances* (1901). These stories deal with different historical and contemporary types of character, and are to be distinguished from the popular novels of their class by rather more insistence than is common on psychological and pathological analysis. *Hugh Wynne* is generally conceded to rank among the best stories of the American Revolution yet written.

MITCHELL, Sir Thomas Livingstone (1792-1855). An English explorer. He was born in Stirlingshire, Scotland, began his service in the British Army in the Peninsular campaign of 1808, and in 1826 was promoted to be major. He was then sent to make surveys and plans of the Peninsular battle-fields. In 1827 he published *Outlines of a System of Surveying for Geographical and Military Purposes*, and was made Deputy Surveyor-General of New South Wales. Besides attending to the routine work of this office he led a number of exploring expeditions into the interior of Australia. In 1835 he traced the course of the river Darling, which he followed, in 1836, as far as the Murray River, with which it unites. In the same expedition he followed the Glenelg River to the ocean. He gave the world the results of his explorations in his *Three Expeditions Into the Interior of Eastern Australia* (1839). He went to England in 1839, and on his return to Australia conducted a fourth exploring expedition, in which he vainly attempted to reach the Gulf of Carpentaria. In 1850 he published a school geography for use in New South Wales under the name of *Australian Geography*, and in 1854 *The Lusiad of Camoens Closely Translated.*

MITCH'ILL, Samuel Latham (1764-1831). An American scientist, born at North Hempstead, Long Island, N. Y. He graduated in medicine at the University of Edinburgh in 1786, and was appointed, in 1792, professor of chemistry, natural history, and philosophy in Columbia College. In 1796 he made a geological and mineralogical tour along the Hudson. Jointly with Dr. Edward Miller and Elisha H. Smith he established the quarterly *Medical Repository*, of which he was for eighteen years the editor. He several times respresented his district in the State Legislature and in Congress, and in 1804 was elected United States Senator. In 1808 he became professor of natural history and in 1820 of botany and materia medica in the College of Physicians and Surgeons. He was called the 'Nestor of American Science.' His researches embrace a wide variety of scientific and philosophical subjects, and he published a large number of papers and several larger works. Consult "Memorable Events and Occurrences in the Life of Samuel L. Mitchill, of New York, from the Year 1786 to 1827," by himself and Dr. Francis, contained in Gross's *American Medical Biography.*

MITE (AS. *mīte,* OHG. *mīza, mizza,* Ger. *Miete;* probably connected with Goth. *maitan,* OHG. *meizan,* to cut). Any one of the Acarina, an order in the class Arachnida. They may be distinguished from other arachnids by their small size; by the unsegmented body, without a constriction between the anterior portion or cephalothorax and the posterior portion or abdomen; and by the lack of median eyes. There are exceptions, however, to all these characteristics, and certain forms have been misplaced even by naturalists. The mouth-segments have become united to form a beak or rostrum, but this character is not easily recognized. The young mite, on hatching from the egg, is not provided with eight legs as are other arachnids, but with only four or six, except in the case of Pteroptus. In size mites vary from tiny creatures, invisible to the naked eye, to certain tropical forms fully half an inch long.

Typically, mites have four pairs of legs, arranged more or less definitely in two groups. The two hinder pairs are apparently attached to the abdomen, while the anterior pairs are close to the mouth-parts, which consist of mandibles of varied character, palpi, and maxillæ. The mandibles are typically chelate, but in several families they are reduced to needle-like piercing-organs. In the case of certain gamasid mites the mandibles are nearly as long as the entire animal, and can be wholly retracted within the body, or suddenly extruded to seize the prey. The palpi are of four kinds. Simple, filiform palpi, which have a tactile function, are found in many families. In some parasitic forms the palpi are reduced in size and united to the rostrum. In many predatory mites the palpi are modified for raptorial organs. In some of the water-mites the palpi have become organs for holding the mite to other objects. The legs of mites are composed of from five to seven segments, and commonly terminate in from one to three claws. In many genera a cup-shaped sucking-disk or ambulacrum is attached to the tarsus or last segment. The reproductive organs, as in other arachnids, open on the under side of the abdomen near its base. The body and legs are more or less thickly clothed with bristles, hairs, or scales, which are of characteristic nature and arrangement in each species. In many of the soft-bodied species there are chitinous plates or shields, sometimes so large or numerous as almost completely to cover the mite. In the ticks the body is flat, and of a tough, leathery consistency.



A MITE OR RED SPIDER (*Tetranychus bimaculatus*).

The sense organs are few and of simple nature. Many mites have no eyes, but in some there are one or two ocelli-like spots on each side of the cephalothorax. A few families have what are considered organs of hearing. With the ticks this organ is a membrane-covered pit in the anterior tarsi; in the beetle-mites it is a pore on the posterior margin of the cephalothorax, from which arises a bristle. The sense of touch is supposed to reside in some of the hairs of the body or legs. In many mites there is a considerable difference in appearance between the two sexes, although there is not often much difference in size.

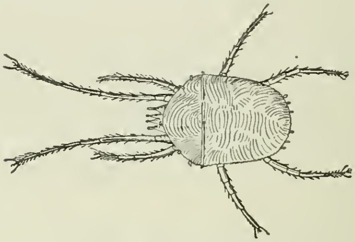
Centralization is the peculiar characteristic of the anatomy of mites. The various organs are more crowded together than in other arachnids. The digestive system, when complete, consists of the pharynx, or sucking-organ, the œsophagus, the ventriculus or stomach, with its cæca, the hindgut, and the Malpighian vessels. The œsophagus is a long, simple tube extending through the centre of the brain. The stomach is of varied size, according to food-habits; in some forms it is very small, while the cæca are numerous and long. The hindgut or intestine is a short tube ending in the rectum. The Malpighian vessels, when present, are two in number, and enter the intestine near its end. In some mites there is a well-developed dorsal pulsating organ or heart, but in others it is not present. The nervous system consists of one ganglionic mass surrounding the œsophagus, from which all the principal nerves arise. Many mites have an elaborate system of tracheæ by which they breathe and which open in various parts of the body, in many common species near the mandibles, but in the ticks and gamasids they open by stigmata near the hind legs. A great number of mites, however, have no internal respiratory system whatever. In these the skin is soft and they absorb oxygen by osmosis.

Life History. Nearly all mites deposit eggs, frequently of large size. In a few forms the larvæ issue from the parent, but in some cases it is rather from the egg within the body of the dead mite. In many cases the hard external skin or chorion of the egg splits into halves and exposes the lining vitelline membrane; this permits the maturing egg to increase in size, which is then called a 'deutovum.' The young larvæ on hatching commonly have six legs, but the gall-mites have but four. During the nymphal stage the mite feeds until it attains adult size. In many cases the nymph molts directly into the adult mite, but in several families the nymph often transforms into a creature entirely different from both the nymph and the adult—the hypopial stage or 'Hypopus,' long supposed to be a distinct genus of mites. On its ventral or under surface is an area of sucking-disks, by which the Hypopus attaches itself to an insect or small mammal, and is transported to some new and suitable locality, where it falls from its carrier, molts into an octopod nymph, begins feeding, and in due time becomes an adult mite. The Hypopus is, therefore, not a parasite, but a commensal, making use of the carrier only for transportation; and in certain gamasids (Uropoda) the mite in this migratorial stage is attached by a thread of hardened excrement to its host.

In some families (as the Trombidiidæ) the larval and nymphal stages are attached to various insects and feed thereon, while the adult is free. In some of the beetle-mites the nymph carries on its back old molted skins, egg-shells, and other débris. In these mites there is a considerable resting-period while the nymph is changing to the adult, a period when much of the internal anatomy is entirely changed; and it has been observed that when the adult emerges its legs are not withdrawn from the legs of the nymph, but from beneath the body. In the bird-mites there is a transition-form between the nymph and the adult female, known as the nymphal female. The adult male mates with this nymphal form, and when the real adult emerges, an egg, already of considerable size, is seen in her body. Parthenogenesis has been observed in a number of mites. As a rule, mites possess no special accessory sexual organs, comparable to those of spiders, but in some male gamasids the mandibles carry the globule of sperm cells and insert it in the female vulva. In many species the males have one pair of legs enlarged and modified to act as claspers for holding the female. The eggs are usually deposited singly, but many gall-mites and harvest-mites place them in clusters.

Habits. The habits of mites are very diverse. Most mites ordinarily move quite slowly and deliberately; very few mites are fitted for leaping. The spinning mites or 'little red spiders' (Tetranychus) produce a tiny thread wherever they go, the accumulated threads of many individuals making a whitish mesh or web. More than one-half of the known mites are parasitic, at least during part of their life. The ticks are well known to infest various mammals, birds, and even snakes and turtles. They have mouth-parts especially fitted for cutting into the skin of the host and sucking up the blood. (See Tick.) One group of the gamasids is parasitic on bats, birds, and small mammals. The bird-mites live upon the skin and feathers of birds, but as they feed upon epidermal scales and loose bits of feathers, they do not injure their hosts, but are rather of service in keeping the skin and feathers clean. The itch-mites burrow within the skin of man and other mammals. Other species live in the cellular tissue of birds. A few occur in the tracheal passages of seals, and one has been found living in the lung of a monkey. Many species feed on living plants, and the gall-mites produce deformations on the leaves and twigs of plants. Since these gall-mites are invisible to the unaided eye, the deformations were formerly supposed to be fungi. Many of the beetle-mites feed on fungi, lichens, and other low vegetation. A large number of mites are predaceous and attack other mites and small insects. There is a large family, the water-mites, living in fresh water, sometimes as commensals within the gills of bivalve mollusks; another group lives in the ocean, even at a considerable depth. In recent years investigators have found a number of mites associated with ants.

Injuries. The injuries caused by mites are arranged in two classes: injuries to man and domestic animals, and injuries to cultivated plants and stored food. The most notable of the former class are the ticks. The famous miana bug of Persia is a tick of the genus Argas, which inhabits houses, and the early travelers in those regions declared that its bite or puncture would produce convulsions, delirium, and even death. Specimens kept in Europe, however, have proved to be comparatively harmless. The moubata bug of Africa is a similar tick with a similar reputation. An allied species, the chicken-tick (*Argas miniata*), does considerable damage to poultry in the Southern States. The cattle-tick (*Boöphilus bovis*) is the most injurious of all mites, as it occurs in nearly all warm countries, and is the means of spreading the Texas or Southern cattle fever. The itch-mites that cause a disgusting scaling of the skin were formerly not uncommon, but modern cleanliness has largely abolished them in the case of man. A species known as the sheep scab-mite (*Psoroptes communis*) is the cause of much injury to sheep, both in flesh and wool. The red spider (Tetranychus) is a perennial source of trouble to greenhouse and outdoor plants, while the 'clover-mite' is a pest of fruit trees in the West, and a related form (Stigmæus) injures pineapples in Florida. To the family of cheese or flour mites (Tyroglyphidæ) belong a number of injurious species. The true cheese or flour mites (Tyroglyphus and Aleurobius) feed on a great variety of stored products: cheese, flour, hams, cereals, drugs, seeds, and dried fruits. Although they are very small, they multiply so rapidly that attacked materials are completely overrun with them in a few days. Some species infest mushrooms and are a serious hindrance to their cultivation. The bulb-mite, or eucharis-mite (Rhizoglyphus), burrows within bulbs and the roots of plants, thereby giving entrance to destructive fungi; the bulbs of lilies and orchids are particularly subject to their ravages. A few species of gall-mites are of great economic importance, especially the pear-leaf blister-mite (*Eriophyes pyri*), which is a notorious enemy of pear culture in the United States. Certain species of Tarsonemidæ, living in enormous numbers in the heads of grasses, are kown to cause a whitening of the grass, called 'silver-top.'


CLOVER MITE (*Bryobia pratensis*).

Comparatively few mites are beneficial to man. One of the harvest-mites is known to destroy the eggs of grasshoppers, and various species of Cheyletus prey on the flour-mites and other injurious forms. Several species have been found feeding on scale-insects.

Classification. The mites, formerly all kept in one family, have, in recent years, been divided into from ten to thirty families, according to the author. The leading families are the following:

Trombidiidæ and Rhyncholophidæ, or harvest-mites; many of large size and bright red color.

Eupodidæ, consisting of many small, soft-bodied species that occur on moist soil.

Tetranychidæ, spinning mites, red-spiders, and clover-mites.

Bdellidæ, or snouted mites, from the long, projecting mandibles; predaceous.

Cheyletidæ, mites with stout, spiny palpi; predaceous or parasitic.

Oribatidæ, or beetle-mites; so called from their hard and often shining bodies; very numerous, but of little economic value.

Gamasidæ, many predaceous, and lurking commonly under fallen leaves and in moist places.

Ixodidæ, or ticks, all parasitic.

Tarsonemidæ, soft-bodied, and of curious structure.

Tyroglyphidæ, cheese and flour mites, soft-bodied forms, in which the 'Hypopus' stage is very common.

Hydrachnidæ, or fresh-water mites; and Halacaridæ, or marine mites.

Sarcoptidæ, or itch-mites; and Analgesidæ, or bird-mites.

Eriophyidæ, or gall-mites, remarkable for their minute size, tapering, annulate body, and possessing only four legs.

MITE, Sir Matthew. In Foote's play *The Nabob*, a wealthy and dissolute character, who has made his fortune as a merchant in India, and squanders it in objectionable ways on his return.

MIT'FORD, John (1781-1859). An English author and divine, born at Richmond, in Surrey, August 13, 1781. He graduated B.A. from Oriel College, Oxford, in 1804. Five years later he took orders in the English Church; and in 1810 he received from Lord Redesdale the vicarage of Benhall in Suffolk. A few years later he obtained two other livings in the same shire. At Benhall he built a parsonage, collected a choice library, and amused himself in gardening. He took permanent lodging in London, where as time went on he came to live for most of the year. He was an intimate friend of Samuel Rogers, of Charles Lamb, and of other literary men. From 1834 to 1850 he edited the *Gentleman's Magazine*, to which he contributed largely. He died at Benhall, April 27, 1859. Mitford wrote considerable verse, of which may be cited *Agnes, the Indian Captive*, a poem in four cantos (1811), and *Miscellaneous Poems*, a selection from his fugitive pieces (1858). For the Aldine edition of the English poets he contributed eleven memoirs. His best critical work was on Gray, found in *The Works of Thomas Gray* (1816), and in the Aldine edition (5 vols., 1835-43). His researches have been very freely used by succeeding editors. Mitford left three volumes of manuscript on Gray and a large mass of other manuscript, much of which is now in the South Kensington Museum and the library of the British Museum.

MITFORD, Mary Russell (1787-1855). An English authoress, born at Alresford, Hampshire, December 16, 1787. In 1797 she drew £20,000 in a lottery, with a part of which her father built a house at Reading. She was sent to a good London school for a short time (1798-1802), and then returned to her father's house. At this time she was reading extensively. In 1810 she published *Miscellaneous Poems*, which were immediately followed by other volumes (1811-12-13). The family, reduced to poverty as a result of the father's improvidence, moved in 1820 to a 'laborer's cottage' at Three Mile Cross, a village near Reading. For a living she now began writing for the magazines and the stage. Among her plays (tragedies), which were moderately successful, are *Julian* (1823), *Foscari* (1826), and *Rienzi* (1828). In the meantime she had taken to writing sketches of village life as she had observed it. They were published (5 vols., 1824-32) in installments, under the title *Our Village*. These descriptive pieces possess charm, grace, and humor akin to Jane Austen's. They were followed by the more regular novel of country life, *Belford Regis* (1835), and, after a long interval, by *Atherton and Other Tales* (1854). In 1851 Miss Mitford removed to a near-by cottage at Swallowfield, where she died, January 10, 1855. Consult her delightful *Recollections* (London, 1852); *Our Village*, with introduction by Mrs. A. T. Ritchie (London, 1893); L'Estrange, *Life of Mary Russell Mitford* (ib., 1870); and *The Friendships of Mary Russell Mitford* (ib., 1882).

MITFORD, William (1744-1827). An English historian, born in London. He studied at Queen's College, Oxford, and in 1769 became a captain in the South Hampshire militia. He made the acquaintance of Gibbon, then a fellow-officer, by whose advice and encouragement he was induced to undertake his celebrated *History of Greece*. The first volume of this work appeared in 1784, and the last in 1810. He was three times elected to Parliament, and was professor of ancient history at the Royal Academy. He also wrote *An Essay on the Harmony of Language* (1774), and several minor works.

MITH'AN. The name of the gayal (q.v.), among the Indo-Chinese tribes west of the Bay of Bengal.

MITH'RAS (Gk. *Μίθρας*, Ar. *Miθra*, Skt. *Mitra*, friend). One of the chief deities of the ancient Persian religion. The god seems to have been known to the Indo-Iranians before their separation, as he appears in both Avesta and Veda. He is a god of light, invoked in company with the heaven (Ahura and Varuna), and is the guardian of truth and the enemy of all falsehood. In India this deity seems to have been early superseded, but in Persia he retained his place as one of the chief gods. It may be considered very doubtful whether the god was borrowed from the early Babylonians at a date long before our knowledge begins, more especially as in the earlier texts Mithras is not the sun, but the light of heaven. In the Zoroastrian religion he is one of the Yazata or spirits of the second rank, though even here he occupies a high position, seeing and knowing everything, a being whom it is impossible to deceive and in constant conflict with the powers of darkness, so that he becomes a warrior god, who is the chief helper of Ahura-Mazda in his struggle with Ahriman. In the Old Persian inscriptions, it should be said, he is invoked by the Achæmenidæ along with Ahura-Mazda and Anahita, and his festival (on the 16th day of the 7th month) was one of the solemn functions of the State religion. Honored by the numerous princes who built up small principalities throughout Western Asia after the division of Alexander's kingdom, the god was a prominent divinity in Cilicia, Cappadocia, and Commagene, though practically unknown in the Greek world. From these regions his worship came to the West through the Romans, although it is not mentioned by contemporary writers till the first century of our era, and the earliest Latin inscriptions belong to the early second century. The cult with its mysteries was popular in the army and quickly spread over the whole Roman world, as its monuments in all the frontier provinces plainly show. The nature of the religion is obscure, as the sacred writings have perished and information must be drawn either from the writings of Christian adversaries or from the representations in the numerous places of worship. It seems clear that the basis of the cult was derived from the Mazdean worship, but with a considerable mixture of Chaldæan worship of the heavenly bodies. Mithras seems to have owed his prominence to the belief that he was the source of all life, and could also redeem the souls of the dead and bring them into the better world. This worship was celebrated in underground chambers of small size, to which only those who belonged to the higher degrees were admitted, and was probably conducted according to elaborate ritual prescriptions. The ceremonies included a sort of baptism to remove sins, anointing, and a sacred meal of bread and water, while a consecrated wine believed to possess wonderful power played a prominent part. The mysteries contained seven degrees, of which the first three seem to have been probationary and not to have admitted to the sacred ceremonies. The degrees are given in this order: (1) *Corax* or Raven; (2) *Gryphus* or Griffin; (3) *Miles* or Soldier; (4) *Leo* or Lion; (5) *Perses* or Persian; (6) *Heliodromos* or Courier of the Sun; (7) *Patres* or Fathers, who were at the head of the cult, and whose chief was the *Pater patrum*. The other initiates called themselves brethren (*fratres*). Women seem to have been excluded from the rites. The nature of the initiation is not known. The undoubted similarity in much of this worship with the new religion of Christianity seems only to have made the battle between the rivals bitterer, and with the triumph of Christianity began the destruction of the Mithras worship, and by the end of the fourth century it seems to have been practically extinct in the West. Consult: Cumont, *Textes et monuments figurés relatifs aux mystères de Mithras* (Brussels, 1894-99); id., *Les mystères de Mithras* (2d ed., Paris, 1902); id., in *The Open Court* (Chicago, November, 1902).

MITHRIDATES, mĭth'rĭ-dā'tēz (also *Mithradates*, from OPers. Miθra, the sun-god + *dāta*, given, p. p. of *da-*, to give). An old Persian name, common throughout the East, borne by several kings of Pontus. The most celebrated of them and the greatest of the rulers of Pontus was Mithridates VI., surnamed *Eupator* and *Dionysus*, but commonly called Mithridates the Great. He was born at Sinope about B.C. 134, and succeeded his father, Mithridates V., about B.C. 121. At the age of about twenty he took the reins of government into his own hands. Little that is certain is known of the early part of his reign. He soon subdued the tribes along the northern coast of the Euxine as far as the Tauric Chersonese and incorporated the Kingdom of Bosporus; he then prepared to extend his conquests south of the Euxine, and invaded Cappadocia and Bithynia. Here he encountered the Romans. He waged three wars with them, known as the First, Second, and Third Mithridatic Wars—the First, B.C. 88-84; the Second, B.C. 83-82; the Third, B.C. 74-65. The immediate cause of the First Mithridatic War was the invasion of the territories of Mithridates by Nicomedes, King of Bithynia, at the instigation of the Romans. Mithridates quickly compelled Nicomedes to withdraw, but was in the end defeated by the Roman general Flavius Fimbria, while his general Archelaus was defeated in Greece by Sulla. It was in the course of this war that Mithridates issued an order to all the cities of Asia to put to death, on the same day, all the Roman and Italian citizens who were to be found within their walls. Eighty thousand Romans and Italians are said to have perished in this massacre. As a result of the First Mithridatic War, Mithridates consented to abandon all his conquests in Asia, to pay a sum of 2000 talents, and to surrender to the Romans a fleet of seventy ships. The Second Mithridatic War was due to the invasion of Mithridates's dominions by the Roman general Murena. The war was in the main favorable to Mithridates, but was short-lived, Murena being soon ordered by Sulla to withdraw. In B.C. 74 Nicomedes III., King of Bithynia, died, leaving his dominions by will to the Romans. Mithridates claimed that Nicomedes had left a legitimate son, and at once prepared to assert the latter's right. The Third Mithridatic War ensued. At first alone, and then supported by his son-in-law, Tigranes, King of Armenia, Mithridates successfully opposed the Roman forces under Lucullus, but in B.C. 66 the conduct of the war was intrusted to Pompey. Mithridates was then obliged to retreat beyond the Euxine, where, besieged by his son, Pharnaces, who had rebelled against him and had been proclaimed King, he took his own life at Panticapæum in B.C. 63. Mithridates was a specimen of the true Eastern despot, but he possessed great ability and extraordinary energy and perseverance. His want of success was owing not to his defects as a general, but to the impossibility of raising and training an army capable of coping with the Roman legions. He had received a Greek education at Sinope, could speak more than twenty different languages, and had a taste and appreciation for art and science. He owned a magnificent collection of pictures, statues, and engraved gems. In the estimation of the Romans, he was the most formidable opponent they had ever encountered. Consult Reinach, *Mithridate Eupator* (Paris, 1890).

MITLA, mē'tlȧ, or **MICTLAN**. A small town situated thirty miles east of the city of Oaxaca, in Southern Mexico. It is notable as being the site of one of the most famous and remarkable groups of American ruins. The surroundings are mountainous and inclose a wide, fertile valley, in which, near the banks of a stream, are located the ancient buildings still in a good state of preservation. They consist of five great clusters which have been termed: (1) the group of the Catholic Establishment; (2) the Columns; (3) the Arroyo; (4) the Adobe; and (5) the South Side; in all occupying an area of about 2000 feet in width. Other foundations of razed buildings exist in the vicinity, and at some distance away, on an isolated hill, are the remains of a fort.

The buildings, which are worthy of the name of temples or palaces, are massive, rectangular structures of dressed stone, set on pyramidal platforms, and erected with surprising accuracy. The stones, usually of large size, and weighing as high as fifteen tons, are laid with such precision that the joints are scarcely discernible and for this reason little mortar was required. The ground plan is simple and the buildings are, as a rule, long and narrow, each containing only a single room, while the walls are but one story in height. The grouping of the buildings is in the form of quadrangles.

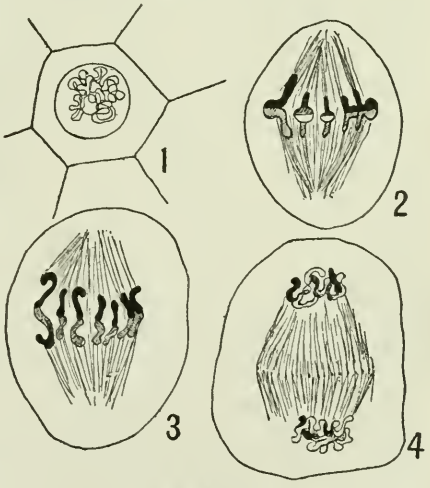
The walls, in many cases over four feet in thickness, are faced with dressed stone or plaster. Mosaic stonework like that of Palenque (q.v.) is used lavishly, the designs being frets derived from animal motives. The exterior walls have no openings, but the doorways, either single or triple, on the courts are imposing in their massive treatment. There were no doors, but sockets for the insertion of awnings. Supports were worked out in the jambs. The rooms were ceiled with beams of wood or slabs of stone. In case the room was wide, two sets of beams were used, supported on a row of large stone columns, some of which are 16 feet high and 36 inches in diameter. The roofs were massive and flat, and constructed of beams, cross poles, and filling material of brush, capped with rammed clay, similar to the method employed by the Pueblo Indians of the Southwestern United States. The floors were made of a durable cement. On the whole, the Mitla buildings, while formal in plan and profile, show perfect and charming mosaic surface decoration, arranged in panels which exhibit great fertility of geometric design, as well as skill in execution. This feature, so far as known, is confined to two groups, though it was probably used in others. In the Arroyo group mural paintings resembling the pictographs of the codices were employed on the lintels. A noteworthy feature is that sculpture is almost lacking in these buildings.

Only one of the palaces has a basement story, and this cellar is cruciform. Several of these cruciform structures have been discovered in and near Mitla, but nowhere else in Mexico have they been observed, except at Chila in Puebla. It is surmised that they were sepulchres of important personages. The character of the Mitla masonry is also seen in the interesting fortified hill situated about one mile west of the village. In location, massiveness of construction, and skill in plan, it ranks with the ancient fortifications of Peru. Piles of rounded stones on the walls indicate that the fort was defended by slingers. The quarries from which the ancient Mitlans secured their materials have been discovered. The blocks were obtained by channeling with stone picks and hammers the full length of the stones and across the ends; then channels were cut down the sides and under the blocks until they could be broken off. Enormous stones in all stages of the work still remain in the quarry. Pottery of excellent design and finish has been found. Large, well-executed figurine vases are numerous. The color is dark-gray like the ancient Zapotecan ware, but painted pottery is uncommon here. Fan-shaped implements and a few celts of copper represent the only metal objects found.

Consult: Charnay, *Cités et ruines américaines* (Paris, 1863); Bandelier, *Archæological Tour in Mexico in 1881* (Boston, 1884); Seler, *Wandmalereien von Mitla* (Berlin, 1895); Holmes, "Archæological Studies Among the Ancient Cities of Mexico," in *Publications of the Field Columbian Museum* (Chicago, 1897); and Saville, "Cruciform Structures Near Mitla," in *Bulletin of American Museum of Natural History*, vol. xiii. (New York, 1900).

MITO, mē'tō, or **MYTHO**. A town of Cochin-China, situated on an arm of the Me-kong, about 45 miles southwest of Saigon, with which it is connected by rail (Map: French Indo-China, E 5). It has a college and a hospital and is on the trade route between Cambodia and Annam. Population, about 27,000.

MITO'SIS (Neo-Lat., from Gk. *μίτος*, *mitos*, thread). The phenomena accompanying the division of the nucleus of cells, a term proposed by Fleming in 1882 and superseding 'karyokinesis.' In cell-division the seat of the changes is the nucleus, in which portion of the cell the processes of cell-division originate. After the nucleus subdivides the entire cell divides into halves, forming two new cells. Mitosis occurs not only in the division of cells during growth, but the nucleus subdivides, forming the first steps in reproduction or fertilization of all organisms. When the nucleus is about to divide, the chromatic granules forming part of the nuclear substance, and previously scattered throughout the central mass of the nucleus, become arranged in a row, forming a long thread, which extends through the nucleus in an irregular spiral (spireme) and then divides into portions ('chromosomes') of fairly equal length. The chromosomes are shaped like long loops, which afterwards become shortened, thus giving rise to short loops, straight rods, or rounded granules. As a rule the number of chromosomes is constant for each species of plant or animal, and also for



STAGES IN MITOSIS.

1, Preparatory to division; 2, early stage in separation of chromosomes; 3, later stage in separation; 4, formation of daughter nuclei at poles, and of wall at equator of spindle.

successive series of cells during growth. By the time the process has reached this stage a special mechanism appears, which has till now remained concealed in the cell-substance. This serves to divide the chromatin elements into two equal parts, to separate the resulting halves from one another, and to arrange them in a regular manner. At the opposite poles of the longitudinal axis of the nucleus two clear bodies—the 'centrosomes,' each surrounded by a clear zone, the so-called 'sphere of attraction'—now become visible. These were first discovered by Fol, by Van Beneden, and also by Boveri, who recognized their importance. They appear to possess a great power of attraction over the vital particles of the cell, so that these become arranged around them like a series of rays. At a certain stage in the preparation for division, the substance of the cell-body and of the nucleus gives rise to delicate fibres or threads; these fibres are motile, and, after the disappearance of the nuclear membrane, seize the chromosomes with wonderful certainty and regularity, and in such a way that each element is held on either side by several threads from each pole. The chromatin elements thus immediately become arranged in a fixed and regular manner, so as to lie in the equatorial plane of the nucleus. The centrosomes and threads or astral fibres (*aster*) called the 'spindle' together form the 'amphiaster.' The chromatin elements next split longitudinally, thus becoming doubled, as discovered by Fleming. This splitting is completed by the two halves being gradually drawn farther apart toward the opposite poles of the nuclear spindle, until they finally approach the centre of attraction or centrosome, which has now fulfilled its object for the present, and retires into the obscurity of the cell-substance, only to become active again at the next cell division. Each separate half of the nucleus now constitutes a daughter nucleus in which it breaks up, and is scattered in minute granules in the nuclear network. The body of the cell then divides, showing two new cells. Roux has pointed out that the whole complex but wonderfully exact apparatus for the division of the nucleus exists for the purpose of dividing the chromatin substance in a fixed and regular manner, not merely quantitatively, but also in respect of the different qualities which must be contained in it. It will be remembered that the chromatin particles or chromosomes are believed to be bearers of heredity. The mechanism of mitosis is thus far unknown. The problem may be solved, as Wilson states, through chemical research.

Amitosis. Mitosis is the indirect division of the nucleus: where the nucleus elongates and directly divides through its total mass the process is called 'amitosis.' This appears to occur exceptionally, but is known to take place in amœba, in leucocytes, and has been observed in the sperm-cells and eggs of batrachians and some insects; but more commonly in pathological tissues.

Bibliography. Fleming, *Zellsubstanz, Kern und Zellteilung* (Leipzig, 1882); Roux, *Ueber die Bedeutung der Kernteilungsfiguren* (Leipzig, 1883); *Gesammelte Abhandlungen über Entwicklungsmechanik der Organismen* (Leipzig, 1895); Weismann, *The Germ Plasm* (New York, 1893); Wilson, *The Cell in Development and Inheritance* (New York, 1890). See Cell; Embryology; Mechanics of Development.

MITRA (Skt., friend). A Vedic Hindu deity. He is mentioned most frequently in company with Varuna (q.v.), with whom in the Veda his attributes blend. Although he seems to have been a god of importance in the Indo-Iranian religion, he lost his rank early in the Indian period, and was not recognized after the Vedic age. His Iranian counterpart, Mithra (q.v.), however, was one of the chief deities of the pre-Zoroastrian religion, where he represented the sun.

MITRAILLEUSE, mē̇′trȧ′yẽz′ (Fr. mitrailleur, from *mitrailler*, to fire mitraille, from *mitraille*, bits of grape-shot, from OF. *mitaille*, fragments, from *mite*, small bit; ultimately connected with Goth. *maitan*, to cut). A machine gun, in which is combined a number of rifle barrels, with breech-action mechanism, and designed to discharge small missiles with great rapidity. It was invented in Belgium, and adopted by the French a little before the war with Germany in 1870. See Machine Guns.

MITRAL VALVE. See Heart; Circulation.

MITRE (OF., Fr. *mitre*, from Lat. *mitra*, from Gk. *μίτρα*, mitre, fillet, belt; probably ultimately of Oriental origin). The head-dress worn in solemn functions by bishops and some abbots. The ornament is probably of Eastern origin, although the head-dress of Eastern prelates at the present day is quite different, being a large round cap, something like a crown. The Western mitre is a tall, tongue-shaped cap, terminating in a two-fold point, supposed to symbolize the 'cloven tongues as of fire' in which the Holy Spirit descended upon the Apostles; two flaps or streamers fall from it behind over the shoulders. Opinion is much divided as to the date at which the mitre first came into use. Eusebius, Gregory Nazianzen, Epiphanius, and others speak of an ornamented head-dress worn in the Church; but there is no very early pictorial representation which exhibits any head-covering at all resembling the modern mitre. From the tenth century, however, it is undoubtedly found in use, although not at first universally. At the Reformation the mitre was practically discarded as a part of the episcopal costume in England, though there are traces of its survival in isolated instances; and the first Bishop of the Episcopal Church in America, Seabury, occasionally wore one. In the last half of the nineteenth century the practice was revived with increasing frequency in the Anglican Communion. In the Roman Catholic ritual three kinds of mitres are distinguished: *mitra pretiosa*, richly ornamented with jewels, gold, and silver; *mitra auriphrygiata*, of gold brocade with embroidery; and *mitra simplex*, of white silk or linen damask, with scarcely any decoration, which is worn when black vestments are used. See Costume, Ecclesiastical.

MITRE, mē′trȧ, Bartolomé (1821-94). An Argentine statesman, born at Buenos Ayres. To escape the despotism of the Dictator Rosas, he fled to Montevideo. In 1846 he emigrated to Bolivia, where he was appointed chief of staff to President Ballivian, and director of the military college. Upon the overthrow of Ballivian (1847) he was banished to Peru, and thence went to Chile. In 1851 he joined Urquiza in the uprising against Rosas, and in 1852 commanded the revolutionary artillery at the battle of Monte Caseros, in which Rosas was overthrown. Elected

Deputy to the Assembly of Buenos Ayres, he strongly opposed the administration of Urquiza, who was now at the head of the Argentine Confederation. When subsequently Buenos Ayres had set up an independent government, he was appointed minister of war and commander-in-chief of the forces. He was defeated by Urquiza at Cepeda in 1859, and Buenos Ayres was forced to rejoin the Confederation. In 1861 war again broke out, and Urquiza was defeated by Mitre at Pavon. A constituent congress was then assembled, the present Constitution of the Argentine Republic was adopted, and under it Mitre was chosen President for six years. By his care important internal improvements were promoted and foreign immigration was encouraged. When in 1865 war was declared against the Republic by the Paraguayan Dictator Lopez, Mitre effected an alliance with Brazil and Uruguay, and commanded the united armies until 1867. In 1874, having failed as a candidate for the Presidency, he headed an ineffectual revolt. He founded at Buenos Ayres the newspaper *La Nación*, which he long edited; published a volume of verse, *Rimas y Poesías* (1879), and wrote two valuable historical works, the *Historia de Belgrano* (1857) and *Historia de San Martin* (1869).

MITRE, The. A former London tavern, the favorite meeting-place of Dr. Samuel Johnson, Boswell, and other celebrities. It stood on Fleet Street, and other well-known taverns of the same name were situated on Wood Street and Fenchurch Street, both destroyed in the great fire of 1666.

MITRE SHELL. A gastropod of the genus Mitra, family Mitridæ. The shells are very beautiful and much prized by collectors, the favorite being the 'bishop's mitre' (*Mitra episcopalis*). The shell is turreted, smooth, white, spotted with bright red; pillar, four-plaited; outer lip denticulated at its lower part; epidermis thin. It is found in East Indian seas. In this genus the shell is fusiform, thick; spire elevated, acute; aperture small, notched in front; columella obliquely plaited; operculum very small. The animal has a very long proboscis, and when irritated emits a purple liquid having a very offensive smell. Over 400 recent and 100 fossil species have been described. These mollusks are found at depths varying from the surface to 17 fathoms, on reefs, sandy mud, and sands. All are inhabitants of warm countries, notably the East Indian and Philippine regions.

MITROWITZ, mĭt'rō-vĭts, or Mitrovicza. A town of Southern Hungary, in the Comitate of Szerem, situated on the Save, 40 miles west of Belgrade. It has a high school, considerable trade in grain and wine, and contains ruins of the old Roman city of *Sirmium*. Population, in 1900, 11,518.

MITSCHERLICH, mĭt'shĕr-lĭk, Eilhard (1794-1863). A distinguished German chemist, born at Neuende, near Jever. In 1811 he proceeded to the University of Heidelberg, where, as well as at Paris and Göttingen, he devoted himself to history, philology, Oriental languages, and the natural sciences and medicine. Afterwards he turned his attention to chemistry, and while working under Link at Berlin he first observed the similarity in the crystalline form of those phosphates and arsenates similar in chemical composition. He then set to work measuring crystals of a large number of substances, and was able to establish, about 1820, the principle of isomorphism. The importance of the discovery was fully recognized by Berzelius, on whose invitation Mitscherlich went to Stockholm, remaining there until 1821, when on the death of Klaproth he was appointed to the vacant chair of chemistry at Berlin. One of his earliest discoveries after his appointment was that of the double crystalline form of sulphur, the first observed case of dimorphism. He further discovered selenic and permanganic acids and nitro-benzene; studied the formation of ethers, the phenomena of fermentation, etc. His principal work is his *Lehrbuch der Chemie*, begun in 1829 (ed. 4, Berlin, 1842-47). His papers on various scientific topics appeared in Poggendorff's *Annalen*, in the *Annales de chimie et de physique*, and in the *Abhandlungen* of the Academy of Berlin. A complete edition of his works was published at Berlin in 1896. Mitscherlich was an honorary member of almost all the great scientific societies, and received the gold medal from the Royal Society of London for his discovery of the law of isomorphism. Consult Rose, *Eilhard Mitscherlich* (Berlin, 1864). See Isomorphism; Atomic Weights; Chemistry (historical section).

MITTAG-LEFFLER, mĭt'tāg-lĕf'lĕr, Magnus Gösta, Baron von (1846—). A Swedish mathematician, born at Stockholm. He studied mathematics at Upsala and later under Weierstrass at Berlin. He began his teaching as tutor at Upsala in 1872, and five years later became professor of mathematics at Helsingfors. In 1881 he was made professor of mathematics at the University of Stockholm, and subsequently was several times its rector. He was made a member of the Academy of Sciences of Sweden in 1883. His mathematical contributions are connected chiefly with the theory of functions. In 1882, under the patronage of King Oscar, he founded the *Acta Mathematica*, at present one of the leading mathematical journals of the world. The historical part of this journal has since 1887 been published separately by Eneström as the *Bibliotheca Mathematica*. It was Mittag-Leffler's appreciation of Sonya Kovalevsky's (q.v.) work that took her to Stockholm.

MITTERMAIER, mĭt'tĕr-mī'ĕr, Karl Joseph Anton (1787-1867). A German jurist; born in Munich, and educated at the universities of Landeshut and Heidelberg. He was a professor at Bonn for two years, 1819-21; but the rest of his life was passed as professor of law and jurisprudence at Heidelberg. For many years he was a member of the Baden Legislature, and in 1848 he was president of the Frankfort *Vorparlament*, serving afterwards as representative of the city of Baden in the German National Assembly. His greatest claim to distinction lies in his extensive writings on jurisprudence, among which is a complete manual of criminal law, *Das deutsche Strafverfahren*, and he was an earnest advocate of reform in the German criminal procedure and in prison discipline. The number of his published writings is very large, including many treatises on branches of law, discussions on all the important questions of his time connected with jurisprudence, and especially on trial by jury and the penal code. His principal works have been translated into many languages. He himself translated Francis Lieber's *Letter on Anglican and Gallican Liberty*, and edited the German translation of the same author's *Civil Liberty*.

MITTERWURZER, mĭt′tẽr-vo͞orts′ẽr, Anton (1818-76). A German opera singer, one of the greatest barytone interpreters of the works of Gluck, Marschner, and Wagner. He was born at Sterzing in the Tyrol; made his first theatrical appearance at Innsbruck, and at twenty-one was engaged at Dresden, where he stayed for thirty years, and greatly influenced operatic methods. Mitterwurzer was at his best in such Wagnerian rôles as Wolfram, Telramund, and Hans Sachs.

MITTIMUS (Lat., we send). A written warrant or mandate issued by a competent judicial officer, directing a proper officer to safely convey the body of a prisoner to some jail or place of confinement, and commanding the warden to receive and keep the prisoner for a certain time, or until released by due process of law. The act of sending the prisoner to prison is termed the commitment, and this latter term is now more commonly employed to describe the warrant also. Any officer who disobeys such a command is guilty of contempt of court. See Commitment; Arrest.

MITTU, mĭt′to͞o. An agricultural Negro tribe, akin to the Bongo, and living on the Upper Nile in Southern Sudan. They are of earthy red-brown color, and below the middle stature, but muscular. The hair is short and crisp. The lighter color of the skin would indicate a type of Hamite blood; but they are all pagans, like the other negroes about them, and little affected by Mohammedanism. Goats, fowls, and dogs are their domestic animals. At certain seasons of the year they are engaged in hunting and fishing. The costume of the Mittu consists only of a fringed apron; but they are fond of decorating their hair and parts of the body, such as the neck, arms, and lips, with ornaments. Their weapons are bows and arrows, with jagged, murderous points. They call their land Moro.

MITTWEIDA, mĭt′vī-dȧ. An industrial town of Saxony, Germany, situated on the Zschopau, about 30 miles west-southwest of Dresden (Map: Germany, E 3). It has important manufactures of cotton and woolen goods, machinery, and furniture. Its educational institutions include a realschule and a technical school. Population (including Rössgen), in 1900, 16,119, chiefly Protestants.

MITYLENE, mĭt′ĭ-lē′nē. An island of the Ægean. See Mytilene.

MIVART, mī′vẽrt, Saint George Jackson (1827-1900). An English zoölogist, born in London. He was educated first at Harrow, then at King's College, London, and then, having become a Catholic in 1844, at Saint Mary's College, Oscott. He was admitted to the bar in 1851, but in 1862 he became lecturer on comparative anatomy and zoölogy at Saint Mary's Hospital, London, and held the chair of biology in the Roman Catholic University College, Kensington, during its short career (1874-77). From 1890 to 1893 he was professor of the philosophy of natural history at the University of Louvain, Belgium. He was a most careful and competent anatomist and zoölogist, and wrote a large number of very important memoirs, especially upon the morphology and classification of vertebrates, and contributed largely to the discussion of the question of evolution. He was probably the most learned and powerful critic of Darwin and Huxley in minimizing the effect of natural selection as a factor of evolution, and in insisting upon the existence of the guiding action of divine power, especially in the development of man's intellect and spiritual instinct. He distinguished, however, between absolute and directive creation, maintaining that evolution operated only by means of the latter. His strength lay in natural science, and in this department he held a position of unquestioned eminence. His efforts to reconcile the facts of science with the doctrines of religion aroused widespread attention. In this field he published a number of works, such as *Lessons from Nature as Manifested in Mind and Matter* (1876); *Nature and Thought* (1882); *On Truth* (1889); and *The Groundwork of Science: A Study of Epistemology* (1898). He claimed an increasing freedom of thought which ultimately took him beyond what were considered in the Church the bounds of permissible speculation, and after a series of magazine articles dealing with the relations between science and faith which ran through the years 1885-1900, he was finally excommunicated by Cardinal Vaughan in January, 1900. He died April 1st of the same year. His more important works in natural science are: *The Genesis of Species* (1871); *Man and Apes* (1873); *The Common Frog* (1874); *The Cat* (1881); *Dogs, Jackals, Wolves, and Foxes* (1890).

MIXED CADENCE (in music). The peculiar closing strains of a melody, formed by the succession of the subdominant, dominant, and tonic chords. It is the most frequently used of any of the cadences. See Cadence.

MIXED RACES. Races which are blends of various other races. Of the factors which have been most potent in producing the varieties of man which we find on earth to-day, probably environment and cross-breeding must be assigned the first place. Unfortunately, neither one has been investigated with sufficient care to allow an accurate estimate of its specific influence. Further, the lack of any agreement among anthropologists as to a classification of human races complicates the problem, and until that agreement is reached, confusion in the discussion is inevitable.

Certain general observations may, however, be permitted. With regard to cross-breeding, it is undoubted that extensive migrations, with consequent blood mixtures, have been going on for an indefinite period. Accurate observation of anatomical and physiological characteristics of certain rather restricted groups, as in Europe, reveals a variability in these characters which has led some observers to conclude that a pure race does not exist at the present time. Recognizing these disturbing facts, however, any one will admit that there are certain types which are relatively permanent. We regard the fair white European as differing permanently from the Negro, and both of these equally permanently from the typical Mongol. It is also a matter of common observation that mixture of any two of these types will produce a third, less distinctive, of course, but not to be included in either parent type. The real problem of hybridity as applied to man then arises: Are these subtypes permanent and fertile, or do they tend to revert to either one or the other of the parent types? It is here that the lack of accurate knowledge referred to above prevents positive statement. Early reports as to lack of fertility of certain half-breeds, as in the case of English and Australians, have been shown upon examination to be erroneous or the apparent sterility due to non-essential factors; and recent observations on half-breed American Indians actually show an increase rather than a decrease in fertility. Looking at the question broadly, it would seem that the evidence, while extremely scanty, points toward the view that any two races (however defined) can unite to form a third; and this in turn with others, until we have a confusion of strains and types in which the originals are indistinguishable, wholly or partly, which is apparently precisely the condition which we find to-day in various regions of the world. An authoritative catalogue of the existing mixed races of the world is therefore impossible. The most notable are probably the well-known Mulatto, or cross between European and Negro, the Mestizo, so called, or cross between European and American Indian, and the complex mixtures which we find in the East Indian Archipelago, where Chinese and Malayan traits predominate.

The social significance of race mixture is of course very great, but the complicating factors in this aspect of the question are even greater than on the physical side. We find here two schools ardently advocating diametrically opposed views both as to the advantages or disadvantages of racial mixtures, as well as to the mode of transmission of the characteristics of the parent stocks. The whole problem is involved in the general zoölogical problem of evolution and heredity, and unassailable ground as to the points involved cannot be assumed until a much wider range of facts is at our disposal and the disputed questions of inheritance in general have more nearly approached solution.

MIXES. See Zoque.

MIXOG′AMY (from Gk. μιξο-, *mixo-*, mixed, from μιγνύναι, *mignynai*, to mix + γάμος, *gamos*, marriage). A term describing the breeding habits of most fishes, where the males and females congregate on the spawning-beds, and the number of the former sex is greatly in excess. The same habit has been observed in gars (Lepidosteus). On the other hand, the stickleback (Gasterosteus) is truly polygamous, several females depositing their eggs in the same nest, guarded by one male only. Some bony fishes (Ophiocephalus, and probably all chondropterygians) are monogamous, as probably are all the viviparous fishes. Consult Günther, *An Introduction to the Study of Fishes* (London, 1880).

MIXTEC, or **MISTEC**, mē-stĕk′. An important tribe of high native culture occupying the coast region of Guerrero, Mexico, from Acapulco southward into Oaxaca, and inland to beyond the border of Puebla. With their southern neighbors, the Zapotec (q.v.), they constitute the Zapotecan linguistic stock. Like them, they were skilled and industrious in agriculture and the simpler arts, built cities and temples of hewn stone, preserved their rituals and traditions in hieroglyphic records, and had a calendar system resembling that of the Aztec tribes. They still occupy much of their original territory, keeping themselves as far as possible apart from the political affairs of Mexico, and maintaining their ancient reputation for weaving and pottery.

MIXTURE (Lat. *mistura*). An aqueous preparation of an insoluble substance held in suspension by a suitable vehicle. Among the mixtures used in medicine are those of chalk, of rhubarb and soda, and the compound mixtures of iron and of glycerin.

MIXTURE (OF., Fr. *mixture*, from Lat. *mixtura*, mixture, from *miscere*, to mix). An organ stop, consisting of from three to six ranks of small metallic pipes. It is generally found in large organs, and resembles the sesquialtera and furniture stops, except that it is much higher and shriller. Like other compound stops, the two smaller ranks of the mixture stop change on the upper part of the organ scale into an octave lower. This is necessitated from the fact that the pipes in their upper ranks would produce too small a volume of sound. The mixture can be used only in forte and fortissimo passages, as otherwise the harmonic would be heard too prominently.

MIYA, mē′yȧ (Jap., august house). A term sometimes applied to the mansions of Japanese princes, but more commonly denoting the shrines of the Shinto religion (q.v.). These buildings represent the ancient cabins of the primitive Japanese modified by the progress of civilization and by Buddhistic influence. The earth floor of the hut is replaced by wooden flooring raised two or three feet from the ground, necessitating steps at the entrance. A veranda going completely round the edifice has been added. The sides of the hut were made of mats, but the shrine has walls of wood. The roofs were originally thatched, but are now covered with shingles, tiles, or even copper. In many shrines Buddhist influence has led to much decoration, but the characteristic of the true miya is extreme simplicity. It contains neither picture, image, nor altar, but only a mirror, or in some instances a 'pillow' for the god. Before the shrines is the '*tori-i*' (supposed to signify 'bird-rest'), which is sometimes taken for a gateway by tourists. Often many of them are placed before a single shrine. From a cord which hangs above the entrance are suspended '*go-hei*,' paper cuttings, representative of the offerings of cloth which were made in ancient times. Services are infrequent, usually not oftener than once a year, and in some shrines there are no ceremonies. 193,476 miya are registered, most of them tiny constructions and only a few of wide reputation. The shrines are divided into four classes: national, provincial, prefectural, and local, and a few are supported in meagre fashion by funds from the Imperial treasury.

MIYÁDZŬ, mē-yäd′zŭ. The most important town of the Japanese Province of Tango in that part of Hondo known as San-in-do, 87 miles northwest of Kioto. It was the residence in feudal times of Matsudaira, one of the three daimios who ruled the province. Population, about 10,000. In the vicinity, near Ama-no-hashidate, or 'Heaven's Bridge,' is a narrow tongue of land which juts out into the sea in a way much admired by the Japanese.

MIYAJIMA, mē-yä′jē-mȧ (temple island), sometimes called Itsukushima. A small, beautifully wooded island in the Bay of Hiroshima, Japan, celebrated as the site of one of the most ancient Shinto shrines of the country. The temple is dedicated to the goddess Benten, worshiped by women for attractiveness and by men for wealth. It was built in the year 527. The island is also notable for its deer, and the absence of dogs. Priests, image-carvers, fishermen, and inn-keepers make up the population.

MIYAKO, mė-yä'kō. Another name for Kioto, a city of Japan.

MIZON, mė'zôN', Louis Alexandre Antoine (1853-99). A French naval officer and explorer in Africa. He was born in Paris; studied at the Naval School (1869-72), and in 1877 was sent out to accompany Brazza on his expedition to the region of the Ogowai River. He was stationed at Franceville for six years, and in 1886 he published charts of the Ogowai. Four years afterwards he was sent to Adamawa, where he promoted French commercial interests in the Niger country and greatly irritated Great Britain. The latter power in 1893, after Mizon had made a treaty with the Sultan of Hamarua, declared Hamarua a British protectorate, and forced Mizon's recall. In 1895 he was made French resident at Majunga in Madagascar. He died in 1899 as Governor of the colony at Jibuti in French Somaliland.

MIZ'PAH, or **MIZ'PEH** (Heb., watch, outlook). The name of several places in Palestine, of which the most important are: (1) The heap of stones and pillar set up by Jacob and his brethren as a witness of the covenant between Jacob and Laban. It was also called Galeed by Jacob, and Jegar-sahadutha by Laban (Gen. xxxi. 44-49), the latter being the Western Aramaic rendering of the Hebrew *gal-‘ed* (‘heap of testimony’). The narrative points to the existence of a sanctuary in Galeed which was known as Mizpah. The pillar and the heap of stones are to be regarded as objects for the cult—the former a Baal symbol, the latter a boundary stone, serving also as an altar. It was at this sanctuary that Israel was encamped before the conflict with the Ammonites (Judges x. 17), which, as Gen. xxxi. 25 informs us, lay in Gilead (upon which Gal-ed represents a play). The indications in the Old Testament are insufficient for determining the site of the place with certainty. It lay north of the Jabbok, and perhaps near the modern Jerash, which answers the conditions involved. (2) The place in the territory of Benjamin where Israel gathered before punishing the tribe of Benjamin for their outrage on the concubine of the Levite at Gibeah (Judges xix.-xx.), and probably also the place where Samuel assembled Israel to resist the Philistines and subsequently to present Saul as King (I. Sam. x. 17 sqq.), though it is also possible that the two places may be distinct. The location is not certain. It may be a point on the mountain ridge north of Shafat. These gatherings again indicate the presence of a sanctuary at Mizpah, and the continued importance of the place is made manifest by its choice as a seat of government under Gedaliah (II. Kings xxv. 23; Jer. xl. 6). In post-exilic times we meet with references to Mizpah, and it is of special interest to note that in the days of the Maccabees Mizpah again becomes a gathering-place for the Jews (I. Macc. iii. 46). Besides these two Mizpahs there are references in the Old Testament (a) to the land of Mizpah (Josh. xi. 3) and the valley of Mizpah (ib., xi. 8), which are identical. This Mizpah is mentioned in connection with the battle of Merom (q.v.), and may be located near Hermon. A fourth Mizpah was situated in the ‘lowland’ of Judea (Josh. xv. 38), and a fifth in Moab (I. Sam. xxii. 3). The use of Mizpah as an inscription for memorial rings is based upon the words occurring in connection with the setting up of the ‘heap’ of stones by Jacob and his brethren: "The Lord watch between me and thee" (Gen. xxxi. 49).

MIZZEN, or **MIZEN**, See Mast.

MJÖSEN, myē'zen. The largest lake in Norway, situated in one of the most fertile valleys of the country, 36 miles northeast of Christiania (Map: Norway, D 6). Its length is 62 miles, its width averages only two, and nowhere exceeds 10 miles. It receives the Laugen River at Lillehammer and empties its waters through the Vormen into the Glommen. Its depth is remarkable, reaching in the southern part 1460 feet, its bottom being here 1050 feet below sea-level. The vicinity of the lake is very popular as a summer resort, and steamers ply on it regularly during the ice-free season, which in the southern part, on account of its great depth, sometimes lasts throughout the year.

MNEMONICS, nė-mŏn'iks. See Memory.

MNEMOSYNE, nė-mŏs'ĭ-nė (Lat., from Gk. Μνημοσύνη). In classical mythology, the goddess of memory, daughter of Uranus and Gaia. By Zeus she became the mother of the Muses (q.v.). See Mythology.

MNESICLES, nĕs'ĭ-klēz (Lat., from Gk. Μνησικλῆς, *Mnēsiklēs*). A Greek architect, who built the Propylæa of the Acropolis at Athens. His name was found on an inscription in its ruins, and Plutarch mentions him as its architect. See Acropolis, Athens.

MO'A (Maori name). A general name for a family (Dinornithidæ) of extinct ratite birds of New Zealand, some of which were of gigantic proportions. The existence of their remains, and of legends among the Maoris relating to them, was first published in 1838. The exploration of New Zealand revealed bones of these birds in great profusion, on the surface, in peat bogs, in seaside sand-dunes, and especially in certain caves where the dry air had in some cases preserved not only the ligaments, binding skeletal parts together, but even pieces of dried skin and feathers, which still retained their chestnut and white colors, while footprints and broken egg-shells have also been found. Prehistoric camping-grounds always furnish many charred bones and fragments of egg-shells. There is evidence that the extermination was completed about the date of the discovery of America by Columbus.

The moas form a family more nearly associated in structure with the emeus, cassowaries, and kiwis than with the ostriches. They were in organization nearest to the kiwis (Apteryx), but distinguished by their short beaks and by having after-shafts upon the feathers. They attained not only to great numbers and size in the isolation of New Zealand (where they were exposed to no enemies until man came), but to a remarkable variety, some twenty species being now recognizable. Some were not larger than turkeys, and these perhaps may have had some vestiges of wing-bones; but the larger moas were not only wingless, but entirely destitute of any shoulder-girdle whatever. The largest and most typical were of the genus Dinornis, and these had long and comparatively slender leg bones and large depressed skulls. Some of these were taller than any ostriches, estimates varying from 10 to 12 feet. The leg of the tallest species (*Dinornis maximus*) was considerably longer than that of a horse. In the genus Pachyornis, on the other hand, the leg bones were short, massive and extremely powerful, so that these are called the 'elephant-footed' moas. Their eggs were greenish in color. One (of the giant moa, measuring 10½ by 6½ inches) was found unbroken in the grave of a Maori, with whom it had been buried unknown centuries ago. Consult: Owens, *Extinct Birds of New Zealand* (London, 1879); Newton, *Dictionary of Birds* (New York, 1893-96); and Lucas, *Animals of the Past* (New York, 1901). See ÆPYORNIS; EXTINCT ANIMALS; EXTINCTION OF SPECIES.

MO'AB. The name given to a people occupying the high table-land east of the Dead Sea and the southern section of the Jordan. The southern boundary was Edom, the eastern, Ammon and the desert; the northern boundary shifted from time to time, but in general was marked by a line some miles beyond the northern extremity of the Dead Sea. This land of Moab is a plateau about 3000 feet above the Mediterranean Sea. The western slopes are generally steep and the aspect of the Moabite Mountains rising to the plateau is barren. In the spring the hills are covered with grass and portions of the plateau are now sown with corn. It has streams in abundance; besides the Arnon, which divides the plateau, springs and brooks intersect the country. To the east the plateau is separated from the desert by low rolling hills. Numerous ruins testify to the former prosperity of the district, while the hundreds of rude stone monuments (stone-circles, dolmens, cairns), show that it was densely settled in very early days. According to the biblical account, Moab, the eponymous ancestor of the Moabites, was a son of Lot by one of his daughters (Gen. xix. 37). This story, which traces both Moab and Ammon to an incestuous connection, may be a bit of tribal slander by Hebrew writers to throw discredit on their hated rivals and foes. (See LOT.) The close affiliation, however, between Hebrews and Moabites, which is indicated by the story, is correct. Not only was the language of Moab practically identical with Hebrew, but Moabites and Hebrews belong to the same branch of the Semitic stock, and for an indefinite period Hebrew and Moabitish history form an inseparable unit. The story of the separation of Abraham and Lot embodies a reminiscence of a union once existing between Hebrew and Moabitish clans which was dissolved by a quarrel over land—to this day a common cause for hostility among Bedouin clans. The land of Moab was included in the Egyptian supremacy over Western Asia in the period from the seventeenth to the thirteenth century B.C., and the name Moab occurs in a list of conquests inscribed by Rameses II. (c.1300 B.C.) on one of his monuments at Luxor. The relations between Moab and Israel during the portion of Hebrew history known to us were generally hostile, and this hostility is traced back by tradition to the days of the Exodus (cf. Deut. xxiii. 4-5), but the oldest document we have regarding Moab is a fragment of a song (Num. xxi. 21-30), recalling a victory of the Ammonites over Moab and the subsequent defeat of the Ammonites by the Hebrews. The song, which bears marks of antiquity, may date from the early struggles of the Hebrews, anterior to the attempts of the latter to conquer Canaan to the west of the Jordan. On the other hand, the story of the endeavor of Balak, King of Moab, to secure the services of Balaam to curse Israel (Num. xxii.-xxiv.) is to be looked upon as a Midrash based upon the persistent hostility between Israel and Moab and illustrating the invincible character of the former. Coming to a period for which the historical traditions are less uncertain, we find that after the conquest of Canaan the Hebrews were frequently at the mercy of the Moabites, as well as of Ammonites and Amalekites. We learn of a King Eglon of Moab, who held the Hebrews in subjection for eighteen years (Judges iii.), from which they were freed by Ehud, a Benjamite. Saul appears to have held the Moabites in check, while under David they actually became tributary to the Hebrews; and this condition continued after the separation of the Southern Hebrews until the days of Ahab, when Moab began to resist and finally, on the death of Ahab, threw off the yoke. This happened during the reign of King Mesha, who describes his victories over Israel on the monument known as the Moabite Stone (q.v.). When the advance of the Assyrian power threatened the independence of the various Palestinian principalities, we find the Moabites occasionally in alliance with the Hebrews against the common foe, but subsequently we find them on the side of Babylonia and abetting the destruction of the Southern Hebrew kingdom. Moab was saved from extinction, but of course became tributary to Babylonia. In post-exilic sections of the Books of Isaiah and Jeremiah we find references to Moab which point to the continued existence and in a measure prosperity of the country, but otherwise throw no light upon its history. The name lingered on into the Christian era. During the Roman occupancy of Palestine the land of Moab was still densely inhabited, as the Roman and Greek remains show, but gradually the Arabs of the desert overran it, and what culture once existed there came to an end. It remained for modern travelers like Seetzen and Burckhardt to rediscover it, but it is still one of those districts of Palestine in which it is dangerous to travel. The chief god of the Moabites was Chemosh (q.v.) and their religion, so far as we know it, bore the characteristic marks of early Semitic cults. Consult: Robertson Smith, *Religion of the Semites*, pp. 376 and 460 (Edinburgh, 1894); Tristram, *Land of Moab* (New York, 1874); Conder, *Heth and Moab* (London, 1883); George Adam Smith, *Historical Geography of the Holy Land* (London, 1897); Clermont-Ganneau, *Recueil d'archéologie orientale*, vol. ii., pp. 185-234 (1889).

MOABITE STONE, THE. A stone bearing an inscription of 34 lines in the Moabitish language, discovered by the German missionary F. Klein, at Diban, in Moab, in 1868. The negotiations set on foot for its purchase by M. Clermont-Ganneau, attaché of the French consulate at Jerusalem, who had also learned of the existence of the stone, led to quarrels among the Arab tribes claiming an interest in it, and the monument was unfortunately broken to pieces. The fragments, however, were with great difficulty collected, and are now preserved in the Louvre. With the aid of a squeeze obtained by Clermont-Ganneau prior to the destruction of the stone, the greater portion of the inscription has been recovered, and as the result of numerous researches by French, German, and English scholars, the decipherment may now be said to be complete. The characters on the Moabitish stone are identical with those on Phœnician monuments, and the language is so closely allied to Hebrew that the conclusion is justified which makes Hebrew and Moabitish practically identical. The inscription itself refers to the deeds of Mesha, King of Moab, who is mentioned in the very first line, and the interest of the stone is greatly enhanced by the circumstance that he is identical with the Mesha (q.v.) spoken of in II. Kings iii. 4. Mesha begins in his inscription by referring to the affliction which Moab endured under Omri, King of Israel, and the latter's son (i.e. Ahab, who, however, is not mentioned by name). We know from the biblical narrative that Moab was tributary to Israel during the reigns of Omri and Ahab. This is the 'affliction' referred to and is attributed by Mesha to the anger of his deity Chemosh. Thanks, however, to Chemosh, who turned with favor to Mesha, the latter regained the cities which Israel had captured. Mesha adds in an exaggerated manner that "Israel perished with an everlasting destruction." The rest of the inscription is taken up with details of the conflict and with building operations undertaken by Mesha. Besides its historical significance, the inscription is of geographical importance because of the many names of sites in Moab which it contains. According to the biblical account, the revolt of Moab took place after the death of Ahab (c.853 B.C), but Mesha claims that already in the lifetime of Ahab he freed himself from the Israelitish yoke. This would make the date of the Moabite stone c.860 B.C. As the oldest inscription in Phœnician characters, the Moabite stone has also great epigraphical value. Of the large literature on the subject it is sufficient to refer to the publications of Smend and Socin, *Die Inschrift des Königs Mesa von Moab* (Freiburg, 1886), with supplement in *Berichte der königlich sächsischen Gesellschaft der Wissenschaften* (1897); Lidzbarski, in "Ephemeris für semitische Epigraphik," i. (1900); Nordländer, *Die Inschrift des Königs Mesa von Moab* (Leipzig, 1896); Driver, *Text of the Books of Samuel* (New York, 1890).

MOALLAKAT, mō'ȧl-lȧ-kät' (Ar., hung up). A collection of seven Arabic poems by the same number of authors who lived in the century preceding the birth of Mohammed. The name refers to the custom of hanging poetical compositions on the walls of the Kaaba as a challenge to competing poets.

MOAT (OF. *mote*, embankment, from ML. *mota*, mound, embankment, ditch, castle; probably connected ultimately with Bavarian *mott*, peat, Swiss *mutte*, turf). The ditch round the ramparts of a fortress. See FORTIFICATION; CASTLE.

MOAWIYAH, mō'ȧ-wē'yȧ (Ar. *Mu'āwiyyah*) (c.610-680). Caliph, and founder of the Ommiad dynasty. He was born at Mecca, the son of Abu Sofian, the bitter enemy of Mohammed. He was made Governor of Syria by the Caliph Othman, and during his term of office conquered the island of Rhodes, but lost Cyprus. On the proclamation of Ali as the successor of Othman in 656, Moawiyah revolted, and with the aid of the gifted Amr ibn al-Aas attempted to make himself Caliph. He was defeated in several battles by Ali, who, however, was prevented by domestic rebellion and foreign war from completely crushing his rival. Moawiyah was proclaimed Caliph at Damascus, 657, and after the assassination of Ali in 661 he succeeded in speedily reducing the rest of the Empire to submission. His army, after making extensive conquests, was unable, after a long siege and repeated assaults, to capture Constantinople, and in 678 he entered into a treaty of peace with the Byzantine Emperor. Moawiyah not only exerted absolute control over the Saracen empire, but succeeded in having the caliphate declared hereditary in his family. Consult: Muir, *Annals of the Early Caliphate* (London, 1883); Weil, *Geschichte des islamitischen Volkes* (Stuttgart, 1866).

MOB. See CROWD.

MO'BERLY. A city in Randolph County, Mo., 130 miles east by north of Kansas City; on the Missouri, Kansas and Texas and the Wabash railroads (Map: Missouri, D 2). It has the division headquarters and machine shops of the Wabash Railroad, brick yards, flouring and planing mills, foundries and machine shops, ice factory, and a large grain elevator. There are valuable deposits of coal and fire clay in the vicinity. An extensive trade is carried on in agricultural and dairy products, lumber, live stock, poultry, hides, wool, tobacco, and, of the city's manufactured products, flour and bricks. Moberly has a public library and a Y. M. C. A. building. Population, in 1890, 8215; in 1900, 8012.

MOBERLY, GEORGE (1803-85). An English prelate, Bishop of Salisbury. He was born in Saint Petersburg, Russia, and was educated at Winchester and Oxford. In 1826 he took the Oxford chancellor's prize for the best English essay. After connection with Balliol College, as tutor and fellow, he was in 1835-36 head-master of Winchester. He was then presented to the living of Brightstone in the Isle of Wight, and in 1868 became a canon of Chester Cathedral. In 1869 he was consecrated Bishop of Salisbury. Of his numerous published works the most important are: *A Few Remarks on the Proposed Admission of Dissenters to the University of Oxford* (1834); *Sermons Preached at Winchester College* (1844); and *Sermons on the Beatitudes* (1860). In 1868 he delivered the Bampton lectures which appeared under the title of *The Administration of the Holy Spirit in the Body of Christ.*

MOBILE, mô-bēl'. A port of entry and the county-seat of Mobile County, Ala., 140 miles east by north of New Orleans; on Mobile Bay, at the mouth of Mobile River, 30 miles from the Gulf of Mexico, and on the Louisville and Nashville, the Southern, the Mobile, Jackson and Kansas City, and the Mobile and Ohio railroads (Map: Alabama, A 5). It has a total area of about eight square miles and is situated on a plain which rises gradually from the river into low hills. The streets are broad and generally regular, and are well shaded with live oaks and magnolias. The finest structure in Mobile is the United States Government building, which cost $250,000. Other notable buildings are the court house, Cotton Exchange, Chamber of Commerce, Commercial Club, United States Marine Hospital, City Hospital, Providence Infirmary, Odd Fellows' and Temperance halls, Masonic Temple, and the Cathedral of the Immaculate Conception. The old Guard House Tower is an interesting structure of Spanish architecture. Besides the charitable institutions mentioned, there are several orphan asylums. The educational institutions include Barton Academy, Convent and Academy of the Visitation, Saint Mary's School, and the Medical College of Alabama, opened in 1859. Spring Hill College (Roman Catholic), opened in 1830, is a few miles west of the city. Mobile has three libraries: the Public, the Mobile (subscription) of 8000 volumes, and the Y. M. C. A. Public, with 3000. Among the local attractions are the shell road, a fine drive along the bay, and Monroe, Frascati, and Bienville parks.

Mobile, as the only port in the State, has extensive commercial interests, particularly in its export trade. The exports in 1901, principally lumber, cotton and cotton products, live stock and meat products, breadstuffs and naval stores, were valued at nearly $12,000,000, while imports amounted to about $3,000,000. The commerce of the city has been promoted by extensive improvements in the harbor and in the channel through the bay, both of which are now accessible for large vessels. According to the census of 1900, Mobile was the third manufacturing city in Alabama. Capital to the amount of $3,294,238 was invested in the city's various industrial enterprises, their products aggregating $4,451,062. The leading manufactures are lumber and lumber products, flour and grist mill products, foundry and machine shop products, ships and boats, tobacco, cigars, and cigarettes. There are also cotton mills, red cedar pencil and basket factories, and a distillery of whisky. The cultivation of vegetables, which are shipped in considerable quantities to Central and South America, is a lucrative industry in the vicinity.

Mobile spends annually in maintenance and operation about $230,000, the principal items being $35,000 for interest on debt, $35,000 for the police department, $31,000 for the waterworks, $25,000 for street expenditures, and $21,000 for the fire department. The schools are supported by the State and county. The city owns and operates the water-works, which were built in 1899 at an approximate cost of $615,000. The system comprises 94 miles of mains. Population, in 1860, 29,258; in 1870, 32,034; in 1890, 38,469, including 17,045 (44 per cent.) persons of negro descent.

In 1702 Iberville, the French explorer, established a settlement twenty miles north of Mobile and called it Fort Louis de la Mobile, from the Maubila Indians. In 1710, on account of a destructive hurricane, the settlement was moved to the present site. For eighteen years it was the capital of French territory in this part of America, but on account of the shoaling of a part of Dauphin Island, it was forced to surrender this distinction to Biloxi in 1720 . In 1763 Mobile, with the rest of 'West Florida,' was ceded to England and became a starting point for English expeditions up the Mississippi and into the 'Illinois country.' On March 14, 1780, Galvez, the Spanish commandant at New Orleans, captured the city, and by the treaty of 1783 Spain was left in possession. After 1803 the United States claimed the city as a part of Louisiana, and on April 13, 1813, General James Wilkinson captured it, but was dispossessed by the English later in the year. Restored to the United States by the Treaty of Ghent in 1814, Mobile was incorporated as a city five years later. In 1870, during the 'reconstruction period,' its area was curtailed and its name changed to the 'Port of Mobile,' but in 1887 it was reincorporated with full city rights. On August 5, 1864, it was the scene of Farragut's famous naval victory. Forcing his way into the harbor in spite of numerous torpedoes and mines, he destroyed the Confederate fleet. This victory was followed by the capture of Forts Gaines and Morgan. (See MOBILE BAY, BATTLE OF.) Early in the spring of 1865 the other fortifications surrendered and the city passed into Union hands. Consult: Hamilton, *Colonial Mobile* (Boston, 1897); and Powell, *Historic Towns of the Southern States* (New York, 1900).

MOBILE BAY. The estuary of the Alabama and Tombigbee Rivers (whose waters after their junction form the Mobile and Tensas Rivers), running into the Gulf of Mexico, through the southwestern portion of the State of Alabama (Map: Alabama, B 5). It is about 30 miles long and from 10 to 12 miles wide. The island of Dauphin lies west of the entrance, which is defended by Forts Morgan and Gaines, and on the east is Mobile Point, the station of a lighthouse with a revolving light. The bay has also an outlet on the southwest through Grant's Pass, communicating with Mississippi Sound, used by steamers of light draught, and the regular course of the Mobile and New Orleans steamers. The harbor, once quite shallow, has been improved by the United States Government; ships drawing over 23 feet of water can now enter the lower bay, and vessels drawing 17 to 23 feet can pass through the channel to the wharves of Mobile. See MOBILE BAY, BATTLE OF.

MOBILE BAY, BATTLE OF. A battle of the Civil War in America, fought August 5, 1864, between a Federal fleet under Rear-Admiral Farragut and the Confederate ram *Tennessee* aided by three auxiliary gunboats and the guns of Fort Morgan. When Farragut was ordered to the Gulf of Mexico in January, 1864, he wished to attack Mobile, and effectually put an end to blockade-running, but not until late in July was he assured of the support of a land force and of ironclads, without which the attack was likely to prove a failure. The city, thirty miles above the Gulf, was protected by Fort Morgan and Fort Gaines, respectively on the eastern and western sides of the entrance to the bay. The channel was closed by piles and torpedoes except for a narrow space under the guns of Fort Morgan. At 7 o'clock on the morning of August 5th the four monitors, *Tecumseh*, *Manhattan*, *Winnebago*, and *Chickasaw*, began to fire upon the fort as they steamed past. They were followed by the wooden sloops *Brooklyn*, *Hartford* (flagship), *Richmond*, *Lackawanna*, *Monongahela*, *Ossipee*, and *Oneida*, to each of which was lashed a gunboat, to prevent it from drifting if disabled. When the *Brooklyn* was almost abreast of the torpedoes she stopped and began to back. The captain of the *Tecumseh* disobeyed orders, steering to the west of the open channel, and his vessel was blown up. As the *Brooklyn* turned across the channel, to prevent fouling, Admiral Farragut ordered the course directly across the torpedoes. Though the torpedoes were felt to strike the bottom of the vessels, none exploded. Little damage was done by the guns of the fort and the Federal gunboats were released. Soon they sank the *Selma*, drove the *Gaines* aground, and the *Morgan* under the guns of the fort, and the fleet prepared to anchor. The ram *Tennessee* coming out from the shelter of the fort attacked the entire Federal fleet. Though hit many times, and rammed by the *Hartford*, the *Monongahela*, and the *Lackawanna*, her armor suffered little damage, but her smokestack was shot away, her steering gear disabled, and her commander had his leg broken by a splinter. Her port shutters were so jammed that it was impossible to use her guns successfully and at 10 o'clock she surrendered. General Granger had invested Fort Gaines, August 3d, and on August 7th that fort surrendered. Fort Morgan was immediately invested and surrendered on August 23d. No attempt was made to take the city at this time on account of the shoal water, but the port was effectually closed. The Confederate losses amounted to 12 killed, 20 wounded, and 280 taken prisoners. The Federals lost 52 killed, 170 wounded. To this should be added from the crew of the *Tecumseh*, 93 drowned and 4 captured. Consult: Loyall Farragut, *Life of David Glasgow Farragut* (New York, 1892); and Mahan, *Admiral Farragut*, in "The Great Commanders Series" (New York, 1892).

MOBILE POINT. A name applied to the end of a long, narrow strip of sand which stretches between Navy Cove and the Bay of Bon Secours to the north and the Gulf of Mexico to the south, at the eastern extremity of the entrance to Mobile Bay. Fort Morgan is situated here, on the ground once occupied by Fort Bowyer (q.v.).

MOBILE RIVER. The western branch of the system of channels through which the united Alabama and Tombigbee Rivers discharge into Mobile Bay. It is about 50 miles long, and communicates at several points with the Tensas, or eastern branch of the system, the two entering the bay through a common delta at the city of Mobile.

MOBILES, mō̇′bē̇′y', Corps of (Fr. *garde mobile*, movable guard). A French corps organized in 1870, and consisting entirely of men who had previously been exempted from service in the active army for reasons other than physical disability.

MOBIL′IAN TRADE LANGUAGE. An Indian trade jargon formerly serving the same purpose of intertribal and trade communication in the Gulf States that is still served by the Chinook jargon (q.v.) along the Columbia and the northwest coast, by the *lingoa geral* in Brazil, and to a certain extent by the sign language (q.v.) of the Plains. It was based upon Choctaw, with additions from all the neighboring dialects and from the more northern Algonquian languages, and was the common medium of communication among all the tribes of the Gulf region, from the Atlantic coast of Florida probably as far west as Matagorda Bay in Texas and northward along both banks of the Mississippi to the Algonquian frontier about the entrance of the Ohio. It was called *Mobilienne* by the French, from Mobile, the great trading centre of the Gulf region. Along the Mississippi it was sometimes known as the Chickasaw trade language. It was evidently by this medium that De Soto's interpreter from Tampa Bay was able to talk with all the tribes they met until they reached the Mississippi. In an official report upon the Texas tribes in 1805 Sibley stated that the 'Mobilian' was spoken in addition to their native language by all the Indians who had come from the east side of the Mississippi. It was still spoken in Louisiana fifty years ago, but has died out with the general decay of the Indian life.

MOBILIER, mō̇′bē̇′yȧ′, Crédit, krȧ′dē̇′. See Crédit Mobilier.

MOBILIZATION (Fr. *mobilisation*, from *mobiliser*, to mobilize, from *mobile*, Lat. *mobilis*, movable, from *movere*, to move, Skt. *mīv*, to push). The transformation of an army from its peace establishment to a war footing and its assembly at appointed depots or stations. The German method of mobilization, which is typical of Continental Europe generally, is as follows: The mobilization order is issued by the Emperor, and promulgated by all civil and military authorities. From the moment the order is issued every individual is supposed to know what to do and where to report. The reserves are called in, and the establishment of the standing army completed from their number. The remainder are formed into additional regiments; at the same time the levy of horses is commenced. In time of war, the organization of a mobilized army corps differs but little from that obtaining in time of peace. Any additional formations are made into separate cavalry divisions, and are composed of a number of cavalry regiments taken from the regular divisions. There would also be reserve divisions, and depot and landwehr formations of every kind; train columns and sanitary or hospital detachments being also assigned. The landwehr keeps the active army up to strength, and garrisons stations at home, and, if necessary, those at or near the base of operations. Artillery is distributed in part throughout the divisions of the army corps, and in part as the nucleus of an artillery corps, under the separate command of a general officer. The pioneer battalion is broken up into companies and attached to the divisions; mail, telegraph, balloon, and railway service being similarly assigned. As soon as the army moves the *etappen* are organized, maintaining, if possible, by railways the connection with the rear. Additional information will be found under Frontier, Military.

MÖBIUS, mẽ′bē̇-u̦s, August Ferdinand (1790-1868). A German mathematician, born in Leipzig. He studied at the universities of Leipzig and Göttingen. At first he devoted his attention to law, but later, under the influence of Gauss, he took up mathematical astronomy. In 1816 he was made professor at Leipzig and almost immediately afterwards became director of the observatory in the Pleissenburg, which was built after his plans

(1818-21). His important astronomical and mathematical memoirs appeared from this time on, in the *Astronomische Nachrichten*, Crelle's *Journal*, and the *Berichte* of the Scientific Society of Leipzig. His leading mathematical work was *Der barycentrische Calcul* (1827). This contained a novel discussion of homogeneous coördinates, presented the first systematic discussion of the essential differences between the modern and the ancient geometries, set forth the generalization of figures, stated the invariant property of cross ratios, and made extensive use of the principle of duality. He also wrote the following works: *Die Hauptsätze der Astronomie* (1836; 7th ed. 1890); *Lehrbuch der Statik* (1837); *Die Elemente der Mechanik des Himmels* (1843). His *Gesammelte Werke* have been edited by Baltzer, Klein, and Scheibner (4 vols., Leipzig, 1885-87).

MÖBIUS, Karl August (1825—). A German zoölogist. He was born in Eilenburg; studied at Berlin, and in 1868 was made professor of zoölogy at Kiel. There he became especially interested in marine animals, and he was a member of the commission of 1871 and 1872 for the investigation of German writers. Möbius went to Berlin in 1887 as director of the zoölogical museum. His publications include: *Die Nester der geselligen Wespen* (1856); *Die echten Perlen* (1857); *Neue Seesterne* (1859); *Fauna der Kieler Bucht* (1865-72); *Die Auster* (1877); *Die Fische der Ostsee* (1883); *Aesthetische Betrachtung der Tiere* (1895); and *Aesthetische Beurteilung der Säugetiere* (1900).

MÖBIUS, Theodor (1821-90). A German philologist, one of the foremost students of old Norse literature and language, son of August Ferdinand Möbius, the mathematician. He was born at Leipzig, studied there and in Berlin, and in 1852 became docent of Scandinavian languages at Leipzig. He was promoted to professor in 1859, and in 1865 became a member of the faculty of Kiel. Möbius's most valuable work was as an editor. Especial mention should be made of *Fornsögur* (with Vigfusson, 1860); *Edda Sæmundar* (1860); *Islendingabók* (1869); *Kormákssaga* (1886); *Málsháttakvæthi* (1873); and Snorre's *Háttatal* (1879-81). His other work includes the dissertation, *Die ältere isländische Saga* (1852); the valuable bibliography, *Catalogus Librorum Islandicorum et Norvegicorum Ætatis Mediæ* (1856; a supplemental volume in 1880); *Analecta Norrœna* (1859); *Altnordische Philologie im skandinavischen Norden* (1864); *Altnordisches Glossar* (1866); *Dänische Formenlehre* (1871); and *Ueber die altnordische Sprache* (1872).

MOCCASIN. See Shoes and Shoe Manufacture.

MOCCASIN FLOWER. See Lady's-Slipper; also Colored Plate of American Orchids.

MOCCASIN SNAKE, Water Moccasin, or Cottonmouth. An aquatic, fish-eating, venomous pit-viper (*Ancistrodon piscivorus*) of the Southern United States, allied to the copperhead. It may grow to be four feet long; is thick and heavy in body; has a tapering tail, without any rattle or spine; and in color is dark chestnut brown, with light marks on the lips, obscure blackish bars on the sides, and the abdomen black blotched with yellowish white. The interior of the mouth, displayed when the snake is about to strike, is cottony white. This serpent exists in large numbers from southern Indiana and southeastern Virginia to the Rio Grande in swamps, marshes, on over-flowed lands, and along rivers and bayous, where it is fond of lying in the sunshine upon banks, tussocks, driftwood, or bushes and trees overhanging the water. It never goes far away from such places, and is really a water-snake; its food is mainly frogs and fishes. When disturbed it may escape by swimming, but is quite as likely to turn and fight fearlessly. It is one of the most virulent and deadly of all American serpents, but fortunately it does not wander into places where men usually go, except in the irrigated rice fields, where it is greatly dreaded. In captivity it is one of the most untamable and ferocious of known reptiles. It produces eight or ten young annually in midsummer, all fully prepared for offense or defense. The moccasin is 'mimicked' by the quite harmless water-snake Natrix, which, however, is usually much smaller, has a narrower, less triangular and forbidding head, and may always be distinguished by the double row of scales on the under side of the tail. Consult Stejneger, *Annual Report of the Smithsonian Institution for 1893* (Washington, 1895). Compare Copperhead; Rattlesnake.

MOCENIGO, mō-che-nē′gō. The name of a prominent Venetian family which furnished several able commanders and doges to the Republic. The most noted was Tomaso, Doge from 1414 to 1423. At a time when Venice was mistress of extensive possessions, Mocenigo endeavored to maintain her position by a policy of peace. His chief opponent was Francesco Foscari (q.v.), the next Doge, who urged a policy of conquests on the mainland of Italy. Mocenigo was able to withhold Venice from this course, which afterwards proved so disastrous to her power. To him was due the building of the present Doge's palace. At the time of Tomaso's death Venice had reached the zenith of her glory.

MOCHA, mō′kȧ. A strongly fortified seaport, and once the capital, of the Province of Yemen, in Arabia. It is situated on the Red Sea, at the head of a little bay near the Strait of Bab-el-Mandeb, and 130 miles west-northwest of Aden (Map: Turkey in Asia, Q 13). It formerly exported large amounts of coffee and other produce, which are now distributed through the ports of Aden and Hodeida. Population, 5000.

MOCHA STONE, or Dendritic Agate. A name given to those crypto-crystalline varieties of quartz, such as agate and chalcedony, which contain moss-like or dendritic forms, usually consisting of manganese dioxide distributed through the mass. They were originally brought into Europe from Mocha. Of a similar nature is the moss-agate.

MOCHNACKI, mōk-näts′kē, Maurycy (1803-35). A Polish publicist and critic, born at Bojaniec, Galicia. He took part in the revolution of 1830-31, and, after the capture of Warsaw, left his native country and spent the remainder of his life in France. He was the defender of the Romantic School in Poland, and is said to have dealt the death blow to Classicism in that country. His works are: *A History of Polish Literature in the Nineteenth Century* (1830), and a valuable *History of the National Insurrection in Poland in 1830 and 1831* (1834).

MOCKING-BIRD (*Mimus polyglottos*). The most famous, if not the sweetest and most beautiful, of American songsters. It receives its popular name from its extraordinary powers of vocal imitation. It is often called 'mocking-thrush,' and was formerly considered a peculiarly modified thrush, but now, with its near relatives the catbird and brown thrasher, it is classified very near the wrens. The genus Mimus is characterized by the elongate form, long tail, short wings, and straight bill, much shorter than the head, notched near the tip, and whiteness of the plumage on the inferior surface of the body. The mocking-bird is about ten or eleven inches long, the tail being nearly one-half the total length. The upper parts are ashy-gray; the wings and tail are nearly black, extensively marked with white; under parts grayish-white. The bird is very common in the South Atlantic and Gulf States, and in summer ranges as far north as Massachusetts and westward to the Pacific coast. The nest is built in bushes and low trees. It is made of twigs, leaves, weed-stalks, and grasses, lined with rootlets, cotton, etc. The eggs are four to six in number, pale greenish-blue, heavily spotted and blotched, especially near the larger end, with bright brown. Two and sometimes three broods are reared in the season, which begins early in the spring and lasts until the end of the summer. During the spring and early summer the birds sing all day and even all night, and in many localities the air rings with their music. Their native song is extraordinarily beautiful, but it has in addition the power of reproducing the songs of other birds with such accuracy as to deceive even the imitated birds. There is, however, very great individual difference in this power, for while some birds seem seldom to attempt any mimicry, others are constantly imitating the sounds which they hear.

When taken from the nest, young mocking-birds readily become accustomed to cage life, and may live for many years. They are easily taught and often improve greatly with careful training. The food of the mocking-bird is largely composed of insects and berries or seeds. An inhabitant of gardens and roadsides, fond of human habitations, and seldom seen in the woods, the mocking-bird is often found in villages and even in the streets of large towns.

Besides the common mocking-bird, more than a dozen other species of Mimus occur in the West Indies, Mexico, Central and South America. The 'mountain mocking-bird' (*Oroscoptes montanus*) of the Western United States is a much smaller and quite different bird, and not especially notable as a songster. See Colored Plate of SONG-BIRDS.

MOCKING WREN. The Carolina wren. See WREN.

MOCK MOONS. See HALO.

MOCK ORANGE. A hardy flowering shrub. See PHILADELPHUS.

MOCK SUNS. See HALO.

MOD′DER, or KAIBA, **RIVER.** A left affluent of the Vaal River, South Africa, which it joins after an eastern course of 186 miles, about 31 miles above its junction with the Orange River (Map: Cape Colony, K 5). During the war of 1899-1902 its banks were the scene of much fighting and witnessed the repulse of the British troops at Maagersfontein in 1899, and the surrender of Cronje at Paardeberg in 1900.

MODELING (from *model*, from OF. *modelle*, Fr. *modèle*, from Lat. **modellus*, from *modulus*, standard, diminutive of *modus*, measure). The process of preparing the original pattern or design from which a work in sculpture is to be cast or carved. Modeling is also practiced by medalists; the head or figure intended to be cut in the die being first modeled in relief with wax on a piece of slate. Goldsmiths, silversmiths, and jewelers also model intricate and artistic forms and ornaments of pieces of plate, to be cast and chased by them, or in which jewels are to be set. Modeling is also a branch of the potter's trade. For large models, the material employed is potter's clay, which, when used by sculptors, is mixed with a portion of sandstone, finely pulverized, to make it work freely. In painting, the term modeling is used to denote that quality which conveys to the eye the sense of projection, volume, and bulk of an object.

MODEL YACHTING. The pastime of sailing model yachts. In England it is known as 'miniature yachting,' under which name it was first generally practiced in America. The boats used were either exact models to scale of well-known large yachts, or of such perfection as to be capable of being built full size from the models—thus considerably improving the sailing capacity of the models. The model department is one of the most important branches of modern shipbuilding yards, owing to the practice of 'trying out' important yachts in the shape of models before proceeding with full size construction. In this manner, faults in design are discovered and remedied. The yachts are rigged with careful accuracy, and are mechanically self-steering. There is a variety of devices for this purpose. Some have wire springs which, when the pressure of the wind has been removed, return the rudder to its original fixed angle; but a traveler about three-quarters of an inch aft of the tiller head, threaded with two screws, will, in the hands of an operator who knows his business and the prevailing winds, be sufficient. Models steered with this device may frequently jibe back and forth, but they will, at the end of a mile run, invariably arrive within a very short distance from the exact spot for which they were started. The use of spinnakers has never been successful. The principal races are those between the boats of the Miniature Yacht Club, the Wave Crest, and the American Model Yacht Club of New York. Plans, diagrams, and full instructions for building and sailing will be found in a series of articles published in *Outing* for February and March, 1895 and 1896, by Franklyn Bassford.

MODENA, mō′då-nȧ (Lat., *Mutina*). A former duchy in Northern Italy, south of the Po, included in the *compartimento* of Emilia in the modern Kingdom of Italy. The Roman colony of Mutina was founded on the Æmilian Way about B.C. 220, after the conquest of Cisalpine Gaul. Modena was acquired by the House of Este (q.v.) in 1288, and in 1452 the Marquis Borso d'Este was made Duke of Modena by the Emperor Frederick III. He was at the same time make Duke of Ferrara by the Pope, and the political destinies of the two cities were therefore united until 1598, when Ferrara was seized as an escheated fief by its overlord, the Pope, while Modena, with Reggio and Mirandola, remained in the possession of the House of Este. In 1796 the Duke Ercole was dethroned by Bonaparte, and Modena, with Ferrara and Bologna, was erected into the Cispadane Republic, which in 1797 was merged in the Cisalpine Republic. By the Treaty of Lunéville (1801) the Duke of Modena received the Breisgau in exchange for his duchy. On the death of Duke Ercole in 1803 the duchy devolved by marriage upon the House of Hapsburg, the daughter of Ercole having married Ferdinand, a son of Maria Theresa, and it was awarded by the Congress of Vienna (q.v.) to the son of this marriage, Francis IV., who proved a cruel despot. He married Beatrice, daughter of Victor Emmanuel I. of Sardinia. In 1831 an uprising forced him to take refuge in Austria, but he was promptly restored by Austrian arms, and ruled by the methods which the Hapsburg connections made familiar in all parts of Italy at that time. Francis IV. died in 1846 and was succeeded by his son, Francis V. The latter has been described as hardly more than an 'Austrian deputy sheriff.' In 1848 he was forced to flee from his State, which proclaimed itself a part of the Sardinian Kingdom, but he was soon reinstated by Austria. He fled when war broke out in 1859, and although it was provided by the Treaty of Zurich that he should be restored, the people of the duchy, in common with those of Parma, Tuscany, and the Legations, promptly declared their wish to be united with Sardinia in the new Kingdom of Italy, and this, being formally confirmed by a plebiscite, was done. See ITALY.

MODENA. A city in Northern Italy, formerly the capital of the Duchy of Modena and now the capital of the province of the same name, situated in a rich gardened plain between the Panaro and the Secchia, 24 miles northwest of Bologna (Map: Italy, E 3). A navigable canal connects it with both rivers. It is a city of spacious streets and roomy arcades, and is divided into an old and a new part by the historic Via Æmilia. On the main piazza rises the fine Romanesque cathedral, dating from 1099, by Lanfranco. It was restored in 1893. The façade is embellished with curious sculptures. The exterior is also enriched by a rose window, and by a colonnade encircling the whole edifice. The interior is at first disappointing, but is in reality imposing. There are here a good altar-piece by Dosso Dossi and a fine group by Mazzoni. The famous Campanile, dating from 1224, is over 300 feet high. It leans slightly. The Gothic Church of San Francesco has an immense and excellent terra-cotta 'Descent from the Cross' by Begarelli. San Pietro is remarkable for its fine brick Renaissance façade.

Modena is rich in palaces. The Palace Albergo Arti (1767) now holds the municipal museum, containing several interesting collections. The historic library here—Biblioteca Estense, one of the most famous in Italy—has 132,000 volumes, and also over 8000 MSS., some of them very rare. It possesses in addition a coin collection and museum of archæology. Its picture gallery is quite well known, comprising examples by Correggio, Dosso Dossi, Guido Reni, and Velazquez. The splendid ducal palace dating from 1635 is now used for a military school. Modena has statues of Tassoni and Victor Emmanuel II., and an excellent religious group by Mazzoni. The trade of Modena is not very important. There are weekly cattle markets—grain, beef, sausages, fruit, wine, and liquors being chiefly dealt in. The manufactures are few. Linen and woolen goods, leather, hats, vinegar, glass, and pottery are produced. Silk is woven, but less extensively than formerly.

In art history Modena is known for its terracottas. It is the seat of an archbishop, and has a university, a 'Konvit,' a military school for infantry and cavalry, a technical institute, a technical school, an agricultural college, and an academy of fine arts. The university, founded in 1683, has three faculties, and a pharmaceutical and a veterinary school. The number of students is over 700. The public gardens are lovely, and the site of the former ramparts serves as a pleasure ground. Population (commune), in 1901, 64,843. For history, see MODENA (duchy).

MODENA, GUSTAVO (1803-61). A noted Italian actor. He was born in Venice and educated for the law, but was early turned to the stage and revealed extraordinary powers as a tragedian. Among his greatest impersonations were those in the plays of Alfieri, and several from the French, especially the rôle of Louis XI. Political troubles obliged him to live in exile from 1831 to 1837. In the movements of 1847 his patriotism again led him to take a prominent part. He published at this time his *Dialoghetti popolari.*

MODERATOR (Lat. *moderator*, one who regulates, from *moderare*, to regulate; connected with *modestus*, discreet, *modus*, measure, and ultimately with OHG. *mezan*, *mezzan*, Ger. *messen*, Goth. *mitan*, AS. *metan*, Eng. *mete*). A title given to the presiding officer on certain academic and ecclesiastical occasions. In the Congregational and Presbyterian Churches of the United States the title of moderator is given to the presiding officer of assemblies. In the former the title is used not only in the meetings of congregations and district, State, and triennial conventions, but also in councils called to act in a judicial capacity. The presiding officers in the series of Church courts provided for in the Presbyterian system, viz. the session, the presbytery, the synod, and the General Assembly, are usually called moderators. The pastor of a local church is *ex officio* moderator of the session of the church, while in the other bodies mentioned the moderators are elected from among the presbyters. The most important function of these officers, apart from presiding at the sessions of the body, is the naming of the standing committees.

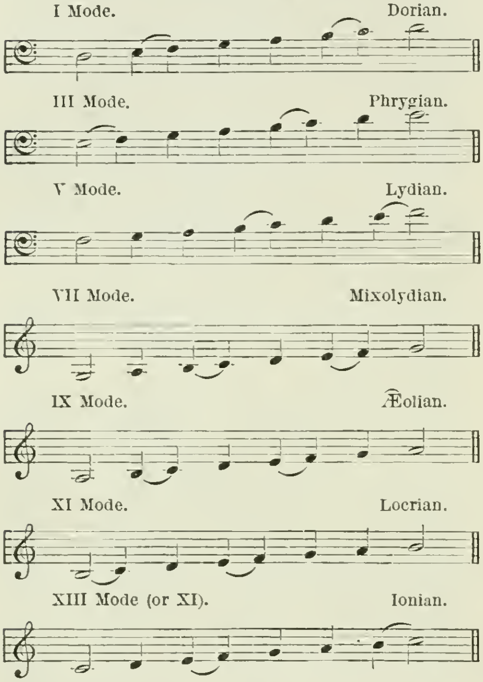
MODERN GEOMETRY. See GEOMETRY.

MODERN INSTANCE, A. A novel by W. D. Howells (1881). Bartley Hubbard, the hero, a thoroughly unprincipled, selfish fellow, originally a country journalist, removed to Boston after his marriage to Marcia Gaylord, a beautiful but passionate and undisciplined girl. Hubbard disappears after a final quarrel, and two years later brings action for divorce in a Western town. There Marcia and her father, the Judge, surprise him by a counter-suit, and his career ends in a shooting affray in Arizona. Though painful in its general features, it is a graphic picture of certain phases of New England life.

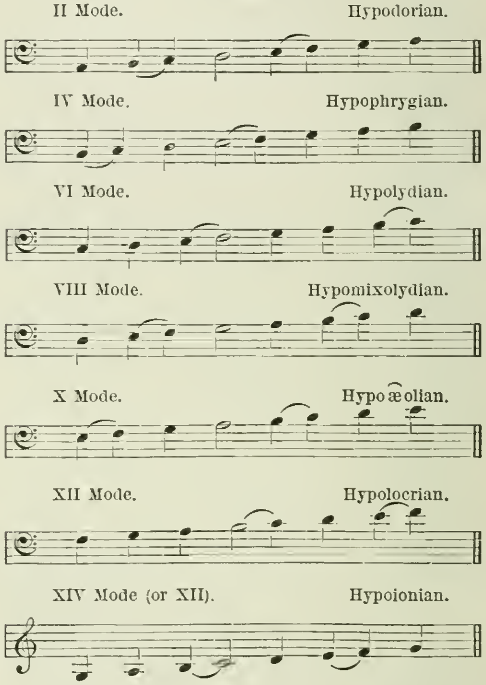
MODERN MACCABEES, Knights of the. A fraternal beneficial organization founded in 1881, for social and benevolent purposes. The organization had at the close of the year 1902 975 subordinate tents or branches, with a total membership of 102,868, and an insurance branch in which there were in force certificates representing $125,540,000 insurance. During the year 1902 the organization disbursed $941,578, and the entire amount of benefit paid since the date of organization was $6,706,668. This is the original order bearing this title.

MODES (OF., Fr. *mode*, from Lat. *modus*, measure, manner). The octave species in use before the time of the invention of harmony as well as during the period of the contrapuntal style up to the time of Bach. The original scale of the ancient Greeks was a *descending* minor scale with semi-steps between the third and fourth and seventh and eighth degrees. Other tones than the fundamental were also taken as starting points, but the tones of the original scale remained unaltered. This shifted the position of the semi-steps every time the starting tone was shifted. The combinations of tones thus obtained were regarded as separate scales and called octave species. This system the theorists of the early Middle Ages adopted. But instead of using *descending* scales they made use of *ascending* ones. At the same time they retained the original Greek names, but applied them to scales *not* corresponding to the original Greek scales. From among the nine octave species of the Greeks four were originally selected for the service of the Church. These were known as the *authentic modes.* Their establishment is commonly attributed to Saint Ambrose, Bishop of Milan, who died in A.D. 397. Some time later—and tradition mentions Saint Gregory I. (Pope from 590 to 604) as their originator—four other modes were added. These were called the *plagal modes.* During the sixteenth century, when the principles of harmony began to be first understood, two more authentic with their corresponding plagal modes were added, so that the total number of Church modes was twelve. Some theorists claimed the existence of two more, Locrian and Hypolocrian (one authentic and one plagal); but neither of these was ever used in actual practice. The reason for their rejection will become apparent a little further on. The following is a complete table of the fourteen modes:

AUTHENTIC MODES.



PLAGAL MODES.



(In this table the final note, corresponding to our modern tonic, of each mode is indicated by a half note, the semi-steps by slurs.) It will be seen that the compass of every *authentic* mode is from the final to its octave above; that of every *plagal* mode from a fourth below to a fifth above the final. Every *authentic* mode has its corresponding *plagal* distinguished by the prefix hypo (under), and beginning a fourth below the authentic mode. Furthermore, every mode must be considered as consisting of two series of tones forming either a pentachord or a tetrachord in such a manner that the highest tone of the lower series is at the same time the lowest tone of the higher series. In the authentic modes the first five tones constitute the pentachord, the last four the tetrachord. In the plagal modes the tetrachord comes before the pentachord. The former arrangement is called by the eminent theorist Zarlino (q.v.) *harmonic division* (*divisione armonica*); the latter arrangement, *arithmetical division* (*divisione aritmetica*). In examining the above table it will be noticed that the pentachords and tetrachords of all the modes, except the Locrian and Hypolocrian, exhibit the compass of a *perfect* fifth or fourth. In these two modes the pentachord represents the compass of a *diminished* fifth, the tetrachord that of an *augmented* fourth (tritonus). Both these intervals were strongly condemned by musical theory, and hence these two modes were rejected as impure, and therefore impracticable.

In every mode four notes have a special significance, just as the tonic, dominant, and subdominant have in our modern scales. These notes are: (1) The final; (2) the dominant; (3) the mediant; (4) the participant. The *final* is the tone on which every melody ends. By means of this tone the mode in which any melody is written is determined. If it moves within the range of the final and its octave, the mode is authentic; if it moves below or above the final, the mode is plagal. The *dominant* of every authentic mode is found a fifth above the final; of every plagal mode a third below the dominant of its corresponding authentic mode. The only tone which can never serve as a dominant is B. Whenever B would occur, C is substituted for it. The reason for this change is that B always forms a dissonant interval with F, either an augmented fourth or a diminished fifth. The *mediant* derives its name from the fact that in the authentic modes it always lies midway between the final and the dominant; it is always the third tone of the mode. In the plagal modes the position of the mediant is rather unsettled, owing to the necessity of obtaining a convenient tone for cadences, as in the case of the dominant, and for the same reason B can never appear as a mediant. C is invariably substituted. The *participant* in the authentic modes lies either between the final and the mediant, or between the mediant and the dominant. If, however, two notes lie between the mediant and the dominant, either tone may serve as the participant. In the plagal modes the participant is always the same as the dominant of the corresponding authentic mode. Since each plagal mode begins a fourth below its corresponding authentic, this dominant (participant of the plagal) is the same as the lowest tone of the plagal mode. Here, again, B is barred and C substituted. Likewise F can never be participant, the next higher tone (G) being substituted.

While every melody must end upon the final, it may begin upon any one of the four just-mentioned tones. But any phrase except the last of a melody may also end upon these tones. Hence they are also called *cadences* or *modulations*. As in a long melody a feeling of monotony would be produced by the constant employment of these modulations, two or more tones are admitted. The final, dominant, mediant, and participant are called *regular* modulations, and the additional tones *conceded* modulations. One of the most frequent of these conceded modulations is the seventh tone of the mode. This always appears an octave lower than the true pitch, on account of a license permitting the extension of every authentic mode by one tone below its final and of every plagal mode by a sixth above the final. In order to bring melodies within the range of certain voices it sometimes happens that they are written a fourth higher or a fifth lower than the regular mode. Such transposition is always indicated by a B flat in the signature. In these cases the true final will be either a fourth below or a fifth above the closing note.

According to their range melodies are classed as *perfect*, *imperfect*, and *superfluous*. A perfect melody moves within the range of the mode in which it is written; an imperfect melody does not exhaust the entire range; a superfluous melody exceeds the range either above or below. Some melodies exhaust the complete range of both the authentic and its corresponding plagal mode; these are said to be written in a *mixed mode*. See GREEK MUSIC; PLAIN CHANT; and for an explanation of the two modes in use at present, see MAJOR; MINOR.

MODES'TO. A city and the county-seat of Stanislaus County, Cal., 77 miles south by east of Sacramento; on the Tuolumne River and on the Southern Pacific Railroad (Map: California, C 3). It has some manufactures, and a trade in grain, fruit, and wool, being the centre of an extensive and productive region, the fertility of which is developed by an elaborate system of irrigation. The court house and the county hospital are fine structures. Population, in 1890, 2402; in 1900, 2024.

MODICA, mō'dē-kȧ. A city in the Province of Syracuse, Sicily, 63 miles by rail southwest of the city of Syracuse, in a fertile and beautiful valley 1445 feet above the sea (Map: Italy, J 11). The principal products are grain, wine, oil, cheese, butter, cattle, and mules. There are a public library, a hospital, and an infant asylum, a gymnasium, technical schools and a technical institute, and a theatre. Population (commune), in 1881, 41,231; in 1901, 48,962.

MODIFICATION OF TEMPO. See TEMPO.

MODIL'LION (OF. *modillion*, *modiglion*, Fr. *modillion*, from It. *modiglione*, modillion, from Lat. *modulus*, model). An ornamental bracket much used in classic architecture, especially in the cornices of the Corinthian and Composite styles. It is so called only when used in a long series—not singly—and is usually small. Larger and single brackets are called *consoles*.

MODIOLOIDES, mō'dĭ-ō-loi'dēz (Neo-Lat. nom. pl., from Lat. *modiolus*, nave of a wheel + Gk. εἶδος, *eidos*, form). One of the very earliest fossil clams known, found in rocks of Lower Cambrian age. See FORDILLA; PELECYPODA.

MODISH, LADY BETTY. A character in Colley Cibber's *Careless Husband*, a charming woman of fashion, who, though coquetting with Lord Foppington, is in love with Lord Morelove. Mrs. Oldfield acted the part so successfully as to win unusual praise from the author.

MODJESKA, mō-jĕs'kȧ, HELENA (1844—). A noted actress, of Polish origin, since 1876 a resident of the United States. She was the daughter of Michael Opido, a musician, and was born in Cracow, October 12, 1844. Married in 1860 to a manager named Modrzejewski, from the contraction of whose name comes that by which she is known, she became in 1865 the leading actress in the theatre of her native city. Three years later she was married to her second husband, Count Bozenta Chlapowski, and became the star of the Imperial Theatre of Warsaw. Political difficulties and ill health led her with her husband to come in 1876 to California, where they established a Polish colony. This did not succeed, and after only a few months' study of English the Polish Countess made her début in San Francisco (July, 1877) as Adrienne Lecouvreur. She won a surprising success, and was soon seen in New York in the same play. In 1880 she made her London début in the part of Camille. In 1889 and 1890 she starred with Edwin Booth, with whom she had already in 1883 appeared in *Romeo and Juliet.* The list of her rôles is a long one, but her greatest devotion has been to Shakespeare, from whom are many of her most notable impersonations, among them Ophelia, Rosalind, Viola, Imogen, Cleopatra, and Lady Macbeth. Her great natural gifts, always ordered by high ideals and the most careful study of her art, have gained her as a tragic actress a foremost rank upon the American stage. Consult: Strang, *Famous Actresses of the Day in America* (Boston, 1899); McKay and Wingate, *Famous American Actors of To-day* (New York, 1896); Gilder, in *Actors and Actresses of Great Britain and the United States,* ed. by Matthews and H. Sutton (New York, 1886).

MÖDLING, mẽd'lĭng. A town of Lower Austria, situated at the foot of the Wienerwald, ten miles south-southwest of Vienna. The manufactures consist of iron products, railway supplies, footwear, etc. Population, in 1890, 10,956; in 1900, 15,304.

MO'DOC. A small but warlike and aggressive tribe, formerly ranging about Lower Klamath Lake and Lost River, and on the extreme northeast frontier of California. The name is said to mean 'aliens' (i.e. enemies), having been given by some one of the neighboring tribes. They call themselves *Maklaks,* 'people,' and with their northern neighbors, the Klamath, whose language they speak and with whom they originally formed one tribe, are at present classified as a distinct linguistic stock known as Lutuamian, but who may eventually prove to be connected with the Shahaptian. (See NEZ PERCÉ.) At some earlier period they seceded from the parent Klamath tribe and established themselves on Lost River. Their houses were round log structures, covered with earth, and their women were expert basket-weavers and cradle-makers. The Modoc made no alliances, but were at war with all the weaker surrounding tribes, and carried on a regular slave trade by selling their captives to the Columbia tribes in exchange for ponies. They were of vigorous vitality, and kept up their numbers in spite of smallpox and constant wars with both Indians and whites. They came into early collision with the California immigrants, and a chronic warfare was inaugurated, marked by wholesale massacres on both sides. In 1850 they were severely defeated by troops under Captain Lyon. In 1852 they massacred a number of settlers, for which terrible retaliation was made by a band of miners under the notorious Ben Wright, who invited their warriors to a feast and peace conference, and treacherously murdered forty-one of the forty-six who responded. Although thus diminished by nearly half their fighting force, the Modoc recommenced the war of extermination, which continued until 1864, when they entered into a treaty by which they agreed to go upon the Klamath reservation in Oregon. By this time they had been reduced to about 250. Finding their position there intolerable by reason of the persecution and insults of the Klamath, who considered them as rebels, the majority under a younger leader known as Captain Jack (q.v.) left the reservation and returned to their old home on Lost River. They were induced to return on promise of protection, but finding themselves again subjected to the same persecution without official redress, they returned to Lost River, leaving only about 100 behind under the old hereditary chief Skonchin. Orders were given to the troops to bring them back, and on November 29, 1872, the final Modoc war was begun by a night attack on Captain Jack's camp. The Modoc retreated to the Lava Beds, just across the line, where they so intrenched themselves in the labyrinth of volcanic rocks that four hundred regular troops were twice forced to retire with heavy loss without being able to come near enough even to see one of their concealed enemies. A peace commission to confer with the hostiles was then appointed, consisting of General Canby, Rev. Mr. Thomas, and Indian Superintendent Meacham. They met the head men of the Modoc on April 11, 1873. Jack repeated his demand to remain on Lost River, and on Canby's refusal, drew his revolver and shot him dead. At the same moment the other warriors fired, killing Thomas instantly and severely wounding Meacham, but were driven off before they could finish the work by the arrival of the troops whom Canby had kept hidden within easy reach. The war was continued under General Davis until the hostiles were finally starved out and compelled to surrender two months later. A part of the surrendered hostiles were returned to their kindred on the Klamath reservation, Oregon, while the rest were transported to the Quapaw reservation in Indian Territory. Those on the Klamath reservation now number 225, and are apparently fairly prosperous and advancing and coalescing with the Klamath. Those on the Quapaw reservation number 50, having decreased about one-half since the removal. See KLAMATH.

MO'DRED. The nephew of King Arthur. Tennyson represents him ambitious to gain the throne, and after revealing Guinevere's unfaithfulness to the King, he stirs up a revolt, during which Arthur is slain.

MODUGNO, mō-dōō'nyō. A town in the Province of Baridelle Puglie, Italy, about five miles southwest of Bari. It markets good fruit, wine, and oil. Population, in 1901 (commune), 11,-885.

MODULATION (in Music) (Lat. *modulatio,* from *modulari,* to regulate, from *modulus,* diminutive of *modus,* measure, manner). The process of changing from one key to another within the same composition. In a movement of even the smallest dimensions monotony would result if the composer should confine himself strictly to one key. There are two kinds of modulations, *passing* and *final.* Passing modulation introduces chords belonging to other keys only incidentally and soon returns to the original key. But when a piece modulates so that the original key is abandoned and a new key takes its place, the modulation is final. In the sonata-form (see SONATA) the first development of the principal subject confines itself only to *passing* modulations. A *final* modulation occurs at the entrance of the secondary subject (generally to the dominant key). The second or development section is concerned entirely with *passing* modulation. But even here the choice of keys is not arbitrary. However, no rules can be given; the artistic and æsthetic instinct of the composer is the sole guide. According to the theory of the present day, all modulation is regarded in its relation to the principal key of the piece, and, in a wider sense, all keys are but steps within the unlimited domain of tonality (q.v.). Older composers are very sparing and careful in the use of modulation, but the nineteenth century (especially Wagner, Schumann, Chopin) practically removed all barriers. The means of modulation are various and cannot be discussed in an article like the present. The most frequent expedient is the different interpretations put upon the same chord. Thus the chord c, e, g may be conceived as tonic of C, dominant of F, subdominant of G, etc., and consequently can be used to modulate at once to those keys. In modern music the chord of the diminished seventh plays an important part in modulation. Thus c♯, e, g. b♭ leads into D minor; the same chord conceived as e, g, b♭. d♭ into F minor; as g. b♭. d♭, f♭ to A flat minor; as a♯. c♯. e, g into B minor, etc. The principal works on modulation are: Dräseke, *Anweisung zum kunstgerechten Modulieren* (Freienwalde. 1876): Riemann. *Harmonie und Modulationslehre* (Leipzig. 1900): Jadassohn. *Die Kunst zu modulieren* (Leipzig. 1890).

MOD′ULE (Fr. *module*. from Lat. *modulus*, small measure). In classic architecture. an arbitrary measure or standard for determining the proportions of the various members of the columnar orders. It is based upon the width of the temple façade. Vitruvius. upon whose statement all such calculations have been based. divides a hexastyle Doric front, for example. into 44 moduli, the capital being the modulus, the diameter of the shaft two moduli. the total height of the column 14 moduli, etc. Such a scheme was undoubtedly a Greek idea incorporated in the writings of the Greek architects whom Vitruvius copied. But no such cast-iron rules could have been formulated as were laid down by the neo-classic architects of the Renaissance. such as Serlio and Vignola. who made the modulus the one determining unit of proportion. By them the diameter. semi-diameter. or one-third of the diameter are most frequently used: the first being usually divided into 60 parts (or minutes). the second into 30 parts. and the third into 20 parts.

MODULUS (Lat., small measure). A term variously used in mathematics. In the theory of logarithms (q.v.) it designates the multiplier by which one system of logarithms is transformed into another. The expression $\sqrt{a^2 + b^2}$ is often called the modulus of the complex number, $a + bi$, where i stands for $\sqrt{-1}$. (See Complex Number.) In the theory of numbers. the term congruence (q.v.) is applied to an equality in which we neglect certain quantities which are called 'moduli:' e.g. $26 \equiv 12$ (mod. 7) denotes that 26 is congruent to 12 to the modulus 7. i.e. that $26 - 12$ is a multiple of 7.

MODULUS OF ELASTICITY. See Elasticity.

MOE, mō′*e*. Jörgen (1815-82). A Norwegian poet and folklorist. He was born at Holm, in the District of Ringerike. and before his entry at the University of Christiania became well acquainted with Asbjörnsen (q.v.), later his collaborator. From 1835 to 1852 hardly a year passed during which Moe did not make a long tour of the country in search of popular legends. The first collection of these tales, edited by Moe and Asbjörnsen under the title *Norske Folkeeventyr*, appeared in 1842-44; was republished by Moe in 1852, and was translated into English by Dasent (1859). His *Samlede Skrifter* (1877) include the popular poems (1850) and the juvenile stories, *I Brönden og i Kjörnet* (1851). Moe died at Christiansand, where he had been bishop for seven years.

MOEL, moil (Welsh, hill). A hill having a rounded outline in its upper portion because the summit is protected from rapid denudation by a layer of soil and a growth of forest trees or grass, or by marshes of peat. Consult Marr, *The Geographical Journal* (London. 1901).

MŒLLER, mĕl′lĕr, Louis (1856—). An American genre painter, born in New York City. He was a pupil of E. M. Ward and Will Low in New York City, and of Dietz and Duveneck in Munich. He is a clever delineator of character. In 1884 he won the first Hallgarten Prize with his picture "Puzzled," and he was made a National Academician in 1895.

MÖEN, mē′*e*n. A Danish island in the Baltic Sea, separated from Seeland on the northwest by the Ulv Sound, and from Falster on the southwest by the Grön Sound (Map: Denmark, F 4). Area, 82 square miles. Population, in 1901. 14,504. Its surface is remarkably irregular compared with the rest of Denmark. The limestone formation which underlies a large part of the country here crops out in the form of high and steep chalk cliffs of great natural beauty. The soil is very fertile. Agriculture and fisheries are the leading industries. The chief town and seaport is Stege. on the west coast, with a population (1901) of 2247.

MŒ′RÆ. The Greek name of the Fates. See Parcæ.

MŒRIS, mē′rĭs (Lat., from Gk. Μοῖρις, *moiris*). Lake. The ancient name of a sheet of water in Central Egypt, a remnant of which. it is generally agreed. exists in the present *Birket-Karun* or *Birket el-Kerun* ('lake of horns'). 34 miles long by 4½ miles wide, extending along the northwestern borders of the Province of Fayum. The classical writers have left very confused descriptions of a great artificial reservoir at this locality for storing the water of the Nile and irrigating the surrounding country by means of sluices. As the lake is at present 130 feet below the level of the sea. it must. within historic times. have hollowed out its bed 200 feet, or the artificial lake must have been a small reservoir southeast of it. or else the ancients must have totally misrepresented the whole matter. The investigations of Major Brown. which have been fully confirmed by Petrie. seem to point to the latter solution. The lake formed by the Bahr-Yusuf (Joseph's Canal) must have been much larger. until the kings of Dynasty XII.. and later the second Ptolemy. diked off considerable portions. The semi-mythical King Mœris of Herodotus is Amenemhat III., the builder of the Labyrinth (q.v.). whose two colossi have been discovered at Biahmu. Consult Petrie, *Hawara, Biahmu, and Arsinoë* (London, 1889).

MOERO, mwā′rō, MOERO-MKATA, or MERU. A lake in South Central Africa, situated 100 miles west of the southern end of Lake Tanganyika. (Map: Africa, G 5.) It lies on a plateau at an altitude of 3000 feet, and is surrounded, especially on the north, by wooded mountains having an Alpine aspect. It is 68 miles long, 24 miles wide, and very deep, especially in the northern part. It is evidently of great age, as it contains a remarkable species of fish belonging to the Silurian period and of amphibious habits. The Luapula River enters the lake by two mouths at the southern end, and leaves at the northern end to join the Congo. The lake was discovered in 1867 by Livingstone. The settlement of Rhodesia was founded on its eastern shore in 1892.

MŒSIA, mē′shĭ-ȧ (Lat., from Gk. *Μοισία*, *Moisia*). An ancient Roman province, bounded by the Danube, and for a short distance by the Savus (Save), on the north, the Black Sea on the east, the mountain chains of Hæmus (Balkan) and Orbelus on the south, and by the range of Scardus and the river Drinus (Drina) on the west. The river Cibrus (Tzibritza) divided it into two parts, the eastern (Mœsia Inferior) corresponding approximately to the present Bulgaria, and the western (Mœsia Superior) to Servia. Its original inhabitants were mostly of Thracian race. Gaulish or Celtic invaders settled in Western Mœsia about B.C. 277, under the name of Scordisci. The Romans first came in contact with the tribes of Mœsia after the conquest of Macedonia. In B.C. 75 C. Scribonius Curio forced his way as far north as the Danube, and gained a victory over the Mœsians, but the country was not completely subjugated till B.C. 29. It was made a Roman province in the reign of Augustus, and flourished for more than two centuries; but as a frontier province it was much exposed to hostile invasions, and required a line of fortresses and stations all along the south bank of the Danube. The chief Roman towns were Viminacium in Mœsia Superior, and Istros, Marcianopolis, and Nicopolis in Mœsia Inferior. In A.D. 250 the Goths made an irruption into the country, and defeated and slew the Roman Emperor Decius in the following year, and about the end of the fourth century it was given up to them by the Emperor Theodosius I. Slavic tribes settled in Mœsia in the sixth and seventh centuries, and toward the close of the seventh century the Bulgarians established their kingdom in the eastern part.

MŒSO-GOTHS, mē′sō-gŏths′. A name given to the Goths who, early in the third century, settled in Lower Mœsia, at the mouth of the Danube. In the fourth century they were converted to Christianity through the efforts of Ulfilas, who translated the Bible into their dialect. (See ULFILAS.) The name Mœso-Goths is applied especially to those Goths who remained in Mœsia after the great migrations at the beginning of the fifth century. See GOTHS.

MOF′FAT, ROBERT (1795-1883). A missionary to South Africa, born in Ormiston, Scotland. In early life he was a gardener, but having made the acquaintance of some Wesleyan ministers, he determined to engage in religious work, and sought to qualify himself to be a missionary. He was accepted by the London Missionary Society, and set apart for the ministry in 1816; was appointed to South Africa, and arrived at Cape Town early in 1817. He proceeded to Namaqualand, and to the kraal of Africaner, a savage chief, who was converted and became an earnest Christian. The country, however, did not prove well adapted for the location of a mission centre; and Moffat, after having explored a considerable region, established the station of Kuruman in 1825. His missionary labors were very successful, and productive of great benefits in the amelioration of the character of the people and the development of civilization. In 1859 a new centre was established among the Matabele at Inajati. The missionary labors of Dr. Moffat and his travels and adventures are described in his book, *Missionary Labors and Scenes in South Africa* (1842). During 1839-43 he visited England and then returned to Africa, and remained there till 1870, when he went back to England and settled in Brixton, London, where he spent the rest of his life. In 1873 he was presented with the sum of £5800 in recognition of his great services. His daughter was the wife of Dr. David Livingstone. Besides the volume already mentioned, Dr. Moffat published *Africa, or Gospel Light Shining in the Midst of Heathen Darkness: A Sermon on Faith* (1841); and *Rivers of Water in Dry Places: An Account of the Introduction of Christianity into South Africa, and of Mr. Moffat's Missionary Labors* (1863). He also translated the Bible into the language of the Bechuanas. The full account of Moffat's life and labors is given in the *Lives of Robert and Mary Moffat*, by their son, John South Moffat (London, 1885; new edition, 1886; popular edition, 1889).

MOGADOR, mŏg-ȧ-dōr′, or SUERA. The principal seaport of Morocco, situated on the Atlantic coast, 120 miles west-southwest of the city of Morocco, of which it is the port (Map: Africa, C 1). It is built on a rocky promontory, surrounded on the land side by sand-dunes. A channel between the town and a neighboring island forms the harbor. Mogador is the best-built town of Morocco, having been planned by a French engineer in 1760. A part of it, the Kasbah or castle, is surrounded by walls, and contains the residences of the Moorish officials and of the protected Jewish and Christian merchants. Most of the Jews, however, live in a separate quarter of the city. The trade of the city is considerable, and is mostly with Great Britain and France. The principal exports are olive oil, almonds, gum arabic, hides, goat skins, and wool. The total value of the trade for 1901 was $2,786,000. Population, about 15,000.

MOGILA, mo-gē′lȧ, or **MOGILAS**, PETER (c.1596-c.1647). A Russian theologian. He was born in Moldavia, of a noble Wallachian family, and was educated at the University of Paris. After serving in the Polish army he went into a monastery at Kiev, and became metropolitan of that see in 1629. He set up a printing-press, and founded an academy and a library, to which he gave his own collection of books. He published a catechism in 1645, and other minor works. His great title to fame rests upon the orthodox *Confession of Faith*, which was drawn up at his instance by the Abbot Kosslovski of Kiev, approved at a provincial synod in

1640, and accepted by the patriarchs of Constantinople, Jerusalem, and Antioch in 1642-43, and by the Synod of Jerusalem in 1672. It has been edited in Greek and Latin by Panageotes (Amsterdam, 1662) and Hoffmann (Leipzig, 1695). A German translation by Frisch appeared at Frankfort in 1727. It is given by Von Kimmell, in *Libri Symbolici Ecclesiæ Orientalis* (Jena, 1843).

MOGOK, mō′gŏk. The capital of the district of Ruby Mines, Upper Burma, India, 65 miles northeast of Mandalay (Map: Burma, C 2). The town lies in a valley at an altitude of 4000 feet above the sea. It is noted for its ruby mines, which are controlled by a European company, which has introduced a complete modern mining installation with electric power furnished by an artificial reservoir supplied by the Yeni stream. Population, estimated, 8000.

MO′GONTI′ACUM. The Roman name of Mainz.

MOGUL, GREAT (more correctly *Mughal*, or *Moghul; Hind. Mughal*, from Mongol *Mongol*, Mongol, from *mong*, to be brave). The popular designation of the Emperor of Delhi, as the impersonation of the powerful empire established in Hindustan by the Mongol conqueror, Baber, the great-grandson of Timur, in 1526. The most important princes of this line, after Baber (the first Great Mogul), were Akbar (1556-1605), Jehangir (1605-27), Shah Jehan (1628-58), and Aurungzebe (1658-1707). In 1803 the Great Mogul, Shah Alam, was deprived of his throne, and in 1827 he surrendered even the appearance of authority, becoming a pensioner of the British. In 1857 Mohammed Bahadur, the last of the dynasty, who had been invested with the imperial dignity at Delhi at the outbreak of the Sepoy Mutiny, was condemned and transported for his complicity in the mutiny to Rangoon, where he died in 1862. Consult Keene, *Fall of the Mughal Empire* (London, 1876).

MOHÁCS, mō′häch. A market town of Hungary, situated on the right bank of the Danube, 25 miles southeast of Fünfkirchen (Map: Hungary, F 4). It is poorly built, but is an important station for steamers, and carries on a considerable trade in wood, coal, and grain. It is noted as the scene of the battle of August 29, 1526, between the Hungarians under Louis II. and the Turks under Solyman the Magnificent. The King and over 20,000 Hungarians and Germans perished, and a large part of Hungary fell under the yoke of Turkey. On August 12, 1687, a second battle was fought at Mohács, in which the Imperialists under Charles of Lorraine defeated the Turks, thereby putting an end to the Turkish dominion in Central Hungary. Population, in 1890, 14,403; in 1900, 15,832.

MO′HAIR (OF. *mouhaire, mouaire, mohere*, Fr. *moire*, from Ar. *mukhayyar*, fabric of goats' hair). The wool of the Angora goat (see GOAT) of Asia Minor and South Africa. Few animals have so beautiful a covering as the fine, soft, silky, long, and always pure white wool of this goat. Each animal at the annual clip in April or May yields from two pounds to four pounds of wool. The fabric *mohair* made from this wool is characterized by its light weight, smooth, dust-shedding surface, and lustre. In pile fabrics, such as plushes and astrakhans, mohair is sometimes used for the pile-warp, while the body is made of cotton. The fabric known as camel's hair is made from the best mohair, which enters into the manufacture of many fabrics. Consult *The Angora Goat* (*Farmers' Bulletin*, No. 137, United States Department of Agriculture, Washington, 1901). See WOOL AND WOOLEN MANUFACTURES.

MOHAM′MED (Ar. *Muhammad*, the Praised; according to Deutsch, Sprenger, and Hirschfeld, the predicted Messiah (cf. Haggai ii. 7). The name given the founder of Islam. He was born about the year A.D. 570, at Mecca, the son of Abd Allah, of the family of Hashim and Amina, of the family of the powerful tribe of the Koreish. His father, a poor merchant, died before or shortly after Mohammed's birth; and his mother, after the fashion of her tribe, gave the child to a Bedouin woman, that she might nurse him in the healthful air of the desert. The infant was subject to fits, which were ascribed to demons, and the nurse brought him back in his third year. Three years afterwards his mother died. His grandfather, Abd al-Muttalib, adopted the boy; and when the grandfather died, Mohammed's uncle, Abu Talib, a man of influence, though poor, took him into his house, and remained his best friend and protector throughout his life. The later tradition has surrounded Mohammed's youth with unreliable legends. What is known is that he at first gained a scanty livelihood by tending the flocks of the Meccans, and that he once or twice accompanied his uncle on his journeys to South Arabia and Syria. In his twenty-fifth year he entered the service of a rich widow named Khadija, who was also of the Koreish, and accompanied her caravans, perhaps as a camel-driver, to the fairs. Soon Khadija, who was much older than he and twice widowed, offered him her hand, which he accepted. She bore him a son, Al-Kasim, and four daughters, Fatima, Zainab, Rukaiya, and Umm Kulthum; and afterwards a second son, whom he called Abd Allah. Both sons died early. Mohammed conducted Khadija's business at Mecca with success, although he spent much time in solitary contemplation. He was esteemed for his integrity and good judgment, and there is nothing of much importance to be told of his life until he reached his fortieth year, and received his first revelation.

The conditions attending his advent as a religious leader are important. By the year 600 Christianity had penetrated Arabia through Syria and Abyssinia. Judaism no less played a prominent part in the peninsula, particularly in the north, which was dotted over with Jewish colonies founded by emigrants after the destruction of Jerusalem, and especially round about Yathrib (Medina). That both Christianity and Judaism had found an entrance into the more southerly part of Arabia is shown by the monotheistic inscriptions found there. Besides these two important religious elements, several sects, remnants of the numerous ancient sects which had sprung up everywhere during the first Christian centuries on the borders of Syria and Babylonia, heightened the religious ferment which, shortly before the time of Mohammed, began to move the minds of the thoughtful. Certain men in the Hedjaz (Waraka, Obaid Allah, Othman, Zaid, and others) began to preach the futility of the ancient paganism, with its star-worship, its pilgrimages and festive ceremonies, its temples and fetishes. It had long ceased to be a living faith, but the mass of the people clung to it as to a sacred inheritance from times immemorial. The unity of God, the 'ancient religion of Abraham,' was the doctrine promulgated by the religious reformers, and many were roused by their words to search for a form of religion which should embody both the traditions of their forefathers and a purer doctrine of the divinity, and turned to Judaism or to Christianity. Mecca, the centre of the pilgrimages of most of the Arabian tribes, where, from times anterior to the city itself, the Kaaba (q.v.), Mount Arafat, the valley of Mina, etc., had been held sacred—the Koreish, Mohammed's tribe, had had supreme care over these sanctuaries since the fifth century—was naturally the scene of much of this reform preaching. Surrounded by such conditions, Mohammed in his fortieth year entered the field as a teacher of a faith independent alike of the old idolatry and of Judaism and Christianity. Like other Oriental prophets, he claimed to have received a divine call, which, he asserted, had come to him in the solitude of the mountain Hira, near Mecca. Gabriel appeared to him, and commanded him to proclaim the name of Allah—that is, to preach the true religion. That Mohammed was no common impostor is clear. The source of his visions is more difficult to determine. By some they have been attributed to his epilepsy. Undoubtedly they were in considerable measure due to his frequent retirement into desert solitudes, which brought on the ecstasies so familiar in Oriental religious enthusiasts. Waraka, one of his wife's relatives, who had embraced Judaism, may have instructed him in Jewish doctrines and told him the stories of the patriarchs and Israel, not as they are related in the Bible, but as in the Midrash. The legendary poetry of the latter seems to have made as deep an impression on Mohammed's poetical mind as the doctrine of the unity of God and the moral teachings of the Old Testament, together with those civil and religious laws, scriptural and oral, which are either contained as germs or fully developed in this record. Christianity exercised less influence upon him. His knowledge of the New Testament was confined to a few apocryphal books; and while he recognized Jesus, whom, together with Moses, he called the greatest prophet next to himself, his notions of the Christian religion and its founder were excessively vague. He told of his mission to Khadija, who stood by him faithfully from the first, to his daughter, his step-son Ali, his favorite slave Zaid, whom he had freed and adopted, and to his trustworthy friend, Abu Bekr. His other relatives rejected his teachings. Abu Lahab, his uncle, called him a fool; and Abu Talib, his uncle and adoptive father, although he protected him, never professed belief in Mohammed's works.

By the fourth year of his mission he had made forty proselytes, chiefly slaves and people from the lower ranks; and now first he claimed to have received a command to come forward publicly as a preacher, and to defy the unbelievers. He vigorously assailed the superstition of the Meccans, and exhorted them to believe in a just but merciful God, eternal, indivisible, almighty, and all-wise, and in himself as chosen, like the prophets of old, to teach mankind how to escape the punishments of hell and attain eternal happiness. He adopted a primitive Oriental doctrine that the mercy of God is to be obtained by prayer, fasting, and almsgiving. He was too practical to challenge the strong belief in the sacredness of the Kaaba and the ceremonies of the pilgrimage, and he made them a part of the new religion; but he unsparingly condemned certain barbarous habits of the Bedouins, such as the killing of their new-born daughters. The prohibition of certain kinds of food also belongs to the first period, when he was still under the influence of Judaism; the prohibition of gambling, usury, etc., probably are of a somewhat later date. Whether he did or did not understand the art of writing and reading is not quite clear; but he employed the services of amanuenses for his Koranic dicta, which at first consisted merely of brief rhymed sentences, in the manner of the ancient Arabic soothsayers. The Meccans looked upon him as a common 'poet' or 'soothsayer,' who was not in his right senses, or simply a liar. Nevertheless, the number of his converts increased until his progress compelled attention; and, finally, fearing for the sacredness of Mecca, the rejection of which would deprive them both of their preëminence and of revenue, they assailed the new prophet and his adherents, who dared "to call their ancient gods idols, and their ancestors fools." The converted slaves and freedmen had to undergo terrible punishment; and others suffered so much at the hands of their own relatives that they were fain to revoke their creed; so that the Prophet himself advised his followers to emigrate to Abyssinia. Mohammed himself yielded so much as to acknowledge the idols he had assailed as intermediate between God and man; but he soon revoked this as an inspiration of Satan, thereby increasing the hatred of his adversaries, who in every way tried to throw ridicule upon him. At last it became necessary that he should be put beyond the reach of his persecutors, and Abu Talib hid him in a fortified castle of his own in the country. Hamza, his uncle, and Omar, formerly a bitter enemy of Mohammed, and who later succeeded Abu Bekr as the third head of Islam, continued in the meantime to spread the new doctrine. The Koreish now demanded that Mohammed should be delivered into their hands; but Abu Talib steadfastly refused to comply with their wishes; a feud thereupon broke out with the family of the Hashimites, and Mohammed and all the members of his family, except, perhaps, Abu Lahab, were excommunicated. After the space of three years, however, the 'peace party' in Mecca brought about a reconciliation, and Mohammed was allowed to return. A great grief befell him at this time—his faithful wife Khadija died, and shortly afterwards his uncle, Abu Talib, and to add to his misery the vicissitudes of his career had reduced him by this time to poverty. A migration to Taif, where he sought to improve his position, proved a failure; it was with great difficulty that he escaped with his life. Shortly after his return from Taif he married Sauda, and in the course of his later life so increased the number of his wives that at his death he left nine, of whom Ayesha, the daughter of Abu Bekr, and Hafsa, the daughter of Omar, are best known.

In the course of time Mohammed succeeded in converting several men from Yathrib, who came to Mecca on pilgrimage. The inhabitants of that city had long been accustomed to hear from the numerous Jews living there the words 'Revelation,' 'Prophecy,' 'God's Word,' 'Messiah'—to the Meccans mere sounds without meaning. In Yathrib the new faith took a strong hold. The next pilgrimage brought twelve, and the third more than seventy, adherents of the new faith from that city; and with these Mohammed entered into a close alliance. He now conceived the plan of seeking refuge in the friendly city, and in the year 622 (about twelve years after entering upon his work), after encouraging about 150 of his adherents to migrate to Yathrib, he fled thither, accompanied by Abu Bekr. The fugitives reached their destination not without danger, and were enthusiastically received. Thenceforth Yathrib was known as *Madinat al-Nabi* (City of the Prophet), or Medina. The flight (the Hejira) is one of the great events of Islam and the starting-point of the Mohammedan calendar. See HEJIRA.

The Hejira was also a turning-point in the career of Mohammed. Previously he had been despised as a madman or impostor; now he became judge, lawgiver, and ruler of Medina, and of two powerful Arabian tribes. His first care was to organize his forms of worship; his next to proselytize the numerous Jews who inhabited the city, to whom, besides having received their principal dogmas into his religion, he made many important concessions in the outer observances of Islam, and concluded alliances with many of their tribes; but the Jews resisted conversion. They ridiculed his pretensions, and by their constant taunts made him their bitter adversary up to the hour of his death. The most important act in the first year of the Hejira was his permission to go to war with the enemies of Islam in the name of God, a kind of manifesto chiefly directed against the Meccans. Not being able at first to fight his enemies in the open field, he endeavored to weaken their power by attacking the caravans of the Koreish on their way to Syria. He interfered materially with their trade, concluded alliances with the adjoining Bedouin tribes, and at last the signal for open warfare was given. A battle between 314 Moslems and about 600 Meccans was fought at Bedr, in the second year of the Hejira; the former gained the victory, and made many prisoners. A great number of adventurers soon flocked to Mohammed's colors, and he made successful expeditions against the Koreish and the Jewish tribes, chiefly the Bani Kainuka, whose fortified castle he took after a long siege. He sustained heavy losses, and was himself wounded in the battle near Ohod, but his power increased so rapidly that in the sixth year of the Hejira he was able to proclaim a public pilgrimage to Mecca. Although the Meccans did not allow this to be carried out, he gained the still greater advantage that they concluded a formal peace with him, and thus recognized him as an equal power and belligerent. He now sent missionaries all over Arabia and beyond the frontiers without hindrance; and in the following year celebrated the pilgrimage for three days undisturbed at Mecca. Soon afterwards he narrowly escaped death from poisoning at the hands of a Jewess, one of whose relatives had been killed while fighting against him. His missionaries went to Khosru II., of Persia, to the Byzantine Emperor Heraclius, to the King of Abyssinia, and to the Governor of Egypt, and the chiefs of several Arabic tribes received the new gospel; but the King of Persia, and Amru, the Ghassanide, rejected his proposals, and Amru had the messenger executed. This was the cause of the first war between the Christians and the Moslems, in which the latter were beaten with great loss by Amru. The Meccans took the occasion to commit depredations upon certain allies of Mohammed, with the result that the Prophet marched upon the city, captured it without a blow, and was recognized as ruler and prophet. This completed the triumph of the new faith in Arabia. Mohammed now undertook to destroy all traces of idolatry in Mecca, and to establish the laws and ceremonies of his true faith; but he soon learned of a new attack by a considerable force of Arab tribes, gathered near Taif (630). Again he was victorious, and his influence and reputation correspondingly expanded. Deputations came to do homage to him in the name of the various tribes, either as the messenger of God or at least as the Prince of Arabia, and the year 9 of the Hejira was therefore called the Year of the Deputations. He made extensive preparations for a war against the Eastern Empire, but was not able to assemble forces enough to carry out his plan. Toward the end of the tenth year of the Hejira he undertook, at the head of at least 40,000 Moslems, his last solemn pilgrimage to Mecca, and there (on Mount Arafat) instructed them in the important laws and ordinances, chiefly of the pilgrimage; and the ceremonies observed by him on that occasion were fixed for all time. (See HAJJ.) He exhorted his believers to righteousness and piety, recommended them to protect the weak, the poor, and women, and to abstain from usury. Soon after his return from Mecca he became ill and began to decline rapidly. He took part in public prayers as long as he could. At last, realizing the near approach of death, he preached to the people, recommending Abu Bekr and Usama, the son of Zaid, for the leadership of the army. He asked whether he had wronged any one, read passages from the Koran, and exhorted the people to peace among themselves, and to strict obedience to the tenets of the faith. A few days afterwards he died in the arms of Ayesha, his favorite wife, on the 12th of the third month, in the year 11 of the Hejira (June 8, 632). His death caused intense excitement, and Omar tried to persuade the people that he was still alive. But Abu Bekr said to the assembled multitude: "Whoever among you has served Mohammed, let him know that Mohammed is dead; but he who has served the God of Mohammed, let him continue in His service, for He is still alive, and never dies." He had made no provision for a successor, and the quarrel over the leadership, which not long after divided the Moslem world into two warring sects, began before Mohammed's body was buried. Abu Bekr finally received the homage of the principal Moslems at Medina. Mohammed was buried in the night in the house of Ayesha, where he had died, and which afterwards became part of the adjoining mosque.

Mohammed I. was not an idealist, and his religion was adapted to his age and surroundings. It has been said that he gave the people as much religion as he thought they could take care of, judging by his knowledge of them and of his own tendencies. He was at times deceitful, cunning, even revengeful and cowardly, and much addicted to sensuality. But he is praised for his amiability, his faithfulness toward friends, his tenderness toward his family, his frequent readiness to forgive an enemy, and the extreme simplicity of his domestic life. He lived, when already in full power, in simple quarters, mended his own clothes, and freed all his slaves. He was much inclined to melancholy and nervous sensitiveness. His mind contained a strange mixture of truth and error, of right and wrong. Entering the field as the foe of the old superstitions, he yet clung to superstitious beliefs current among his people. He believed in jinns, omens, charms, and dreams. However much the religion of Islam may, rightly or wrongly, be considered the bane and cause of the decay of Eastern States and nations in our day, it must, in the first place, not be forgotten that it is not necessarily Islam which has caused the corruption, as indeed its ethics are for the most part of the higher order; and in the second place, that Mohammed is not to be made responsible for all the errors of his successors. Take him all in all, the history of humanity has seen few more earnest and sincere 'prophets,' using the word prophet in the true sense of one irresistibly impelled by an inner power to admonish, and to teach, and to utter austere and sublime truths, the full purport of which is often unknown to himself.

Mohammed is described as of middle height, lean, but broad-shouldered, with slightly curling hair about a well-developed head. His eyes, overhung with thick lashes, were large and coal-black; his nose, large and slightly bent, was well formed. A long beard added to the dignity of his appearance. A black mole between his shoulders became known among the faithful as the 'seal of prophecy.'

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MOHAMMED. The name of four sultans of Turkey.—Mohammed I. was the son of Sultan Bajazet I., who was defeated and captured by Timur in 1402 and died in captivity in 1403. Mohammed I., after sharing the supreme power with his brothers, became sole Sultan in 1413. He reigned until 1421. He consolidated the Empire, which had suffered from the inroad of Timur.—Mohammed II. (c.1430-81) was Sultan from 1451 to 1481. He was surnamed *El-Ghazi*, i.e. conqueror (of infidels), and also *Buyuk*, i.e. the Great. He was born at Adrianople, and succeeded his father, Amurath II. His first acts were the murder of his brothers and the suppression of a rebellion in Karamania. Having thus secured himself on the throne, he bent all his energies in order to effect the capture of Constantinople. This city was now the sole remnant of the once mighty empire of the Cæsars, and after more than a year spent in preparations, Mohammed commenced the siege on April 6, 1453, with an army of about 70,000 and a fleet of 320 vessels. The Greeks, aided by gallant bands under Gian Giustiniani, a noble Genoese, long maintained an obstinate resistance. On the morning of May 29th the Turks made a combined attack by land and sea without success; but the retirement from the ramparts of Giustiniani, who had been severely wounded, caused a panic among his followers, and the simultaneous charge of a chosen body of Janizaries, with Mohammed himself at their head, proved irresistible. The brave Emperor, Constantine XI., died in the breach, and the Turks poured in over his corpse to plunder and devastate his capital. Mohammed now transferred the seat of his government to Constantinople, and sought to gain the good will of the inhabitants by promising them a free exercise of their religion. After achieving this great conquest, he made formidable preparations for the invasion of Hungary. Belgrade was the first point of attack; but John Hunyady (q.v.) compelled him to raise the siege (1456). Soon after this Mohammed became master of the Morea, annexed Servia, and conquered the Empire of Trebizond, an offshoot of the Byzantine Empire. He then turned his arms against the Albanians, whose leader, Scanderbeg, long defied the Turkish power. Scanderbeg died in 1468, and ten years later the subjugation of Albania was completed. In 1470 Mohammed conquered Negropont from the Venetians. In 1475 he made the Khan of the Crimea tributary, and at the same time deprived the Genoese of Kaffa. In 1480, however, he was repulsed by the Knights of Saint John from Rhodes. In the same year he captured Otranto, in Italy, the last achievement of his reign. Mohammed was possessed of great abilities; he was brave, enterprising, and sagacious; he is said to have spoken five languages fluently, and to have been well versed in geography, ancient history, natural sciences, and the fine arts. But the brilliancy of his career, and the occasional generosity and even magnanimity which he showed, cannot obliterate the recollection of those acts of cruelty and treachery which have justly branded him as the most ruthless tyrant of the House of Osman.—Mohammed III. (1566-1603) was Sultan from 1595 to 1603. He succeeded his father and at once murdered his nineteen brothers. He waged war against Austria without success.—Mohammed IV. (1641-91) was Sultan from 1648 to 1687. He came to the throne when only seven years of age, succeeding his father, Ibrahim, who had been murdered by the Janizaries. The real rulers were the Kiuprili (q.v.). The reign of Mohammed IV. witnessed the collapse of Turkish power in Europe. The great onslaught upon the House of Austria in 1683 resulted in the defeat of Kara Mustapha (q.v.) before Vienna. When other disasters followed, Mohammed was dethroned in 1687. He died in prison.

MOHAMMEDAN ART. The art produced by the nations and in the countries professing the religion of Islam, from the seventh century A.D. to the present time. The most flourishing period was between the ninth and fourteenth centuries, though in certain places, such as Constantinople, Cairo, and India, the golden age lasted later. The homes of this art have been mainly Syria, Persia, Egypt, North Africa, Spain, Asia Minor, India, Sicily, and Constantinople. In a large part of this region it succeeded Byzantine art, under the influence of which it long remained, while also inheriting local peculiarities of earlier Persian and Coptic (Egyptian) art. The Arabs, founders and propagators of Mohammedanism, possessed none of the arts (see ARABIAN ART), and consequently a period of at least two centuries passed before the amalgamation of converted peoples, after tentative efforts to adapt preceding artistic forms, created the special types of Mohammedan art. This work was done especially in Syria, Persia, and Egypt, though North Africa and Spain also contributed their share. Byzantine, Persian, and Coptic artists, even if Christians, were employed at first; but finally all the branches were practiced by Mohammedans. The religious prejudice against the reproduction of the human figure in art prevented any development in the large fields of figured sculpture and painting, forcing the artist into decorative work in pure line and color, in which he became the most consummate master in the whole history of art. Surface ornamentation became the keynote to this art, whether displayed on broad architectural surfaces or on the smallest article of furniture or decoration. This ornamentation, like the forms of architecture themselves, was at first derived from Byzantine models, as in the case of the mosques of Cordova, Damascus, Jerusalem, and the earliest Cairo work, with a large element of stiff floral patterns, many of classic origin. But gradually the invasion of purely geometrical forms almost extinguished the flora, and the system was evolved and completed in the eleventh century, which is a combination of pure geometric and arabesque designs, used with ever-increasing profusion until all surfaces were covered with it.

ARCHITECTURE.

Commencing about A.D. 700, Mohammedan architecture runs parallel to the history of later Byzantine architecture in the East and Romanesque and Gothic in the West. We must study the origins of this architectural style in the mosques (q.v.). As the Mohammedans in the countries which they conquered found themselves surrounded by magnificent monuments of all the past civilizations of the East, it was natural that they should turn to them for the type of their mosques. The earliest mosque of any pretension was that of Amru (about A.D. 641) at Fostat, which consecrated the Arab conquest of Egypt. It served as a type for two centuries. Its colonnades around an open court seem to combine the plan of the atrium of a Christian basilica and the hypostyle hall of an Egyptian temple. The columns were taken from churches and arranged in numerous rows, surmounted by low-stilted arches, on which rested a flat, wooden ceiling. There appears to have been no æsthetic beauty and no decoration in this perfectly plain brick structure. It was in Syria, where the Ommiad caliphs had their capital at Damascus, that the first artistic monuments were erected under Abd al-Malak and his son Al-Walid, about A.D. 700. They spent immense sums on three buildings which still remain: the Mosque of Damascus (705), reputed the most sumptuous monument of the Mohammedan world, and built to surpass the works of Christian architecture in Syria; the Al-Aksa Mosque, and the Dome of the Rock, commonly called 'Mosque of Omar' (691), both in Jerusalem, built to rival the Church of the Holy Sepulchre. The Al-Aksa was of a different type from the Egyptian mosques, and more like a hall or a Christian church. The principal side of its court, called the Jami, containing the Kiblah and pulpit (mimbar), had a forest of 280 columns in 20 rows, and in the centre, opposite the Kiblah, rose a dome. On the other hand, the great Damascus mosque was of the Egyptian type of the Mosque of Amru, the type of the atrium, and had only a triple line of columns on the *Jami* (main hall) side, and a single row on the others. In both mosques the columns now support pointed arches. The courts were filled with secondary monuments, usually in the shape of domed chapels or fountains. The most important of these is the Dome of the Rock in the court of the Al-Aksa Mosque. It followed the Byzantine domical type; its central dome, 112 feet high, is supported on four square piers with intermediate columns, and is surrounded by two concentric aisles with eight piers and sixteen columns, on an octagonal plan. It was erected in order to rival in splendor and sacredness the Church of the Holy Sepulchre.

The next important building in the Mohammedan world is the great mosque at Cordova, the capital of the new Kingdom of Spain, founded in 786. The main hall of this mosque was the largest known, measuring 534 × 387 feet, and containing 856 columns in 19 aisles. Its wooden ceiling, notwithstanding this great length, is 30 feet high. The intricate effect of the maze of columns is increased by there being no central nave as in Christian churches and by the unique arrangement of two stories of superposed horseshoe arches. Here one sees the alternation of white and black marbles, which later became so characteristic of the Italian Tuscan school, and an early form of stiff foliated arabesque in small separate compartments. The eighth century and the following witness a flowering of Mohammedan architecture in all provinces and in all classes of buildings: fountains, baths, aqueducts, palaces, khans, bridges, caravanserais, minarets, mausoleums, monasteries and colleges, bazaars and city gates, hospitals, cloisters. A large part of the revenues of the State was devoted to public works. Bagdad was built in 755 and became the capital. Great buildings were erected in the cities of North Africa, in Kairwan (mosque in 837), Tunis (mosque and arsenal in 742). The wonderful buildings of Bagdad, so vividly described but now all destroyed, probably gave the keynote to the new art. The relief ornaments at Cordova were echoes from Byzantium; so were the mosaics and marbles, as well as the domes of the monuments of Damascus and Jerusalem. But gradually Persian preponderance makes itself felt through the dynasty of the Abbassides with Bagdad as centre. The wooden roof is entirely abandoned for the dome. A purely Oriental system of ornament is invented, both geometric and arabesque. The wall surfaces, which had hitherto been left plain or ornamented in Byzantine fashion, are covered with intricate stuccoes and faïence tiles, inherited from ancient Persia and Babylonia.

EGYPT. Egypt remained for a while outside of this movement, probably because its architecture was still in the hands of native Christian Copts; no domes were used and brick had not yet given place to stone. The most famous mosque of this age was that built by Ibn Tulun when he declared Egypt's independence (876 to 879). As Ibn Tulun objected to destroying so many Christian churches to get the 300 columns required for the new mosque, a Christian Coptic architect offered to build it without using a single column. It is the first mosque with piers in place of columns. This mosque is of the cloistered type, with two aisles on three sides and five aisles on the Jami side; formed of 160 rectangular piers supporting broad stilted pointed arches, such as the Copts had always employed. The entire construction was of burnt bricks stuccoed on both sides, the stucco being decorated with stiff arabesques in relief of the knop and flower pattern derived from ancient Oriental or Greek models. A flat wooden roof rested on the walls not far above the crown of the arches. The wall inclosing the mosque forms a court about 300 feet square. All the brilliant revetment and coloring have disappeared. Still this remains the finest example of the early type of mosque. It also has a couple of the earliest minarets, built, as were all the early ones, of brick. There is a small dome in front of the *Mihrab*, as in the earlier Syrian and Palestinian mosques.

Under another dynasty, another great mosque was built, the El-Azhar or University mosque, in the newly founded capital, Cairo, begun in 969. Here the same cloistered plan was used, but the churches were despoiled of columns for it, in place of using piers. When, in 996, the mosque of El-Hakim was built, however, the quadrangular pier was used as in the mosque of Tulun. But its proportions are far slenderer and higher.

It was about this time (c.1000) that Egyptian architects adopted the dome. Cairo's great characteristic is its multitude of domes. They were used mainly over funerary chapels. There now arose an important class of funerary mosques attached to royal tombs. The Egyptian rulers of the Fatimite dynasty displaced the caliphs of Bagdad as principal patrons of Mohammedan art, and the monuments of Syria, North Africa, and Sicily were inspired from Egypt during the eleventh and twelfth centuries. Undoubtedly it was the thorough study and application of geometry by Arab writers of the schools of Bagdad and Cairo that made possible not only the scientific architecture of this period, but the wonderful system of geometrical ornament that became so much a part of it. A consistent style was finally developed, which spread over the entire Mohammedan world from Spain and Morocco to Persia, and from Asia Minor to India. The minaret towers were multiplied and began to lose their early heaviness (see MINARET), take on great variety of forms, and, being built of stone as well as brick, they were better adapted to a richer ornamentation. The heavy walls were crowned with delicate battlements.

Most characteristic was the invention of the stalactite pendentive, on the basis of spherical polygons, as a unique constructive and decorative bond between the square plan and the circular dome. Often this transition was assisted by a polygonal dome. The historical tendency was ever to raise the domes higher and make them more pointed. Their numbers multiplied in the thirteenth and following centuries. The cemeteries of Cairo are full of ruined but beautiful mediæval domical tombs. The mausoleum mosques of Sultans Hasan, Barkuk, Kait Bey, Kalaun, El-Ghuri are the finest examples in Cairo of the domical style. The use of domes over simple sepulchral chambers had been easy, but its application to the mosque was difficult. Beginning with the tomb of Esh-Shafi'y in 1211, passing through the stage of the tomb mosque of Es-Salih in 1249, complete success was realized, under the impetus given by the Mameluke sultans in the mosque of Hasan in 1356, where the plan is a Greek cross centring about an open court, and with the domed chapel beyond the *mihrab*. This magnificent building was regarded as unequaled in Mohammedan lands. Its proportions are grandiose; the tunnel vaults over the arms of its cross are bold. Stone and marble have definitely replaced brick. During this time, however, the type of the old cloistered mosque had been continued in buildings not connected with tombs, such as those of Bibars (1268), of En-Nasir (1318), Kusun (1329), El-Maridany (1339). The system of stalactite construction passed from pendentives to corbels, and was used to fill up gaps between all different planes. Like most of Mohammedan work, it conceals under apparent irregularity and freedom, not to say vagrant fancy, the most scientific accuracy of form. The wonderful development of decorative work at this time in mosaic, faïence, wood carving, marble inlay, metal, etc., is noticed later in this article and in special articles.

SPAIN. Meanwhile, other Mohammedan lands had been following the example of Egypt, but with the exception of Spain their architecture has been neglected by students. The Arabo-Byzantine style of the monuments of Cordova had ruled for about two centuries; a national Mohammedan style was formed shortly before 1000, as in Egypt, as shown in monuments of Tarragona, Segovia, and especially Toledo and Seville. The cusped and horseshoe arches became very decorative. Christian influence is still shown in mosques covered entirely by domes or roofs, like churches. The famous Giralda tower at Seville belongs to this middle style, while the Alcazars, or Moorish palaces, at Seville, Segovia, and Malaga usher in the style of the Alhambra at Granada. When in 1238 Granada became the capital of the Moors in Spain, its monuments expressed the development of native arts for the ensuing century. Here is found the richest extant combination of the different kinds of surface decoration in which Mohammedan art excelled, however faulty it was in composition, construction, and form. Arabesque and geometrical ornament, stucco and faïence, mosaic and marble inlay cover every inch of space, and stalactites abound as well as open-work tracery. The round horseshoe arch yields to the flat pointed, stilted, and slightly incurving arch. But though so rich, the ornament of the Alhambra, being molded, lacks the life and flexibility of the Egyptian work of the same kind, which is done by hand in the soft plaster. See ALHAMBRA.

PERSIA. The Turks and Mongols made such havoc of the earlier monuments of Mohammedan Persia, the region of Bagdad and the great northern States of Bokhara and Samarkand, that nothing has survived in these regions belonging to the periods thus far mentioned. But the fourteenth and fifteenth centuries, while they show a style certainly in full decadence, are interesting because we can study it in such a variety of forms in different countries. The Tatars and Turks give their version of it, adapted both from Persia, and Armenia, and Georgia, in the buildings of the thirteenth and fourteenth centuries at Sivas, Kaisarieh, Konieh, Nigdeh, Nicæa, Brusa, etc. The contemporary buildings in Persia, at Tabriz, Sultanieh, Teheran, and especially Ispahan (the Meidan, mosque of Mesjid Shah, Bazar, and Medresseh of Hosein Shah), scattered over a period of about three centuries, shows that Persian art was never led to abandon flowing lines for angular and geometrical designs; even its arabesques are more continuous and soft, and it hardly ever resorted to stalactite design. The form of its domes also varied essentially from those elsewhere. It is usually flat-sided and pointed on the interior and bulbous outside, built of brick, which was almost entirely used in place of stone. The minarets have the late circular shape and are exceedingly slender, being topped by small domes. Another peculiarity is the façade of various classes of buildings formed of high recessed pointed arches of the same peculiar flat-sided outline as the domes, and reminding distantly of such English screen façades as Lincoln and Peterborough.

India. At the same time Mohammedan art received a great impetus in India through the establishment of the Mogul supremacy (1526), and produced a style that was in many ways the most artistic and the grandest in the whole sphere of Mohammedan architecture. Buildings like the mosque and tomb of Mahmud at Bijapur, the mosques at Fathipur, Sikhri, Agra, and Delhi, the palace of Akbar at Allahabad, and the Taj Mahal at Agra are masterpieces. There is undoubtedly a dependence on the art of Persia in the shape of the pointed arches and domes, and in the niche façades, as well as a knowledge of the Turkish adaptation of the Saint Sophia type, but these Indian architects showed a surpassing sense of composition and effectiveness, never allowing, as the architects of Egypt and Spain so often did, the love of detail to become paramount.

Finally, when the Turks captured Constantinople (1453) they adopted the Byzantine style and specifically that of Saint Sophia, which became their chief mosque. They never knew the old type of cloistered mosque, but only great domical, fully vaulted interiors. The architects they employed were Christian Greeks. Their mosques have ever since been mere repetitions of Saint Sophia on a smaller scale. But some of them have great merit of dignity and composition and some originality in the exterior treatment; for example, the mosque of Mohammed II., which has four semi-domes grouped around the central one, but especially the Sulaimaniyyah mosque (1553). These alternating of white and black marbles in the interior voussoirs, the simple brilliancy of the surfaces gives quite a different effect from a Byzantine interior. For details regarding special classes of buildings and the delightful domestic architecture of the Moslems, see special articles, such as Caravanserai; Khan; Fountain; Bazar; Tekiye; Minaret; Mosque.

MINOR ARTS.

Decoration. The sculpture of the Mohammedans was purely decorative, becoming richer as the Middle Ages advanced. In the earlier stages it partook somewhat of Byzantine design, as in the mosque of Cordova and in early Egyptian and Syrian mosques. But it was then scanty and rather heavy. When the schools became more differentiated in the eleventh century, into the Persian naturalistic, figured and floral; the Syrian schematic, animal and floral; and the Egyptian, geometric and stiff floral schools, ornament began to spread over the entire building. Even the exterior surfaces of domes and walls were covered with a lacework cut in stone or stucco. Color was given by marble mosaics in Egypt, or in Syria and Persia by brilliantly colored tiles. The Mosque of Omar is an early, the Alhambra at Granada a mediæval, and the Mosque of Ispahan a late example. The tiles became an Oriental specialty, and were imitated in Spain until recently. See Azulejo.

Woodwork and Ivory. In no style of art has so varied an artistic use been made of wood. Where other styles have used stone and marble we find wood used, for instance, in carved ceilings, windows, pulpits, lecterns, screens, latticework, doors, balconies, parapets, tomb-casings. In the richest pieces ivory is sometimes used in connection with wood, being either inlaid in carved panels or being set as panels in wooden frames. Wood was used not only for the furniture of the private house, but for that of the mosque, such as cupboards, tables, and the classes of work mentioned above. Some of the best examples of floral design in Egypt are preserved in wood carvings. The most magnificent pieces are probably the pulpits, such as that of Kait Bey in South Kensington Museum, and the panels from those of Meridany, Lagin, and Kusun in the same museum. The panels of the hospital of Kalaun show a Persian style of figures and animals, rather than the floral and geometrical patterns. The reading-platform of the Mosque of Kait Bey is a fine instance of marquetry and ivory, largely in polygonal design. Ebony and ivory were often combined in mosaic-like patterns, sometimes framed in strips of metal, as in jewel cases and other boxes. But the most extensive of all the wood carvings and inlaid work were the ceilings of mosques and palaces, as in those of Kait Bey, El-Mogyed, and El-Bordeini.

Metal Work. The Persians, Syrians, and Egyptians were skillful workers in metal. Perhaps the earliest centre was in Mesopotamia, at Mosul. Brass, bronze, and copper were chiefly used. While chiseled bronze and repoussé copper seem the earliest processes, the works came to be often inlaid with silver and sometimes with gold by different processes: (1) by incrusting a thread of gold or silver into an undercut groove; (2) by inclosing a metal strip or plate between raised walls; (3) by pressing a thin leaf of metal into stipple marks. The entire metal surface was excavated according to the elaborate design, the edges undercut, the threads or plates of gold or silver inserted and burnished, and then the surfaces chased with all the details that could not be given by the general outlines. Animals, birds, human figures, hunting scenes, feasting scenes, and other genre subjects, as well as floral designs, characterize more especially the Persian and Syrian works, while arabesques and geometric patterns predominate in Egypt. Inscriptions are made almost always to contribute to the decorative effect. The Mesopotamian and Persian schools, though undoubtedly of much earlier origin, gained new life in the twelfth century, when Tatar and Turkish influence gave to artists far greater freedom in the use of the human figure. The school of Damascus was the most famous centre at the time of the Crusades, giving its name to the entire process of damascening or inlaying. The Egyptian school, with its centre at Cairo, flourished somewhat later, under the Mameluke rulers of the fourteenth century. The objects made wholly of gold and silver have almost entirely disappeared, but the inventories of the palace of the rulers of Bagdad and Cairo prove the existence of many thousands of such objects—vases, boxes, mirrors, stands, lamps, trays, coffers, figures of birds and animals, dishes, cups, flagons, bowls. Of these classes many objects still remain in the baser metals, either plain or damascened: particularly interesting are the hanging lamps, lanterns, and chandeliers, the stands and tables, mosque doors, perfume-burners, ewers, boxes (especially writing boxes), trays, and bowls. It is in the magnificent arms and armor that the metal-workers showed the supremest mastery, using all the processes, chiseling, damascening, enameling, jewel-setting to produce the masterpieces in the shape of poniards, swords, and yataghans, helmets, breastplates, and lances, stirrups, bits, and the rest of the military equipment and caparison, including, in later times, muskets, pistols, and halberds. In this special field the school of Syria (Damascus) reigned supreme, manufacturing the best pieces for the entire Mohammedan world. The Persian style was more ornate, standing midway between Syrian simplicity and Indian gorgeousness. See INDIAN ART.

GLASS. It is in Egypt that stained-glass windows were made, rivaling on a small scale the cathedral windows of the Gothic period. Here, as in every other branch, there is originality of methods. The windows are small, forming usually an oblong of less than two by three feet. The frame is of wood and the process consists of pouring a bed of plaster into this frame, letting it set, and then cutting out the design, leaving only narrow rims or bands of plaster to hold the glass. The design is extremely elaborate, with a central *motif*, usually of flowers, plants, and trees: the bits of stained glass cut to fit over the openings are laid on and fastened with fresh plaster. The openings are often slanting toward the street and the plaster artistically finished on the outside. The effect on the inside is similar to mosaic. The commonest designs are: pinks, and other flowers growing from a vase; cypress with entwined flower-stem; scroll of flowers and leaves; kiosk between buds or cypresses; one or two cypresses with flowers. Earlier than these are the more purely geometric designs, as in the tomb of Bibars at Cairo. Of course the plaster is far more fragile than lead as a frame, and the windows easily disintegrate and cannot be made large. Such windows (called *kamariye*) are found not merely in mosques, but in the *meshrabiyeh* or latticed projecting windows of private houses. In harmony and quiet depth of color they surpass their more colossal Gothic counterparts.

A different kind of artistic glass is exemplified in the mosque lamps of enameled and painted glass. It is true that there is a great quantity of exquisite glass, both white and colored, showing in Persia; Syria and Egypt still carried on in the Middle Ages the old Egyptian and Phœnician industry, with exquisite understanding of forms and tones, furnishing models to Venice; but it is in the mosque lamps that the glass-workers certainly enter the domain of fine art. Here the colors are enameled on a gilt ground and the designs are similar to those of metal work, with greater prominence given to inscriptions; cobalt, red, pale green, and white are the principal enamels and the decoration is in bands with medallions. The most beautiful examples are works of the fourteenth century from the mosques of Cairo. The mellow light shining through the enamels and glass of these suspended lamps was of an exquisite effect.

ILLUMINATION OF MANUSCRIPTS. The aversion to the representation of the human figure hindered the development of the art of illumination —a branch of art not cultivated extensively until the later Middle Ages. It is true that figured compositions were not unknown either to the Egyptian or the Syrian artists, but it was the Persian school, under Tatar and Mongol influences, which first boldly attempted scenes of daily life and of history. There are many manuscripts of the Koran belonging to the other schools, whose first and last pages are a mass of geometric and floral ornament. The finest collection of Egyptian manuscripts, executed mainly for the sultans of the fourteenth and fifteenth centuries, is that of the Cairo Museum rescued from the mosques, such as those of Sultans Kalaun, Shaban, and Barkuk. Sometimes the flowers, arabesques, and polygons are in colors on a gold ground, sometimes in gold on a ground of plain blue or red or of shaded and grouped colors. The finest of these illuminated pages surpass anything done by Christian artists in richness, in exquisite coloring, and in fineness of execution. They are executed not on vellum, but on fine Egyptian cream-colored or reddish paper. The Syrian and Persian schools avoided the geometric ornamentation, and their floral designs were freer and more naturalistic. The Persian fondness for legend and poetry shows itself in the rich illumination of poems and stories which gave occasion for charming genre scenes and vignettes, and the artist's fancy sprinkled animals and birds in riotous confusion in a background of beautiful garden scenes.

It is in these figured illuminations alone that we can study the style of the fresco-painters of Mohammedanism, whose works have disappeared. It is plain from native writers that the Caliphs of Bagdad, the rulers of Egypt and Spain, at different times lavishly patronized figure painters and that such works were not confined to the Persian school. It is interesting to note the similarity between Persian and Chinese painted design and to make the Mongols the intermediaries between the two schools. While successful in coloring, the primitive conception of composition and figure, and the awkward conventionalities, make the Persian school less successful in its sphere than the purely decorative Egyptian. The most famous Persian illuminators belong to the sixteenth century, such as Fabrizi, Jehangir, Bukhari, and Bahzada. The latter's works are masterly in composition and correspond to the Italian Giottesque masters. The last great master was Mari, a naturalist from India.

TEXTILE FABRICS. The Far East had always been famous for its artistic stuffs, embroideries, tapestries, rugs. It was as successors to the arts of Persia and Babylon that the Mohammedans developed this branch, though Bagdad, Damascus, Cairo, and Cordova all took part and the tribes and villages rivaled with the large cities. Nothing became more characteristic of the East, nothing influenced the West more strongly, through constant importation and the contact of the Crusaders. The *haute-lisse* tapestry, after a method long lost in Europe, was in current use. The same difference finally appeared in the designs here as in other branches: geometrical and set patterns being more common in Egypt; free floral designs being used in Persia. The few known Persian rugs of as early a period as the thirteenth and fourteenth centuries are now valued at many thousand dollars ($10,000 to $40,000), and a study of their design shows an almost incalculable variety of native flowers naturalistically reproduced. The Syrian school had much in common with the Byzantine and, as usual, occupied a middle position, with medallions in a stiff floral ground containing heraldic animals or birds. There were in every Mohammedan country royal manufactories whose products were entirely reserved for the Court and sovereign; the standards, baldachins, tents, royal robes, hangings, housings, and rugs were all of a magnificence unknown to the ruder West and unsurpassed at any time. The known specimens date no earlier than the eleventh century and the art decayed before the sixteenth century.

INFLUENCE ON EUROPE. Sicily, Southern Italy, Venice, and Spain were affected by the Mohammedan arts during the Middle Ages, and even as late as the Renaissance. Hence the use of the pointed and the horseshoe arch in many parts of Southern Europe. The cosmopolitan culture of the Norman Kings of Sicily had a large Mohammedan element. The palaces of the kings—such as La Kuba, La Liza, Favara, and Baida—were imitated from those of the Eastern Emirs and Sultans: San Giovanni degli Eremiti seems an importation from Cairo. Mohammedan artists executed the wonderful stalactite ceiling in carved wood and probably also the geometric mosaics in the Cappella Palatina at Palermo. The famous Ruffolo Palace at Ravello, and several cloisters (e.g. at Amalfi), show the spread of Eastern architectural forms in Campania. It is interesting to see how in most cases where there are traces of Byzantine art, there are also signs of Mohammedan influence, and vice versa. This is nowhere more evident than in Venice, where both forms of Oriental art were so prominent. Here quite a flourishing school of Mohammedan metalworkers was established, existing as late as the sixteenth century, when Mahmud El-Kurdi signed some exquisite pieces. The Italian artists who imitated them called themselves workers *all' agemina*, 'in the Persian style,' and even Cellini confesses to have copied Oriental arms. In fact, the Renaissance metal-workers of the sixteenth century both in Italy and France owed more than their mediæval predecessors to Oriental design. Even more widespread and radical was the use and imitation in Europe of Oriental stuffs and fabrics, partly Byzantine, but especially Mohammedan, wonderful not merely for beauty of material, but for the figures and patterns woven or embroidered. The imported tents, baldachins, hangings, carpets, and the like, furnished the models for the European ateliers in Sicily, Rome, Venice, Belgium, and France.

BIBLIOGRAPHY. G. Le Bon, *La civilisation des Arabes* (Paris, 1883), contains the most suggestive general sketch of the Mohammedan arts, with numerous illustrations; Gayet, in *L'art persan* (Paris, 1895) and *L'art arabe* (ib., 1893), describes the various arts in Mohammedan Persia and Egypt, in hand-book form. A more thorough book of the same type is Stanley Lane-Poole, *The Art of the Saracens in Egypt* (London, 1886). Franz-Pascha, *Die Baukunst des Islam* (Darmstadt, 1896), is a general historical and critical treatise on Mohammedan architecture and decorative details, with description of the different classes of buildings. For the designs and patterns used in decoration the best text-book remains J. Bourgoin, *Les arts arabes* (Paris, 1868-70) and *Précis de l'art arabe* (ib., 1889). In Fergusson's *History of Architecture* (2d ed., London, 1873-76), considerable space, with not very scientific treatment, is given to the Mohammedan styles; see also his *Indian and Eastern Architecture* (London, 1876); M. von Berchem, in his *Notes d'archéologie arabe* (in various years of the *Journal asiatique*), is laying a good historic basis for a historic treatment and making known new monuments. The most sumptuous illustrative plates are still for Egypt in Prissè d'Avennes, *L'art arabe d'après les monuments du Caire* (Paris, 1869-77), and for Persia Flandin and Coste, *Monuments modernes de la Perse* (ib., 1867). For Spain the first serious work was Girault de Prangly, *L'architecture des Arabes et des Maures en Espagne, en Sicile et en Barbarie* (ib., 1842), which should be supplemented by the Spanish Government publication, *Monumentos arquitectonicos de España* (Madrid, 1877 sqq.). Nothing satisfactory has been published about the monuments of Northern Africa, of Syria or Asia Minor. In fact, the whole literature of the subject is unsatisfactory. Aside from the works remaining *in situ* there are not many collections of the smaller works of Mohammedan art. That of the South Kensington Museum is important, as are those of Cairo, and of the Musée des Arts Decoratifs in Paris.

MOHAMMEDANISM. The name commonly given in the West to the religion founded by Mohammed. The proper name is Islam (q.v.). suggested by Mohammed himself, and explained by him to include the performance of five duties (the 'five cardinal points of Islam'), viz.: acceptance of the formula, 'there is no god but Allah, and Mohammed is his prophet'; prayer; alms-giving; the fast of Ramadan; and the pilgrimage to Mecca.

DOCTRINE AND PRACTICE. Like every organized religion, Islam, as developed by the Mohammedan theologians, presents two sides—the theoretical part, known as *'amān*, 'faith,' and the practical part called *dīn*, 'religion.' The doctrine concerning *God*, His nature and attributes, coincides with the Jewish and Christian in so far as He is by both taught to be the Creator of all things in heaven and earth, who rules and preserves all things, without beginning, omnipotent, omniscient, omnipresent, and full of mercy. But, according to the Mohammedan belief, He has no offspring. Jesus is regarded, like Adam, Abraham, and Moses, as a prophet and apostle, although His birth is said to have been due to a divine intervention; as the Koran superseded the Gospel, so Mohammed superseded Christ and all preceding prophets. Next to the belief in God, that in *angels* forms a prominent dogma, and, like the former, may be traced back directly to Jewish and Christian and in a smaller degree to Persian influences. Created of fire and endowed with a kind of incorporeal body, angels stand between God and man. There are four chief angels: Gabriel, the angel of revelation; Michael, the special protector and guardian of the Jews; Azrael, the angel of death; Israfil (Uriel), whose office it will be to sound the trumpet at the resurrection. Besides angels there are good and evil genii (jinns, q.v.), of a grosser fabric than the former and subject to death. They have different names and offices (*pīrīs*, fairies; *deves*, giants; *takwīns*, fates, etc.), and are much like the *shēdīm* in the Talmud and Midrash and the demons of other peoples. The chief of the evil genii is Iblis (q.v.), once called Azazil, who, refusing to pay homage to Adam, was rejected by God. A third belief is that in certain divinely given *scriptures*, revealed successively to the different *prophets*. Originally there were 104 sacred books, but only four have survived, viz.: the Pentateuch, the Psalms, the Gospel, and the Koran, and the first three are in a mutilated and falsified condition. The number of prophets sent at different times, is stated variously at between 200,000 and 300,000. Among them 313 were apostles, and six were specially commissioned to proclaim new laws and dispensations, which abrogated the preceding ones. These were Adam, Noah, Abraham, Moses, Jesus, and Mohammed—the last the greatest of them all, and the propagator of the final dispensation. The belief in the *resurrection* and the *final judgment* is an important article of faith, which in the theological writings, later than Mohammed, is elaborately developed. The condition of the dead in the future world and the punishment of the wicked are pictured with a great multiplicity of details. The dead are received in their graves by an angel announcing the coming of the two examiners, Munkar ('Unknown') and Nakir ('Repudiating'), who, described as two black angels with blue eyes, put questions to the dead respecting his belief in God and Mohammed, and in accordance with the answers, either torture or comfort him. The soul, awaiting a general resurrection, is treated according to its rank; prophets enter immediately into Paradise; martyrs, in the shape of a green bird, partake of the delights of the abode of bliss; common believers either stay near the grave, or are with Adam in the lowest heaven, or remain in the well Zemzem or in the trumpet of the resurrection, or rest in the shape of a white bird under the throne of God. The souls of infidels dwell in a certain well in the province of Hadramaut (interpreted as Chamber of Death), or, being first offered to heaven, then to earth, and rejected by both, are subject to unspeakable tortures until the day of resurrection. Concerning the latter, considerable discrepancy reigns among the Mohammedan theologians. Mohammed himself seems to have held that both soul and body will be raised, and it is said that the rump-bone will remain uncorrupted till the last day, and from it the whole body will spring anew, after a forty days' rain. Among the signs by which the approach of the last day may be known are the decay of faith among men, the advancing of the meanest persons to the highest dignities, wars, seditions, and tumults, and consequent dire distress. Certain provinces shall revolt, and the buildings of Medina shall reach to Mecca. These are the eight 'lesser' signs; of 'greater' signs there are no less than 17; the sun will rise in the west, the Beast will appear, Constantinople will be taken by the descendants of Isaac, the Antichrist will come and be killed by Jesus at Lud (Lydda). Further there will come a war with the Jews, Gog and Magog's (*Yājūj* and *Mājūj*) eruption, a great smoke, an eclipse, the Mohammedans will return to idolatry, a great treasure will be found in the Euphrates, the Kaaba will be destroyed by the Ethiopians, beasts and inanimate things will speak, and finally, a wind will sweep away the souls of those who have faith, even if equal only to a grain of mustard seed, so that the world shall be left in ignorance. The time of the resurrection even Mohammed could not learn from Gabriel; it is a mystery. Three blasts will announce it; that of consternation, of such terrible power that mothers will neglect the babes on their breasts, and heaven and earth will melt; that of examination, which will annihilate all things and beings, even the angel of death, save paradise and hell and their inhabitants; and, forty years later, that of resurrection, when all men, Mohammed first, shall have their souls breathed into their restored bodies, and will sleep in their sepulchres until the final doom has been passed upon them. The day of judgment, lasting from one thousand to fifty thousand years, will call up angels, genii, men, and animals. The trial over, the righteous will enter paradise, to the right hand, and the wicked will pass to the left, into hell; both, however have first to go over the bridge *Al-Sirāṭ*, laid over the midst of hell, finer than a hair, sharper than the edge of a sword, and beset with thorns on either side. The righteous will proceed on their path with ease and swiftness, but the wicked will fall headlong. *Hell* is divided into seven stories or apartments, respectively assigned to Mohammedans, Jews, Christians, Sabians, Magians, idolaters, and—the lowest of all—to the hypocrites, who, outwardly professing a religion, in reality had none. The degrees of pain—chiefly consisting in intense heat and cold—vary; but the Mohammedans, and all those who professed the unity of God, will finally be released, while unbelievers and idolaters will be condemned to eternal punishment. *Paradise* is divided from hell by a partition (*'urf*) in which a certain number of half-saints will find place. The blessed, destined for the abode of eternal delight (*Al-Jannah*, Heb. *Gan-Eden*), will first drink of the pond of the Prophet, which is supplied from the rivers of Paradise, whiter than milk, and more odoriferous than musk. Arrived at one of the eight gates, they will be met by beautiful youths and angels; and their degree of righteousness (prophets, religious teachers, martyrs, believers) will procure for them the corresponding degree of happiness. Mankind on the last day will be assembled in three classes: (1) Those who go on foot, believers whose good works have been few; (2) those who ride, believers acceptable in the eyes of God; and (3) those who creep, the unbelievers. The various felicities which await the pious represent a conglomeration of Jewish, Christian, Zoroastrian, and other fancies to which the Prophet's own sensual imagination has added very considerably. Feasting in the most gorgeous and delicious variety, the most costly and brilliant garments, odors, and music of the most ravishing nature, and, above all, the enjoyment of the *Ḥur al-'uyūn*, the black-eyed daughters of Paradise (see Houri), created of pure musk, are held out as a reward to the commonest inhabitant of Paradise, who will always remain in the full vigor of youth and manhood. For those deserving a higher degree of recompense, rewards will be prepared of a purely spiritual kind—i.e. the 'beholding of God's face' (Shechinah) by night and by day. The last of the precepts of pure faith taught by Mohammedanism is the full and unconditional *submission* to God's decree, and the *predestination* of good and evil, which is found from the beginning inscribed on a 'preserved table.' Not only a man's fortunes, but his deeds, and consequently his future reward or punishment, are irrevocably, and thus unavoidably, pre-ordained; a doctrine which is not, however, taken literally by all Moslems.

The first of the four chief duties of *dīn* or the practical part of Islam is *prayer*, "the key of Paradise." Certain religious purifications are included as necessary preparations. They are of two kinds: the *ghusl*, or total immersion of the body, required on certain special occasions; and the *wudū'*, a partial ablution, to be performed immediately before the prayer. This is of primary importance, and consists in washing the hands, face, ears, and feet up to the ankles—a proceeding generally accompanied at each stage by corresponding pious sentences, and concluded by the recital of the ninety-seventh sura of the Koran. If water is not to be had, sand may supply its place. Even the ground or the carpet upon which one prays must be as clean as possible, and the use of a special prayer-carpet (*sajjādah*) is therefore recommended. Every Mohammedan is required to pray five times in the space of twenty-four hours. The prayer (*ṣalāt*) itself consists partly of extracts from the Koran (*farḍ*), partly of sentences ordained upon the precept or practice of the Prophet (*sunna*). The times of prayer are: Daybreak (*fajr*); noon (*ẓuhr*); afternoon, midway between the second and fourth (*'asr*); evening (*maghrib*); after night has closed in (*'ishā*). These several times of prayer are announced by the muezzins (q.v.) from the minarets of the mosques. The believer passes through a series of thirteen postures during his prayers; and a certain number of such inclinations of head and knees, prostrations, etc., is called *rak'ah*. It is necessary that the face of the worshiper should be turned toward the kiblah, i.e. in the direction of Mecca (see Kiblah). Women, although not forbidden to enter the mosque, yet are not supposed to pray there, lest their presence should be hurtful to true devotion. Besides these prayers, there are others ordained for special occasions, as on a pilgrimage, before a battle, at funerals, during an eclipse, etc. The Moslems do not pray to Mohammed, but simply implore his intercession, as they do that of the numerous saints, the relatives of the Prophet, and the first propagators of Islam. Petitions, moreover, play a subsidiary part in the prayers, which are chiefly made up of thanksgivings and praise formulas. Mohammedanism has no clergy in the Western sense of the word, but there is always a leader (*'imām*), who takes his stand at the head of the congregation and 'leads' the latter in prayer. (See Imam; Mollah; Mufti.) Next to prayer stands the duty of giving *alms*. These are two-fold, legal (*zakāt*) and voluntary (*ṣadaḳah*), but the former, originally collected by the sovereign and applied to pious uses, has now been practically abrogated. The sadakah, according to the law, is to be given once every year, of cattle, money, corn, fruits, and wares sold, at about the rate of from two and a half up to twenty per cent. Besides these, it is usual to bestow a measure of provisions upon the poor at the end of the sacred month of Ramadan. The duty of *fasting* follows. During the whole month of Ramadan, the Moslem is commanded to refrain from eating, drinking, and every indulgence in worldly pleasure, from daybreak until sunset. During the night he is allowed to eat, drink, and enjoy himself. Certain classes are exempt, as it was Mohammed's special and express desire that no one should fast who is not equal to it, lest he injure his health and disqualify himself for necessary labor. Of other commendable fast-days, the most important is the *'Ashūrā*, on the tenth of Muharram, corresponding in a measure to the Jewish Day of Atonement. The fast of Ramadan is universally kept, in letter if not in spirit, fasting being considered "one-fourth part of the faith." (See Ramadan; Fasts.) The last duty is the *pilgrimage* to Mecca, which every Moslem must make once in his life, if he be free, sound in body, and able to meet the expense. Women also perform the pilgrimage. To pay the way of one who cannot himself afford it is considered a pious act, and the Shiites allow the pilgrimage to be made by proxy. See Hajj; Hajji.

To the 'positive' ordinances of Islam may be added the *ṣaghīr* or *lesser* and *kabīr* or *greater festivals*. The first (*al-fiṭr*, or breaking the fast) follows immediately upon Ramadan, beginning on the first day of the month of Shawwal, and lasts three days. The second (*'īd al-ḳurbān*, or sacrifice festival) begins on the tenth of Dhu l-Hijjah. The latter was intended to be the more important of the two, but the people have in most places changed the order, and make the lesser festival, which follows Ramadan, the more joyful and the longer. The day set aside for the weekly assembly is *Friday*, which, however, is not a day of rest. After prayers the people return to their ordinary affairs.

Islam also enjoins a number of *prohibitory laws* based upon utterances of the Prophet. The drinking of *wine*, which includes all strong and inebriating liquors, is vigorously forbidden. Chiefly through European influence some Moslems have lost their scruples on this score, but the great majority of the faithful refuse even to make use of the proceeds of the sale of wine or grapes. Some scrupulous believers even include opium, coffee, and tobacco in the prohibition; but general practice has decided differently. The prohibitory laws respecting *food* resemble closely those of Rabbinical Judaism; blood, the flesh of swine, animals which have died from disease or age, or on which the name of some idol has been invoked, or which have been sacrificed unto an idol, or which have been strangled, or killed by a blow, a fall, or by some other beast, are strictly forbidden. 'Pure' animals must be slaughtered according to certain fixed rules, and fish, bird, game are generally allowed for food. All *games* subject to chance—such as dice, cards, tables, bets, etc.—are considered so wicked that a gambler's testimony is invalid in a court of law. Chess and other games depending on skill—provided they do not interfere with the regular performance of religious duties, and that they are played without any stakes—are allowed by the majority of Moslem theologians. *Usury* is strictly prohibited. Taking interest upon any loans, however large or small, or profiting in trade through questionable means, save by buying and selling, is severely condemned. To prevent the faithful from ever falling back into idolatry, the laws relating to *images and pictures* have been made very stringent. Whosoever makes an imitation of any living being in stone, wood, or any other material, shall, on the day of judgment, be asked to endow his creation with life and soul, and, on his protesting his inability of doing so, shall undergo the punishment of hell for a certain period.

The *civil* and *criminal laws* of Mohammedanism, founded both on the Koran and the Traditions (*Sunna*, q.v.), in instances where the letter of the written or oral precept allows of various explanations, or where the case in question is unprecedented, are interpreted according to the opinion of one of the four great masters of Islam: Abu Hanifah (born 702), Malik Ibn Anas (born 714), Mohammed al-Shafii (born 767), and Ahmad Ibn Hanbal (born 780), within the pale of their respective sects. (See MOHAMMEDAN SECTS.) Upon the principal points all Mohammedans agree. In regard to *marriage*, polygamy is allowed, but not without restriction. Four wives and a certain number of concubine slaves is the legal limit for a Moslem. The Prophet's example proves nothing to the contrary, since he was endowed with special privileges, and not subject to the common law in many respects. It is, moreover, added as advice, that to marry one or two is quite sufficient for a man. As a matter of fact, the rule among Mohammedans of the present day is to have but one wife. A Moslem may marry a Christian woman or a Jewess, but a Mohammedan woman is not, under any circumstances, to marry an unbeliever. In all cases, however, the child born of a Moslem, whatever the mother's faith, is a Moslem; nor does the wife who is an unbeliever inherit at her husband's death. Forbidden degrees are: The mother, daughter, sister, half-sister, aunt, niece, foster-mother, or a woman related to the faithful "by milk in any of the degrees which would preclude his marriage with her if she were similarly related to him by consanguinity;" the mother of his wife, even if he be not yet actually married to the latter; the daughter of his wife, if the latter still be his legal wife; his father's wife and his son's wife; two sisters at the same time; wives who stand to each other in the relation of aunt and niece; or the unemancipated slave, or another man's slave, if he have already a free wife. A simple declaration of a man and woman at the age of puberty, before two witnesses, of their intention to marry each other, and the payment of part of the dowry (which is indispensable, and must amount to at least ten dirhems, or about one dollar) is sufficient for a legal marriage. A girl under age is given away by her natural or appointed guardian, with or without her consent. To see the face of any woman who is neither his wife nor his concubine, nor belongs to any of the forbidden degrees, is strictly forbidden to the believer. *Divorce* is a comparatively light matter with the Mohammedans. Twice a man may send away his wife and take her back again without any ceremony; the third time, however, he may not receive her again in wedlock unless she have been married properly to another man in the meantime. Mere dislike is sufficient reason for a man to dissolve the conjugal ties, and his saying "Thou art divorced," or "I divorce thee," together with the repayment of the dowry, is all that is required from him by the law. A wife, on the other hand, is bound to her husband forever, unless she can prove some flagrant ill usage or neglect of conjugal duty on his part; and even then she forfeits part, or the whole, of her dowry. A divorced woman is obliged to wait, like the widow, for a certain period before marrying again. If she have a young child, she is to suckle it until it be two years old, and the father is to bear all the expenses of the maintenance of mother and child. If a slave becomes a mother by her master, and he acknowledges the child to be his own, the latter is free, and the mother is to be emancipated at the master's death, and may not be given away or otherwise disposed of by him during his lifetime. A free person, wishing to marry his or her slave, must first emancipate this slave; and if the slave of another person has been married by a free man or woman, and afterwards becomes the latter's property, the marriage becomes illegal, and can only be renewed by a legal contract and emancipation. As regards *inheritance*, males generally receive a double share. A person may not bequeath more than one-third of his property, unless there be no legal heirs. Children, whether begotten with the legal wife or slave, or concubine, or only adopted, and their descendants, are the first heirs; next come the claims of wives, parents, brothers, sisters, in their order. Where there is no legal heir, the property falls to the State. The law is very lenient toward *debtors*. Insolvency and inability to work for the discharge of the claim solve all further obligations. The most conscientious performance of all private contracts is constantly recommended in the Koran. *Murder* is either punished with death or by the payment of a fine to the family of the deceased, according to their own pleasure. There must, however, be palliating circumstances in the latter case. The Bedouins still maintain the primitive Semitic law of blood-revenge, and up to this day the 'vendetta' often rages not only between family and family, but between whole tribes, villages, and provinces. Unintentional homicide is expiated by freeing a believer from slavery, and paying to the family a certain sum in proportion to the rank and sex of the deceased. He who has not the means of freeing a believer is to fast for two months by way of penance. According to the strict letter of the law a man is not liable to capital punishment for killing his own child or an infidel; but practically no difference is made by the Mohammedan governments (chiefly the Turkish) at the present time. Murder is punished with death and no fine frees the culprit. *Injuries to the person* are punished according to the primitive law of retaliation; that is, a certain proportionate fine in money is to be paid to the injured. The payment for any of the single limbs of the human body (e.g. the nose) is the full price of blood, as for a homicide; for a limb which is found twice, like hand or foot, half; for a finger or a toe, the tenth part, etc. Women and slaves have smaller claims. Injuries of a dangerous or otherwise grievous nature pay the full price; those of an inferior kind, however, bring the perpetrator within the province of the lash or cudgel. The Koran orders small *theft* to be punished by cutting off the chief offending limb, the right hand; the second theft is punishable by the loss of the left foot; the third, of the left hand; the fourth, of the right foot, etc.; but the ordinary punishments of imprisonment, hard labor, and the bastinado have been substituted in later times. The property stolen must not, however, have been of easy access to the thief, nor must it have consisted of food, since he may have taken this to satisfy the craving of his hunger. *Unchastity* on the part of a woman was in the commencement of Islam punished by imprisonment for life, for which afterwards, however, stoning was substituted in the case of a married woman, and a hundred stripes and a year's exile in the case of an unmarried free woman, a slave to undergo only half of that punishment. He who accuses a 'woman of reputation' of adultery or fornication must produce four (male) witnesses, and if he be not able to do so, he is to receive fourscore stripes, nor is his testimony ever after to be received unless he swear four times that he speaks the truth, and the fifth time imprecate God's vengeance if he speak false. Even this testimony may be overthrown by the wife's swearing four times that her accuser is a liar, and imprecating the fifth time the wrath of God upon herself if he speak the truth. In the latter case she is free from punishment; the marriage, however, is to be dissolved. Fornication in either sex is, by the law of the Koran, to be visited with a hundred stripes. *Infidelity*, or *apostasy* from Islam, is a crime to be visited by the death of the offender, if he have been warned thrice without recanting. Severer still, that is, not to be averted by repentance or revocation of any kind, is the punishment inflicted for blasphemy—against God, Mohammed, Jesus, Moses, or any other prophet. Immediate death is the doom of the offender.

A further injunction of the Koran is that of making war against the infidels (*jihād*). He who is slain while fighting in defense of Islam or for its propagation is reckoned a martyr; while a deserter from the holy war is held up as an object of execration, and has forfeited his life in this world as well as in the world to come. At first all the enemies taken in battle were ruthlessly slain; later, however, it became the law to give the people of a different faith against whom war was declared the choice of three things—either to embrace Islam, in which case they became Moslems at once, free in their persons and fortunes, and entitled to all the privileges of Moslems; or to submit to pay tribute, in which case they were allowed to continue in their religion, if it did not imply gross idolatry or otherwise offend against the moral law; or to decide the quarrel by the fortune of war—in which case the captive women and children were made slaves, and the men either slain if they did not become converts at the last moment, or otherwise disposed of by the prince. The fifth part of the spoil belongs 'to God,' that is, must be devoted to a sanctuary, to the Prophet and his kindred, to the orphans, the poor, and the traveler.

It must not be overlooked that the Islam of history and of the present time is not the pure and unmodified teaching of its founder. The Koran was not intended to be a systematically arranged code of laws. Such laws and regulations as it contains were called forth by some occurrence during the Prophet's life, and were, properly, supplementary to existing laws and customs, which they abrogated, confirmed, or modified according to the occasion. In course of time cases arose for which no written rules could be found laid down by Mohammed. Recourse was then had to traditional oral dicta or to the Sunna (q.v.); in time precedents were established and laws came into force by the concurrence of the learned (*ijmā'*), or by a process of reasoning (*kiyās*). In this way the peculiar system which is called Mohammedan jurisprudence came into being, theoretically founded on the Koran, but often strangely at variance with the principles and spirit of its author. In like manner the reprehensible features of the doctrine and daily life of Islam must not be charged indiscriminately against Mohammed. That part of the system which most distinctly reveals the mind of its founder, and which also has undergone least change in the course of time and constitutes its most complete and brightest part, is its ethics. Injustice, falsehood, pride, vindictiveness, calumny, mockery, avarice, prodigality, debauchery, mistrust, and suspicion are inveighed against as ungodly and wicked; while benevolence, liberality, modesty, forbearance, patience and endurance, frugality, sincerity, straightforwardness, decency, love of peace and truth, and above all trust in God and submission to His will, are considered as the pillars of true piety and the principal signs of a true believer. Mohammed never expressly laid down that doctrine of absolute predestination and "fatality" which destroys all human will and freedom, and which by the influence of Mohammedan theologians became a fixed element in the orthodox creed. A glance at his system of faith (so far as he had a system), built on hope and fear, rewards and punishments, paradise and hell, both to be man's portion according to his acts in this life, and the incessant exhortations to virtue, and denunciations of vice, are sufficient to prove that aboriginal predestination is not in the Koran, where only submission to Allah's will, hope during misfortune, modesty in prosperity, and entire confidence in the divine plans, are supported by the argument that everything is in the hands of the highest being, and that there is no appeal against his absolute decrees. This is but one instance of the way in which Mohammed's dicta have been developed and explained—in such a manner that he has often been made to teach doctrines which he really did not teach; and thus many elements now found in the Moslem creed, if carefully traced back to their original source, will be seen to be the growth of later generations.

In a general estimate of Mohammedanism it should not be forgotten what Islam has done for the cause of humanity and more particularly the share it had in the development of science and art in Europe. Broadly speaking, the Mohammedans may be said to have been the teachers of barbarous Europe from the ninth to the thirteenth century. It is from the days of the Abbasside rulers that the real renaissance of the Greek spirit and Greek culture is to be dated. Classical literature would have been irredeemably lost had it not been for the home it found in the schools of the "unbelievers" of the "dark ages." Arabic philosophy, medicine, natural history, geography, history, grammar, rhetoric, schooled by the old Hellenic masters, and the "golden art of poetry," brought forth an abundant harvest of works, many of which will live and teach as long as there will be generations to be taught. See ARABIC LANGUAGE AND LITERATURE.

HISTORY. In the first three years of his mission Mohammed won forty converts, including his wife, Khadija, Abu Bekr, and Othman. Then followed Ali, Omar ibn Khattab, and Hamza. In 615 the persecutions of the Koreish drove fifteen of the converts into Abyssinia, and they were later joined by a hundred more. After Mohammed's return from Taif to Mecca he won over some of the Bani Khazraj of Yathrib (Medina), who then made converts among the Bani Aus, formerly their enemies. The new faith spread rapidly from tribe to tribe, the Bani Abd al-Ashhal going over in a body. In 622 the number of Mohammedan pilgrims from Yathrib was 73. After the flight from Mecca Medina was organized into a commonwealth, and Islam became a political as well as a religious movement.

Mohammed's plans included now nothing less than the conversion of the world to Islam. If he had at first hoped to accomplish this by peaceful measures alone, the aggressiveness of his enemies in advancing against Medina soon forced the preacher to become warrior also, and military success won more and more converts. In the sixth year of the Hejira Mohammed sent letters to the Byzantine Emperor, Heraclius, to the King of Persia, to the Governor of Yemen, to the Governor of Egypt, and to the King of Abyssinia inviting them to join the new religion. In the same year he converted part of the Bani Daws of Yemen, and two years later the rest of the tribe followed; in the meanwhile fifteen other tribes responded. With the fall of Mecca in A.H. 8, the triumph of Islam in Arabia was assured. Some of the Prophet's bitterest enemies became his most ardent followers; and the next year saw so many embassies suing for alliance that it became known as the 'year of the deputations.'

After Abu Bekr had brought about the resubjugation of the northern tribes, who had revolted on Mohammed's death, an army was sent into Syria, as the Prophet himself had planned. A second army was sent into Irak. The latter came into contact with the Persian forces, and in Omar's caliphate, by the victory at Kadisiyyah, Chaldæa and Mesopotamia were assured to the Arabs. Christian Bedouins of both sides of the Euphrates became converted at this time, even though tolerance was extended to those who kept their own faith. In Syria almost the only opposition came from Heraclius's armies. The great mass of the people, oppressed by the Byzantines, welcomed the Arabs. By 639 the Greeks had been driven out of the province, most of the large towns having made treaties which guaranteed them toleration of religious belief, and protection of life and property on the mere payment of the *jizyah* (poll-tax) and *kharaj* (land-tax). Friendly relations being thus established, in the following years there was a gradual assimilation of Arabic manners and customs throughout Syria, which made the conversion of the natives easy. Many Christians were converted in the fifty years between Omar and Abd al-Malik in Irak, Khorasan, etc. Omar II. (717-720) was particularly successful by lightening the burdens of Mohammedan landowners. In addition, the children of women captives were brought up as Moslems; and slaves were allowed to purchase their freedom at the price of conversion. In the tenth century the Nestorian Bishop of Bet Garmai was a noted convert; in 1016 Ignatius, the Jacobite Metropolitan of Takrit (at Bagdad), became Abu Muslim. Converts were won in the following centuries, even from among the Crusaders. Bainaud and his followers embraced Mohammedanism in a body; 3000 Crusaders accepted Islam in Phrygia in 1148, as a result of Mohammedan kindness contrasted with ill-treatment on the part of Greek Christians. To-day over fifty per cent. of the population of Syria and Palestine is Moslem.

The rapidity with which Mohammedanism spread in Syria and Mesopotamia was not duplicated in the country to the north. In Armenia, even after the Christian power had been overthrown by the Seljuks of the eleventh century, the mass of the population continued Christian. Georgia resisted until the invasion of the Mongols. After the fall of Constantinople (1453) the western and central portions of the country became converted, and after the ruling dynasty of Samtskhé in 1625 had become Mohammedan, progress was rapid among the aristocracy. The eastern portion of the country had submitted to Persia, and as such was naturally subject to Mohammedan influence. In the seventeenth century there were two petty kingdoms in the East the rulers of which, though native princes, were Moslems. Since the beginning of the nineteenth century Georgia has belonged to Russia, but certain parts are still Mohammedan.

After the Mohammedans had succeeded in subduing Syria they turned their attention to Egypt. Amr ibn al-Aas drove the Byzantines out in A.D. 641, and the whole of the country as far south as Abyssinia and as far west as Libya came under Moslem influence. The conquerors, who treated the natives, and especially the Copts, with great favor, were welcomed by them. Many Copts accepted Islam even before the fall of Alexandria; while the number of converts, partly forced, partly willing, that were made up to the Caliphate of Omar II. (717-720) was large. In the twelfth century Islam was carried, principally by Moslem merchants, into Lower Egypt, and in the fourteenth century into Nubia, the King of Dongola becoming a Moslem in 1340. In Abyssinia conversions were first made in the coast towns in the tenth century, and toward the end of the twelfth a Mohammedan dynasty was founded. In the sixteenth century the Mohammedan Kingdom of Adal, between Abyssinia and the southern end of the Red Sea, came into existence; in the seventeenth, one-third of its entire population was Moslem, while in the middle of the nineteenth one-half of the central province of Abyssinia had likewise been converted.

Amr ibn al-Aas conquered Northern Africa as far as Barca. Before the end of the century rapid progress had been made among the Berbers, who made their last resistance at the Spring of Kahina in 703. Musa ibn Nusair and Omar II., the Conqueror, made innumerable converts. In 789 Western Africa (Mauritania) became separated from Egypt as a kingdom under Idris, founder of the Idriside dynasty; in addition to converting many Berbers, he is said to have forced Christians and Jews to apostatize. The Berbers, however, under the Idrisides as under the Aghlabites (a dynasty founded in 801 by Ibrahim ibn Aghlab, hereditary governor of Ifrikiyyah) were in constant revolt. In the beginning of the tenth century Abu Abd Allah appeared among them as the apostle of the Ismailian sect, and succeeded in winning over the whole of the powerful Kitamah tribe to the support of the Imamate of Ubaid Allah; and the dynasty of the Fatimites was thus successfully established in Kairwan. Early in the eleventh century the faith spread rapidly among the Berbers of the Sahara also, among whom it had been introduced in the ninth century. The revival was due principally to a chieftain of the Lamtuna tribe, Abd Allah ibn Yassin, who founded a monastery and won many disciples from various tribes, to which he sent them back as missionaries. In 1042 he led his followers, known as the *Murabbitin* (Almoravides), against the neighboring tribes, and by force and persuasion succeeded in establishing a vast empire. Before the end of the century it extended from Senegambia to Algiers; Mohammedan Spain was brought under the sway of the Almoravides. In the beginning of the seventh century another dynasty was founded among the Berbers, when Abu Abd Allah Muhammad ibn Tumart appeared in the Mauritanian mountains and preached especially against the laxity of morals and the excessive veneration paid to saints. His followers became known as the *Muwahhidin* (Almohades, or Unitarians). The conquests and conversions of the Almohades were likewise enormous; by 1160 they had an empire extending from Barca to the Atlantic, and embracing Mohammedan Spain. After these events but few of the Berbers remained heathens.

From Northern Africa Islam soon penetrated into the interior of the continent. The Almoravides made many converts in the eleventh century among the negroes of the Sudan, who had already become familiar with the new faith through the visits of merchants and missionaries. The negro tribes of the west were first won over; as early as 1010 the King of Surhay (southeast of Timbuktu) became a Moslem; the States on the upper Niger, Timbuktu (founded in 1077) and Melle (West Sudan, founded by the Mandingos), followed and furnished active missionaries as well. The kingdoms of Bornu and Kanem, along Lake Chad, became converted in the eleventh century, the latter kingdom extending as far as Egypt and Nubia. In Darfur a Moslem dynasty was founded in the fourteenth century and is reigning to-day; at the end of the sixteenth century Wadai and Bagirmi, and in the seventeenth, portions of the Hausa country, became Moslem. In the nineteenth century there was a remarkable revival of Mohammedanism due to the influence of the Wahhabis. The Fulahs were united into one political organization by Sheikh Othman Danfodio, and compelled all the remaining tribes to accept Islam. To-day there are four powerful Mohammedan kingdoms in Senegambia and the Sudan. The nineteenth century movement was aided by such religious orders as the Amirghaniyyah, the Tijaniyyah, the Kadriyyah, and the Sanusiyyah. The vast theocracy of the Sanusiyyah has settlements and schools extending from Egypt to Morocco, in the Sudan, Senegambia, Somaliland, the Sahara, and the Galla country; they have gained many converts by education and the purchase of slaves.

Along the west coast of Africa Islam has made steady progress; e.g. on the Guinea Coast, in Sierra Leone, in the Ashanti country, Dahomey, the Gold Coast, Lagos (where there are 10,000 Moslems), and Liberia (where there are more Moslems than heathen). Often the common people are converts where the chieftains are not. There is hardly a town along the coast for 2000 miles from the Senegal which has not a mosque.

On the east coast the Emozaydij made settlements before the tenth century; they were Shiites, and were followed by Sunnis, who founded the town of Magadoxo, and other towns on the coast from Aden to the Tropic of Capricorn. Arab traders made Zanzibar Mohammedan. Inland, however, only the Galla and Somali tribes are even partly Moslem. In Cape Colony there have been Moslems since the seventeenth and eighteenth centuries, Islam having been carried there by the Malays. Even among the Hottentots there are converts who make the pilgrimage to Mecca, while in the diamond fields the coolies are said to be missionaries.

Islam was introduced into Spain in 711 by Tarik with 12,000 Berbers. The first converts were from among the ill-treated slaves. The remnant of the heathen population followed, then the nobles and the middle and lower classes of the Christians, so that the majority of the population soon consisted of Mohammedans of non-Arab blood. In 1311 there were 200,000 Mohammedans in Granada alone, only 500 of them being of Arab descent. On the whole, conversion was carried on peacefully except when the Almoravides at the close of the eleventh century came to Spain. The Moslem power began to crumble away as early as the eleventh century; the last Moriscos were driven out in 1609.

The other Mohammedan empire in Europe, that of the Turks, made its first conquests at the time of the decline of Islam in Spain. The inception of the Ottoman Empire dates from the beginning of the thirteenth century, when 50,000 Turks settled in the northwest of Asia Minor. In 1353 they entered Europe for the first time and in 1361 made Adrianople their capital. Before the end of the century Bulgaria, Macedonia, Thessaly, and most of Thrace had been subdued by Bajazet; Amurath II. (1421-51) added to this territory, and Mohammed II. (1451-81), after taking Constantinople in 1453, extended his rule over Greece, Servia, Bosnia, and Albania. A large part of Hungary was added by Solyman II. (1520-66); in the seventeenth century Crete was taken, and Podolia was ceded by the Poles. The most noted example of forced conversion was the enrollment of Christian children in the ranks of the Janizaries (q.v.). Large numbers were converted peaceably from all ranks; in the fifteenth century Adrianople was the home of countless renegades; in the seventeenth converts were made even among the Christian clergy. Progress was very rapid at this time. The power of Servia was broken by the Turks in 1389, but the country was not reduced to the position of a Turkish province until 1459, when the inhabitants chose Mohammedan rule in preference to the Roman Catholicism of Hungary. However, though the nobles became Moslems, only in Old Servia (northeast of Albania), since the seventeenth century, has the spread of Islam been rapid. The same period was the date of the rapid conversion of Montenegro; in Bosnia, the Bogomiles joined Islam in large numbers after Mohammed II. had released over seventy cities from Catholic persecution. The other inhabitants followed gradually, and the Christians left the way clear by emigrating into the neighboring countries. The conversion of the inhabitants of Crete first took place in the ninth and tenth centuries, when the whole population joined Islam; at the beginning of the thirteenth century the Venetians acquired the island, and in 1669, when it was taken from Venice by the Turks, the inhabitants had to be reconverted; within 50 years half of them were again Moslem.

In Persia, Islam made progress very early, for under Zoroastrianism the people were oppressed by priest and ruler alike. After the fall of the Sassanid dynasty in the middle of the seventh century, converts were easily made, at first mainly from among the despised industrial classes and artisans. Later the Shiites met with great success, for Hosin, son of Ali, had married Shahban, daughter of Yezdegird, the last Sassanid; and in the middle of the eighth century the Ismailians showed a wonderful power of adapting themselves and their teachings to all classes and creeds. At the close of the eighth century Saman, a noble of Balkh, became a Moslem and founded the dynasty of the Samanids (874-999). Conversions were made in the ninth century by Karim ibn Shahriyar, the converted King of the Kabusiyyah dynasty, and by Nasir al-Hakk of Dailam; in 912 Hasan ibn Ali, of an Abd dynasty on the Caspian, made many converts in Dailam and Tabaristan.

North of Persia there had been much opposition to Islam, and allegiance to the Caliph was often renounced as soon as the armies were withdrawn. In Samarkand, however, conversions were brought about by Ibn Kutaibah, who burned the heathens' idols. Among the Afghans the King of Kabul was converted about 800; in Transoxiana many converts were made in the eighth century, and by the middle of the ninth Mohammedanism was general. The greatest impetus to the spread of the new faith came about the middle of the tenth century, when some of the Turkish chieftains were converted; in Turkestan the founder of the Ilak Khans converted 2000 families of his tribe, who became known as Turcomans. In 956 the Seljuk Turks had their origin, when Selijek migrated with his clan to Bokhara from the Kirghiz steppes.

Much of the progress which Islam had made was lost by the Mongol invasion. Bokhara, Samarkand, Balkh, and Bagdad were left in ruins, and almost without inhabitants. Many Mongol rulers, such as Kublai Khan, were energetic in their opposition to Islam. But in the time of Ogotai Khan (1229-1241) certain Buddhists were converted; Yisun-Timur Khan (1323-28) was an earnest Moslem, and made converts of his troops; Baraka Khan (1256-65) turned Moslem with his subjects—the first ruling Mongol prince to take this step in the eastern portion of the Mongol territory. But it was not till 1295 that Islam became the ruling religion of Persia; at that date Ghazan, seventh of the Ilak khans, joined the new faith. In the Middle Kingdom, in the reigns of Tirneashirin Khan (1322-30) and Tukluk Timur Khan (1347-63), Islam became generally adopted, though Burak Khan (1266-70) had also been a Moslem. In the Golden Horde the leaders and aristocracy followed Baraka Khan when he became converted; Uzbeg Khan (1313-40) placed Islam on a solid basis. The Mongols were likewise successful, to some extent, in introducing Mohammedanism into Russia; e.g. in the Crimea and among the Finns, the Tcheremisses, the Tchuvashes (whole villages of which are Moslem), and the northeast Russian tribes, among whom there are many secret Mohammedans. In Siberia the first conversions were made in the latter half of the sixteenth century. Since 1745 the Baraba Tatars, between the Irtish and Ob, have been converted.

In India the first great Mohammedan conqueror was Mohammed Kasim (711), who took Darbul (capital of Sindh), Multan, and other cities early in the eighth century. Under Omar II. the native princes were called upon to become Mohammedans, and received Arabic names; but many of them later became heathens again. In 1019 Hardat and 10,000 men accepted Islam; but it was some time before the new religion gained a firm footing in India. Down to near the close of the twelfth century Mohammedan India was only a province of Ghazni; at that time Mohammed Ghori conquered the northern part to the mouth of the Ganges, and his slave Kutb al-Din was made Viceroy of Delhi. The latter then proclaimed himself sovereign of Hindustan and founded the dynasty of the "Slave Kings," the first Mohammedan dynasty in India. Mohammed Ghori likewise converted the Ghakkars, in the mountains north of Punjab. Under the succeeding dynasty, the Khiljis (1295-1320), Mohammedan rule was extended to the Deccan. The Tughlak dynasty which followed was troubled by revolt and desertion, and its power was much reduced; the Sayyids, as well as the Lodis (1451-1526), were rulers over but one province, Bengal, Jaunpur, Malwa, and Gujarat having independent Moslem dynasties. The Mogul Empire was established in 2526 by Baber, and then Islamic influences were more successful. Many rajputs were converted when idolatry was made a bar to advancement at court. In the eastern districts of the Punjab and in Cawnpore, many converts were made in the reign of Aurungzebe.

In Southern India and in Bengal the spread of Islam was more rapid. The southern coast was subject to the Mohammedan influences of traders; even in the eighth century refugees had come there from Irak, and missionaries in the eleventh. In Malabar the Mappilas, descendants of the early refugees, are estimated at one-fifth of the population. The Laccadive and Maldive islands, as well as Malabar, have an almost exclusively Moslem population. In the Deccan, Arabs settled in the tenth century; it had the Mohammedan dynasties of the Bahmanids (1347-1490) and Bijapur (1489-1686). Bengal was the scene of most active propaganda, and Islam was welcomed especially among the lower caste Brahmins. Lower Bengal has been the scene of a great Mohammedan revival even in the last few years. Kashmir had a Mohammedan king in the fourteenth century; Islam became supreme in the time of Akbar, and to-day claims over seventy per cent. of the population. In Baltistan there has been a Mohammedan population for over three centuries, and the faith is being carried by merchants from Kashmir, as well as from Persia, even into Tibet. In the various parts of India there are about 60,000,000 Moslems, the number of annual converts being estimated variously from 10,000 to 600,000. It is worth noticing, however, that in Agra and Delhi, the centres of Moslem power, but from one-tenth to one-fourth of the population is Moslem.

Mohammedanism penetrated into China from the south and from the west. Friendly relations were established between the Caliphs and the Emperors in the time of the Caliph Walid (705-717), when the general Kutaibah ibn Muslim sent ambassadors to the Chinese Court. Later Moslem traders entered from Arabia, Bokhara, and Transoxiana. The first mosque was built in 742, in the capital city, Shen-si, Northern China. In 758, 4000 Arab soldiers were sent by the Caliph Al-Mansur to aid the Emperor Sah-Tsung in crushing a rebellion; they remained in China and intermarried with the natives. The annals of the Thang dynasty (618-907) record the arrival of Moslems at Canton; there in the ninth century they lived as a separate community. They were joined later by other arrivals, and intermarried with the natives. Mohammedans entered the Province of Kan-su (part of the Empire of Hoey-hu), and the Khan was converted, in the tenth century. The Uigurs, a Turkish tribe transferred to the Great Wall in the Thang dynasty, became Moslems in the ninth century. All of these Moslem communities formed centres for the spread of Islam throughout the Empire. Further accessions of Syrians, Arabs, and Persians followed the great Mongol conquest. Under the Mongol Khakans Mohammedans were well treated and rose to positions of trust (in 1244 Abd al-Rahman was head of the Imperial finances). At the beginning of the fourteenth century all the inhabitants of Yun-nan were Moslems, and in every town throughout the Empire there was a special Moslem quarter. After the expulsion of the Mongols the Mohammedans avoided all external signs of their religion, and assimilated themselves as far as possible to the rest of the population, while keeping the essentials of their religion intact. Missionary efforts were continued quietly and slowly but surely; the only conversion in large numbers took place in 1770, when a revolt was put down in Sungaria, and the 10,000 military colonists who were sent there all embraced Islam, and after a famine in 1790 in the Province of Kwangtung, when 10,000 children are said to have been bought, and brought up as Moslems. There was a general revival of interest in the eighteenth century, when commercial relations were reëstablished with the outside Mohammedan world. To-day there are 20,000,000 Mohammedans in the Chinese Empire, of which three-fourths are in the provinces of Kan-su and Shensi, in the northwest. As an example of the cities in the east, Peking has 20,000 Moslems, with 13 mosques.

The spread of Islam into the Malay Islands dates from the twelfth century, when more or less successful attempts were made to introduce it into Sumatra; in the fourteenth century the sherif of Mecca sent missionaries to the island and succeeded in making many converts. In the fifteenth century the great Kingdom of Menang-Kaban had many converts, and the larger part of central Sumatra is now Moslem. On the Malay Peninsula the Kingdom of Malacca was converted in the thirteenth or fourteenth century; the Moslems of the peninsula to-day are said to be most strict in their religious practices, though extremely tolerant. Converts have been made among the Siamese Buddhists of the north and among the wild tribes of the peninsula. In Java the first notable success of Islam took place in the fourteenth century; and in the following century the new faith was firmly established on the east coast. In the fifteenth century Radan Rahmat, nephew of the Hindu King of Majapahit, made many converts in Ampel, and in other places on the east coast; at the same time conversions were made in the west. Radan Patah headed a confederacy which, in 1478, defeated the King of Majapahit, replacing the Hindu with a Moslem dynasty. To-day nearly the whole of Java is Mohammedan. In Celebes, general conversion along the coast began in the seventeenth century. The Macassars were the first converts; they then, after much resistance, converted the Bugis, who likewise became propagandists. In the north the Kingdom of Balaang-Mongondou, which was Christian for centuries, was finally converted in 1844. The population of this kingdom is now half heathen and half Moslem. The island of Sumbawa has had a Moslem population since 1540; Lombok was one of the scenes of conversion by the Bugis.

In the Philippine Islands there has been a long struggle between Christianity and Islam. In Mindanao and the Sulu Islands civilized Mohammedan tribes existed as early as 1521, when the Spaniards came to the islands. Owing to their obnoxious and ill-advised methods, the Spaniards could make no progress in the face of Islam. The Mohammedans, as elsewhere, learned the language of the people, adopted their customs and intermarried with them, thereby winning great success. The independent Kingdom of Mindanao had 360,000 Moslem subjects in the nineteenth century. The Sulu Islands have also been a Mohammedan stronghold, though nominally Catholic. Among the ruder inhabitants, those of the lower classes, in the northern islands, Islam has not made much headway, as indeed has been the case throughout the archipelago. In New Guinea and the islands to the northwest of it, progress has been made only on the coasts. In the archipelago as a whole, however, Islam is spreading; in Java, for instance, there were 33,802 pilgrims to Mecca in 1874, and 48,237 in 1886. Books are printed in Mecca in the various Malay languages; in 1882 the Mohammedan schools of Java had 255,000 students. The religious orders, especially the Sanusiyyah, are very active.

It is almost impossible to give reliable figures of the total Mohammedan population of the world. The official estimate of the Turkish Government, which may be considered very conservative, places the number at 176,000,000. This is divided as follows: In the Turkish dominions, 18,000,000; in other parts of Asia, 99,000,000; in Africa, 36,000,000; in other countries and in the islands of the Eastern seas, 23,000,000. The whole of British India, with its dependencies, according to the census of 1901, contained 62,458,000 Mohammedans. Mann (*North American Review*, November, 1900) gives the following figures: India, 57,061,796; Burma, 210,049; Malay Archipelago, 31,042,000; China, 32,000,000; Africa, 80,000,000; a total of 200,313,845. There are about 250,000 Mohammedans in the Sulu group of the Philippine Islands.

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MOHAMMEDAN SECTS. The movement which led to the division of Islam into opposing parties was at first a political one, though religious, theological, and philosophical questions soon arose which added to the complexity of the situation and caused a further subdivision into sects. Mohammed died without naming his successor; and while Abu Bekr was looked upon by many as the natural leader, others felt that Ali, who was not only the cousin and son-in-law, but also a decided favorite of the Prophet, should be his successor. Among the Arabs, however, leadership was not a matter of inheritance, but of election; and when Abu Bekr was chosen Caliph, he received the recognition of all, including Ali. Omar's election likewise resulted in general satisfaction, although the Ommiads, who, even when they had accepted Islam, were still rivals of the Prophet's family, began to show their opposition to those who had been the Prophet's intimate companions. On Omar's death Ali was again denied the caliphate, Othman being chosen. Othman's misrule, however, caused great dissatisfaction, and when he was assassinated Ali finally came to the caliphate. The hostility of the Ommiads, however, continued, and soon turned into open revolt, with Moawiyah, the Ommiad Governor of Syria, at its head. The question as to the right of succession, which was soon to cause the permanent separation of the whole Mohammedan world into Shiites and Sunnites, had even then presented itself in great seriousness, the followers of Ali claiming that only the Prophet's family had the right to the caliphate, the Ommiads opposing this claim.

There was also a third party, afterwards known as the KHARIJITES ('those who go forth'), who held the old Arab view on the question of succession, and were thus directly opposed, in principle, to the 'legitimists.' They were, in reality, theocrats; and they claimed that any man might be called to the *imāmah*, or leadership, even if he did not belong to the Koreish, or was not even a freeman, provided only that he was just and pious and fit in every other respect. As a result of this they also claimed that an unrighteous imam might be deposed, or even put to death; and furthermore, that there was no absolute need for any imam at all. Since Ali, however, united in his person the claims of heredity and of election, they were at first among his partisans. But when at the battle of Siffin Ali submitted to arbitration the decision of his right to the caliphate as against Moawiyah, they refused to stand by the decision and swear allegiance to either one or the other. Twelve thousand of them consequently deserted Ali's camp in a body; they proclaimed "no rule but that of Allah alone." The Kharijites, though often defeated in this and succeeding caliphates, appeared again and again as the assailants of the established government.

After Ali's death, when Moawiyah had finally succeeded in establishing himself in control, he induced Hasan, the elder son of Ali, to yield up his prerogatives. Ali's followers, however, refused to recognize Moawiyah and espoused the cause of Hosein, Ali's second son. A bloody struggle followed, in which Hosein lost his life. The division of the Mohammedans into Sunnites and Shiites was now fixed, and the Shiites, consistently developing the theory of legitimism, refused to recognize that there had ever been any legitimate caliph between Mohammed and Ali. See SHIITES; SUNNITES.

Despite the fact that with Ali's death and the Ommiad supremacy the question as to the caliphate was settled, the Shiites still looked to the descendants of Ali as their religious leaders, or imams. But even among the Shiites themselves unanimity in regard to the imamah did not long prevail, and discussions of a theological nature likewise proved a source of trouble. The impulse to such discussions came from Persia, into which Mohammedanism had well penetrated, and which, since the principle of hereditary succession had always obtained there, naturally espoused the cause of Ali.

Down to the sixth imam, Jafar al-Sadik (died 765), there was agreement among the Shiites; Jafar, however, had two sons, Ismail and Musa al-Kasim. The former, as the elder, should have been successor to the imamah. The father, however, is said to have declared in favor of Musa; and on Jafar's death, a division ensued between the adherents of Ismail—the ISMAILIANS (*Ismā'iliyyah*)—and those of Musa, the greater part of the Shiites following the latter.

From this time on the question of the imamah received more and more a theological, mystical treatment. The notion of the imam, in general, was that of an ever-living, though at times hidden, supreme guide of the people, who after a time is restored to humanity, or at least to the believing part of it. (See MAHDI.) The Ismailian doctrine was that the imam had been revealed in Ali, whereas during the preceding ages the imams had been concealed; that Ali himself had reappeared in every imam till the time of Ismail, and had then become invisible again; but that he would descend some day 'from the clouds' to unite all believers and to restore the pure faith. The real importance, however, of the Ismailians, who existed unobserved for some time, dates from Abdallah ibn Maimun, whose father had been executed for professing materialistic doctrines and trying to turn people away from the doctrines of Islam. Abdallah seems to have practically carried out his father's notions. Aided by favorable circumstances, he matured a plan which, for the boldness and genius of conception and for the energy and vigor with which it was carried out, has not many parallels in history. Nothing less was contemplated than the union of the Arabic conquerors and the many races they had subjected since Mohammed's death, and the enthronement of what afterwards was called 'Pure Reason' as the sole deity to be worshiped. The advanced should be free of all so-called religious fetters, which, as symbols and allegorical actions, should be laid all the heavier on the necks of the less advanced strata of society. The 'believers' and 'conquerors' were to be made missionaries for unbelief and the implements for the destruction of their own empire. With an extraordinary knowledge of the human heart and human weakness, he offered devotion to the believer; liberty, if not license, to the 'free in spirit'; philosophy to the 'strong-minded'; mystic hopes to the fanatics; miracles to the masses. The Messiah whom Abdallah preached stood higher than Mohammed himself, and though he did not reject the Koran, he yet contrived to allegorize and symbolize away nearly all its narratives and precepts. An elaborate secret doctrine was worked out, into which the members of the sect were initiated by degrees. Missionary schools were established, and the instruction given to the young missionaries was artfully designed to win over not merely all the different Mohammedan sects, both Sunnites and Shiites, but also Jews and Christians. By the time the neophyte had completed the ninth and concluding degree of initiation, all his earlier religious beliefs had been explained away. He had learned that no miracle had ever been performed; that the prophet is merely a man distinguished by his purity and the perfection of his intelligence; and that this purity of his intelligence is precisely what is called 'prophecy.' God throws into the prophet's mind what pleases Him, and that is what is understood by the 'Word of God.' The prophet clothes this Word afterwards with flesh and bones, and communicates it to the churches. He establishes by this means the systems of religious institutions which appear to him the most advantageous for the ruling of men; but these institutions and behests are but temporary, and intended for the preservation of order and worldly interests. No man who has knowledge need practice any single one of them; to him his knowledge suffices.

The creed of the Ismailians was gradually built up, and many changes were introduced into it at different times; from it sprang various other sects. The most notable is that of the KARMATHIANS, or CARMATHIANS (so called from one of their leaders, surnamed *Al-karmaṭ*). This sect sprang up in the ninth century, under the caliphate of Al-Mutamid, and by a combination of extraordinary circumstances succeeded in establishing itself for a time as a political power which threatened to overturn the caliphate itself. The practical exertions of Abdallah ibn Maimun and their wonderful results had soon attracted the attention of the authorities. Obliged to flee from place to place, he sought refuge successively in Karaj, in Ispahan, in Ahwaz, in Basra, finally in Salamia, in Syria, where he died, leaving his son Ahmad his successor as chief of the Ismailians. One of Ahmad's missionaries (or, according to other accounts, a convert of a missionary) was Al-Karmat. He lived in Irak, and was a fit man to carry out the plans of Abdallah ibn Maimun. His house in Kufa became the centre whence all the missionaries were sent forth, and where all the details of a great conspiracy were directed. One of the most noted of the missionaries, Abu Said, won over a great part of the people of Bahrein, the majority of whom were not Mohammedans and impatient of the Moslem rule. In 900 Abu Said defeated an army of 10,000 men sent against him by the Caliph, and captured the latter's general. He then gained undisputed possession of the whole country, destroyed the old capital, Hajar, and made Lhasa, his own residence, the capital. At the same time two other Karmathian chieftains arose to threaten the Court of Bagdad, one near Kufa and the other in Syria. The former was defeated, captured, and tortured to death. The latter at first defeated the Governor of Damascus most ignominiously, but in 907 the Caliph's general, Wasif, won a decisive victory and made an end of this branch of the Karmathians. Meanwhile both Al-Karmat and Abu Said disappear from view, and the leadership passed to Abu Said's son, Abu Tahir. In 923 he seized Basra. The next year he pillaged the Meccan caravan and plundered Kufa. In 927 he gained a decided victory over the Caliph's troops in Irak. In 929 he appeared at Mecca at the head of his army, when the pilgrimage was at its height. Attempts to buy him off were unavailing, and a fearful massacre, lasting several days, ensued. The holy places were desecrated and the Black Stone was carried off. Abu Tahir may have thought that this act would destroy the sanctity of Mecca and the Kaaba in the eyes of the faithful; but if so he was mistaken; the caravans still went on their usual annual pilgrimage as often as he did not restrain them by force. In 939 the emir of the pilgrimage, Abu Tahir's personal friend, persuaded him to conclude a treaty by which the pilgrimage was again allowed, on payment of 5 dinars for every camel and 7 for every horse. The Black Stone was returned for an enormous ransom in 950, seven years after Abu Tahir's death. At that time the Karmathians were masters of Irak, Syria, and Arabia. Little of importance is heard of them again till 990, when they were defeated before Kufa—an event which seems to have made an end of their dominion in Irak and Syria. About 993 they were again defeated by Asfar, and their chief lost his life. They retreated to Lhasa, where they fortified themselves, while Asfar marched against Al-Katif, captured it, and carried away all the baggage, slaves, and animals of the Karmathians of that town and then retired to Basra. The Karmathians retained Lhasa for a considerable time, but nothing further is heard of them in history. In 1862-63 Palgrave found remnants of them still living in Najran, and in Bahrein and Oman, and their hatred of Islam seemed in no wise abated.

Concerning the special beliefs of the Karmathians, so far as they have been preserved, their system seems in the beginning to have been merely a sort of reformed Islam. The prophet Al-Karmat, it was held, had brought a new law into the world, by which many of the tenets of Mohammedanism were altered, many ancient ceremonies abrogated, new forms of prayer introduced, and an entirely new kind of fast inculcated. Wine and a few other things prohibited by the Koran were allowed. Certain of the precepts of the book were turned into mere allegories. Instead of tithes they gave the fifth part of their property to the imam. Prayer was merely the symbol of obedience to the imam. Fasting was the symbol of silence, or rather of concealment of religious doctrine from the stranger.

Another offshoot of the Ismailians is the sect known as ASSASSINS (*ḥashshishin*, a name derived from *ḥashish*, a drink drawn from hemp, to which the members of the sect were addicted). The sect owed its origin to Hasan ibn Sabbah, a Persian fanatic, who at the beginning of the eleventh century formed a secret society, the members of which swore blind obedience to their leader, known to history as the 'Old Man of the Mountain.' From their mountain fastnesses in Persia (Alamut) they bade defiance for two centuries to the strongest armies sent against them by Moslem rulers, and they were reduced to harmlessness only by the Mongol invasion (1255). They owed their power chiefly to the perfection of their secret organization and to the unscrupulousness with which they carried out their plans. They were perhaps best known for the countless assassinations of which the members of the sect were guilty. From Persia they spread into Syria and Asia Minor. While Hasan ibn Sabbah was still alive the Governor of Aleppo had invited them to settle in his territory, and they had taken possession of various mountain fastnesses from which they were enabled to play an important rôle in the Crusades. There are still a few Assassins in the neighborhood of Homs. See ASSASSINS.

When the Assassins came into Syria they found the mountain regions around Hama in possession of the NOSAIRIS, apparently a remnant of the ancient Syro-Phœnician population of the land, which had preserved its own religion through the centuries despite all the efforts of Christianity. Most of the Nosairis displayed a bitter enmity toward the Ismailians, though some embraced their cause, and at the end of the tenth century there was a strong infiltration of Ismailian doctrines into the general Nosairi religious system. In fact, the Nosairi religion, without being identical with Ismailism, shows many strong points of analogy with it. The Nosairis are divided into four sects—*Ḥaidariyyah*, *Kalaziyyah* (or *Kamariyyah*), *Shamaliyyah* (or *Shamsiyyah*), and *Ghaibiyyah*. The *Shamaliyyah* and *Kalaziyyah* are the most important. They all possess the same religious book (*Kitāb al-Majmu'*), and differ from one another only on points of minor importance. The chief variations from the Ismailian doctrines are these: While the Ismailians taught that of the seven cycles corresponding to the various manifestations of the deity, the sixth, that of Mohammed, was closed with the death of Jafar, and the seventh, which was to be characterized by the coming of the Mahdi, or Messiah, was thereby opened, the Nosairis taught that the seventh was closed by the seventh divine manifestation, that of Ali. Furthermore, the Nosairis recognized Musa instead of Ismail as the successor of Jafar al-Sadik. This was probably due to the fact that they had accepted as their leader Mohammed ibn Nosairi, who was a partisan of the eleventh imam, a descendant of Musa. And with Musa (died 799), who was the seventh imam, they considered the number of imams to have been completed. Another striking characteristic of the Nosairi belief was their attitude toward the *natiḳs*, the various divine incarnations. The Ismailians held that all the natiks excepting Mohammed were superior to their *assas* (foundations) or *sameṭs*, while the Nosairis placed all of their assas above the natiks. But of greatest importance was the degree to which they carried their doctrine of the divinity of Ali. Ali, while he confided the *word* to Mohammed, had reserved the *ma'na* (meaning) for himself. Ali is their god in heaven and their imam on earth; he is concealed from man because of his divine nature; he is not created and has no attributes; his essence is the light. He created Mohammed to be the veil with which he conceals himself, the place in which he resides, the bearer of his name. Mohammed in his turn created Salman al-Farisi to be the *bab*, or gate—the one through whom man communicates with the deity, and who is charged by the divinity with the making of his propaganda. Salman created the five 'incomparables' (in reality five planets) which created the world. The Nosairis are sometimes called ANSARIES (q.v.).

Besides the Assassins and Nosairis, a third sect with Ismailian tendencies found refuge in the Syrian mountain districts—the DRUSES. When Abdallah ibn Maimun found himself persecuted by the authorities he fled to Syria, and continued to preach there the coming of the Mahdi. His son Mohammed continued the propaganda, and finally the Mahdi himself appeared among the Berbers of North Africa. This Mahdi founded the Egyptian dynasty of the Fatimites (909), the sixth of which, Hakim, probably under Ismailian influence, declared himself an incarnation of the deity. He disappeared mysteriously, which helped to support his contentions. Hamza and Al-Darzi (whence the name

'Druze') were his propagandists (*dāʻi*), and gained many followers in the Lebanon mountains. It is interesting to note that one of Hamza's treatises was intended as a refutation of the Nosairi doctrines, and tried to show that Hakim, not Ali, was God. See DRUSES.

A sectary whose name has become familiar through the use made of his story by Thomas Moore in his *Lalla Rookh* was Hakim ibn Allah, better known as al-Mokanna, 'the veiled,' because he wore a mask to conceal the disfigurement of his face. He lived in the eighth century, and headed a revolt against Mahdi, the third Abbaside Caliph. He claimed to be an incarnation of the deity, and won repute as a miracle-worker. He made many followers, and for a time maintained himself against the Caliph, but was ultimately defeated and committed suicide. He left word that he would reappear as a gray man riding a gray beast, and his followers long expected his coming. They dressed only in white. See HAKIM IBN ALLAH.

All of these Shiite sects were political, or at least politico-religious, sects, whose doctrines turned about the question of the imamah. But there were in Islam also some sects purely theological, differing on such questions as predestination, free will, belief, idea of God, and revelation — points upon which Mohammed had not expressed himself clearly. It was again in Persia that the movement looking toward independent religious views took its rise, under the influence of Greek philosophy.

The most important of these theological or philosophical sects was perhaps the rationalistic sect of the MOTAZILITES, or MUTAZILITES (*Muʻtazilah*, from *ʻazala*, to separate). They were called also Moattalites—i.e. those who divest God of His attributes (Ar. *Muʻaṭṭilun*)—and Kadarites—i.e. "those who hold that man has a free will (Ar. *ḳadar*), and deny the strict doctrine of predestination." The first beginnings of this sect are traced to Mabad, who already in the time of Mohammed himself began to question predestination by pointing out how kings carry on unjust wars, kill men, and steal their goods, and all the while pretend to be merely executing God's decrees. The real founder of the sect, as such, however, was Wasil ibn Ata (c.745). He denied God's 'qualities,' such as knowledge, power, will, life, as leading to, if not directly implying, polytheism. As to predestination, he held that it existed only with regard to the outward good or evil that befalls man, such as illness or recovery, death or life, while man's actions are entirely in his own hands. God, he said, had given commandments to mankind, and it was not to be supposed that He had at the same time preordained that some should disobey these commandments, and that, further, they should be punished for it. Man alone is the agent in his good or evil actions, in his belief or unbelief, obedience or disobedience, and he is rewarded according to his deeds. These doctrines were further developed by Wasil's disciple Abu al-Hudhail al-Allaf (died c.845), who did not deny so absolutely God's 'qualities,' but modified their meaning in the manner of the Greek philosophers, holding that every quality was also God's essence. The attributes are thus not without, but within Him, and so far from being a multiplicity, they merely designate the various ways of the manifestations of the Godhead. God's will he declared to be a peculiar kind of knowledge, through which God did what He foresaw to be salutary in the end. Man's freedom of action is possible only in this world. In the next all will be according to necessary laws immutably preordained. The righteous will enjoy everlasting bliss, and for the wicked everlasting punishment will be decreed. A dangerous doctrine of this system was the assumption that before the Koran had been revealed, man had already come to the conclusion of right and wrong. By his inner intellect, Abu al-Hudhail held, everybody must and does know —even without the aid of the divinely given commandments—whether the thing he is doing be right or wrong, just or unjust, true or false. His belief in the traditions was also by no means an absolute one; indeed, it was held by the Mutazilites that even some of the earliest 'traditioners' may have told untruths, or have been imposed upon, and every tradition was to be rejected which was opposed to the Koran, to more authentic traditions, or even to mere reason. As to the Koran, although its authority was recognized, it was held to be created and not an object of worship.

Many were the branches of the Mutazilites. There were, apart from the disciples of Abu al-Hudhail, the *Jubbaians*, who adopted Abu Ali ibn Abd al-Wahhab's (Al-Jubbaï, d. 914) opinion to the effect that the knowledge ascribed to God was not an 'attribute'; nor was his knowledge 'necessary'; nor did sin prove anything as to the belief or unbelief of him who committed it, who would anyhow be subjected to eternal punishment if he died in it. Besides these, there were the Hashimites, the disciples of Abu Hashim Abd al-Salam, son of Al-Jubbaï, who held that an infidel was not the creation of God, who could not produce evil. Another branch of the Mutazilites were the disciples of Ahmad ibn Habit (or Haït), who held that Jesus was the eternal word *incarnate*, and that He had assumed a real body; that there were two gods or creators, one eternal —viz. the Most High God—and the other not eternal—viz. Jesus—not unlike the Socinian and Arian theories on this subject; that there is a successive transmigration of the soul from one body into another, and that the last body will enjoy the reward or suffer the punishments due to each soul, and that God will be seen at the resurrection with the eyes of understanding, not of the body.

Four more divisions of this sect are mentioned —viz. the *Jāḥiziyyah*, whose master's (Amr ibn Bahr al-Jahiz) notion about the Koran was that it was "a body that might grow into a man, and sometimes into a beast, or to have, as others put it, two faces, one human, the other that of an animal, according to the different interpretations." He further taught that the damned would become fire, and thus be attracted by hell; also that the mere belief in God and the Prophet constituted a 'faithful one.' Of rather different tendencies was Isa Al-Muzdar, the founder of the branch of the *Muzdariyyah*. He not only held the Koran to be uncreated and eternal, but so far from denying God the power of doing evil, he declared it to be possible for God to be a liar and unjust. Another branch was formed by the *Bishriyyah* (from Bishr ibn al-Mutamir), who, while they carried man's free agency rather to excess, yet held that God might doom even an infant to eternal punishment—all the while granting that He would be unjust in so doing.

The last of these Mutazilite sectarians to be mentioned are the *Thumamiyyah*, who held, after their master, Thumamah ibn Ashras, that sinners will undergo eternal damnation and punishment; that free actions have no producing author; and that, at the resurrection, all infidels, atheists, Jews, Christians, Magians, and heretics will be returned to dust, and will not enter either paradise or hell. For the scientific development which the doctrines of the Mutazilites begot, and which resulted in the encyclopædic labors called "The Treatises of the Sincere Brethren and True Friends," see SINCERE BRETHREN.

Allied to the Mutazilites in their view of the divine attributes, but diametrically opposed to them in their view of predestination, were the JABARITES (Necessarians). They held that man's every act is the result of the will of God, and that there is no human responsibility. There are pure Jabarites and middle Jabarites.

Opposed to both the Mutazilites and the Jabarites were the SIFATITES ('Attributists'). With them God's attributes, whether essential or operative, or declarative or historical—i.e. used in historical narration (eyes, face, hand); anthropomorphisms, in fact—were considered eternal. But here again lay the germs for more dissensions and more sects. Some, taking this doctrine of God's attributes in a strictly literal sense, assumed a likeness between God and created things, while others gave it a more allegorical interpretation, without, however, entering into any particulars beyond the reiterated doctrine that God had no companion or similitude. The different sects into which the Sifatites split were, first, the *Asharians*, so called from Abu al-Hasan al-Ashari (883-951), who, at first a Mutazilite, disagreed with his masters on the point of God's being bound to do always that which is best. He became the founder of a new school, which held (1) that God's attributes are distinct from His essence, and that any literal understanding of the words that stand for God's members in the Koran is reprehensible. (2) That predestination must be taken in its most literal meaning—i.e. that God preordains everything. The opinions on this point of man's free will are, however, much divided, as, indeed, to combine a predestination which ordains every act with man's free choice is not easy. The middle path, adopted by the greater number of the doctors, is expressed in this formula: There is neither compulsion nor free liberty, but the way lies between the two, the power and will being both created by God, while the merit or guilt is imputed to man. Regarding mortal sin, it was held by this sect that if a believer die guilty of it without repentance, he will not, for all that, always remain a denizen of hell. God will either pardon him or the Prophet will intercede in his behalf. Further, he in whose heart there is faith but of the weight of an ant shall be delivered from hell fire. From this more philosophical opinion, however, departed a number of other Sifatian sects, who, taking the Koranic words more literally, transformed God's attributes into grossly corporeal things; the *Mushabbihites*, or Assimilators, conceived God to be a figure having limbs like those of created beings, either of a bodily or of a spiritual nature, capable of local motion, ascent, or descent, etc.

The *Murjites*, likewise regarded as a sect of the Sifatites, are sometimes regarded as the representatives of the whole sect, for their doctrines were very widespread, and they counted among them such men as Said ibn Jubair. The sect arose in Syria or North Arabia. It is worthy of note that some of the Murjites hold views approaching closely not only to those of the Mutazilites and Jabarians, but even, with reference to the imam, to those of the Kharijites.

Aside from the sects which owed their rise to political or theological differences, there were others in Islam which sprang from mysticism and asceticism. It is true that the secluded life of the monastery or hermitage was forbidden to Mohammedans by the Koran; nevertheless as early as the first and second centuries of the Hejira a sect of mystics had come into existence the distinguishing external mark of whom was a garment of coarse wool (*suf*), such as had been worn by the founder of the sect, Abu Said ibn Abi al-Khair (815); they came therefore to be known as SUFITES. Their main idea was that to attain to a nearer friendship with God there was necessary a certain course of life which, without demanding entire withdrawal from the world, insisted that religious laws be scrupulously observed, and that, God being loved above all else, everything worldly be despised. Merx has shown that this Oriental mysticism goes back finally to Palestine and Neo-Platonic philosophy, having come to the Mohammedans through the writings of Syrian philosophers. The main stronghold of the sect, however, was, like that of so many others, in Persia, where Sufism made many converts from among the heterodox, and also gradually altered its original character. At first the Sufi had aimed by ascetic practices and religious contemplation to enter into a state of ecstasy in which he might attain to a real knowledge of the deity; but later Sufism became in certain regards a real pantheism, and its adherents in the ecstatic state felt themselves united with, and a part of, the Godhead. Sufism had its organization like other religious orders; the religious meetings were called *dhikrs;* novices (*murid*) were held to regular and exacting duties, as well as to strict compliance with the commands of the sheikh.

A later development (twelfth and thirteenth centuries) of mysticism is represented by the various orders of DERVISHES—*Kadiriyyah*, *Rifaiyyah*, *Maulawiyyah*, etc.—each with its own garb and symbols, rules of faith and practice as determined by its founder. Their *dhikrs* take place once or oftener every week in their religious houses (*takkiyyah*). There are howling, whirling, and dancing dervishes, and in some orders the members become so insensible to physical sensation while in the state of esctasy that they swallow glass or glowing coals, and often wound themselves severely in other ways. Most dervishes follow a trade, and do not withdraw from the affairs of life. There are also some begging dervishes, who have no dwelling places and live entirely from alms. See DERVISH.

The last of the Shiite religious movements is known as BABISM (q.v.). In the earlier half of the nineteenth century Mirza Ali Mohammed al-Bab (gate) made propaganda for a mixture of Sufic and cabalistic doctrines which was soon accepted by a large following. They even threatened the Persian Government at one time, and had to be put down by force of arms.

Such were the numerous sects against which orthodox Mohammedanism was forced to contend; but although Shiite doctrines more than once threatened to gain the ascendency, Sunnism remained the victor in the end. The four sects into which the Sunnites are divided—the *Hanbalites, Malikites, Hanifites,* and *Shafi'ites*—differ only in regard to a few points of minor importance connected with religious observances and civil and religious jurisprudence. These sects have remained almost without change since their foundation under the Abbasside dynasty. Nevertheless, certain innovations had crept into the life of orthodox Mohammedans, principally an exaggeration of the reverence paid to the numerous saints, which amounted often to actual worship. It was against such abuses, as well as against all forms of luxury in every-day life, tobacco-smoking, etc., that Abd al-Wahhab and his followers (the Wahhabites) arose in the latter half of the eighteenth century. From Nejd they carried on an iconoclastic warfare throughout the country; they conquered Mecca and Medina, and in destroying the many sanctuaries there did not even spare the grave of Mohammed. Previous to this they had taken Kerbela, a holy city of the Shiites in Mesopotamia. They were defeated finally by Egyptian troops, and driven back into the interior of the peninsula, and the Wahhabites lost their importance. They still exist, however, as a sect.

Bibliography. Consult: Shahrastani, *Book of Sects,* translated into German by Haarbrücker (Halle, 1850); Steiner, *Die Mu'taziliten* (Leipzig, 1865); Brünnow, *Die Charidischten unter den ersten Omayyaden* (Leyden, 1884); Kremer, *Geschichte der herrschenden Ideen des Islam* (Leipzig, 1868); Spitta, *Zur Geschichte Abu 'l-Hasan al As'ari's* (ib., 1876); Schmölders, *Essai sur les écoles philosophiques chez les Arabes* (Paris, 1842); Krehl, *Beiträge zur Charakteristik der Lehre vom Glauben im Islam* (Leipzig, 1877); Tholuck, *Sufismus sive Theosophia Persarum Pantheistica* (Berlin, 1821); id., *Blüthensammlung aus der morgenländischen Mystik* (ib., 1825); Merx, *Idee und Grundlinien einer allgemeinen Geschichte der Mystik* (Halle, 1893); Goldziher, *Mohammedanische Studien* (ib., 1889-90); id., *Die Zahiriten* (Leipzig, 1884); De Goeje, *Mémoire sur les Carmathes de Bahraïn et les Fatimides* (Leyden, 1886); Sylvestre de Sacy, *Exposé de la religion des Druzes* (Paris, 1828); Goldziher, *Beiträge zur Litteraturgeschichte der Schi'a und der sunnitischen Polemik* (Vienna, 1874); Guyard, *Fragments relatifs à la doctrine des Ismaïlis* (Paris, 1874); Burckhardt, *Notes on the Bedouins and Wahhabis* (London, 1820); Gobineau, *Les religions et les philosophies de l'Asie centrale* (Paris, 1865); E. G. Browne, *A Year Among the Persians* (London, 1893); id., *A New History of the Bab* (Cambridge, 1893); Chantepie de la Saussaye, *Lehrbuch der Religionsgeschichte,* vol. i. (Freiburg, 1887); De Boer, *Geschichte der Philosophie im Islam* (Stuttgart, 1901); Dussaud, *Histoire des Nosairis* (Paris, 1900); Macdonald, *Development of Muslim Theology, Jurisprudence, and Constitutional Theory* (New York, 1893).

MOHAMMED BEN MOHAMMED BEN YAHAYA, yä′hȧ-yȧ, Abul Wefa, or Wafa (940-998). An Arabic mathematician and astronomer, born at Buzjan, and generally known as Abul Wefa. He translated and commented upon works of several Greek mathematicians, and calculated a table of sines at intervals of half a degree, and also a table of tangents, which, however, was used only for determining the altitude of the sun. The ratio, $\frac{\sin a}{\cos a}$, was called by him the 'shadow.' He is, however, most famous for having made the oldest known attempt to solve geometric problems with only one opening of the compasses, and wrote a book containing 12 chapters on geometrical constructions. Our knowledge of this work is due to a Persian translation of an Arabic manuscript, written by a pupil of Abul Wefa. The problems may be divided into three groups: (1) Those dealing with the solution of geometrical problems by one opening of the compasses; (2) to divide a given square in a given number of squares, and to construct a square equal to a number of given squares; this is done by juxtaposition, and not by the Pythagorean method; (3) problems having for aim the construction of regular polyhedra. In the problem-duel between Tartaglia (q.v.), on one hand, and Cardan (q.v.) and Ferrari, on the other, problems of the first group were given for solution and appear in the works of Leonardo da Vinci and Cardan. They also occur in several other works of the sixteenth century, but first found accurate scientific expression in Steiner's *Geometrische Constructionen,* etc. (1883). Consult: Volpeke, *Journal Asiatique,* vol. v. (1855); Cantor, *Geschichte der Mathematik,* vol. i. (Leipzig, 1900).

MOHAM′MED BEN MU′SA AL-KHOWARAZMI. See Al-Khowarazmi.

MOHAMMED KUDAH BUNDAH KHAN, ko͞o′dȧ bo͞on′dȧ kän. See Mongol Dynasties.

MOHAMMERAH, mȯ-häm′mȧ-rȧ. A town in Southwestern Persia, Province of Khuzistan, situated on a canal leading from the Karun River to the Shat-el-Arab, 35 miles from the Persian Gulf (Map: Persia, C 5). The surrounding region produces excellent dates. The harbor is accessible for large ships, and the town has an active trade, which has become especially important since the opening of the Karun to international navigation in 1889. Population, 15,000.

MOHAVE, mȯ-hä′vȧ. An interesting tribe of Yuman stock (q.v.), residing along both banks of the lower Colorado River, in Arizona and California. Their popular name, corrupted from *hamok-habi,* signifies 'three mountains,' in allusion to the three buttes known as the Needles, which they regard as the central point of their ancient territory. They are agricultural, although somewhat nomadic in habit, and in physical type they rank among the finest specimens of the American aborigine. They live in low wikiups of brushwood covered with sand, make pottery and baskets, and cultivate corn, pumpkins, melons, and beans, which, with fish and mesquite beans, give them an abundant subsistence. They practice tattooing and cremate their dead. They have certain hereditary family names, and a chiefship hereditary in the male line, but do not seem to have the true clan system. They are warlike, and avoid intimacy with other tribes or with the whites, and still preserve most of their primitive characteristics.

They number now about 2160, of whom 660 are on Colorado River Reservation, Arizona, and earn a fair living as mine laborers, wood-cutters, and boatmen along the river. Some study of the tribe has been made by Kroeber, of the University of California. See YUMA.

MOHAVE DESERT. A desert region in southern California, lying principally in San Bernardino County (Map: California, E 4). It is a part of the Colorado Desert (q.v.), although the two names are often used synonymously.

MO'HAWK (New England Algonquian name, *Maqua, Mahaqua,* Bear; they call themselves *Ganiega-rono,* Bear People, or Flint People). The leading tribe of the Iroquois confederacy (q.v.) and formerly occupying the Lower Mohawk River Valley, in New York. They were considered the keepers of the eastern 'door' or frontier of the 'long House' of the confederacy, the Seneca being assigned the duty of guarding the western door. The Mohawk territory was supposed to extend northward to the Saint Lawrence, eastward to the country of the Mahican and Wappinger along the Hudson, and southward to the watershed of the Delaware River and the Catskill Mountains, where they bordered upon the Delaware and Munsee. Their geographic position thus brought them into early and intimate contact with the Dutch and English settlers, from whom they procured the firearms which soon made their very name a terror to the remoter tribes. This exposed situation, however, caused them to suffer much more than their confederates in the colonial wars, so that their seven villages of 1644 were reduced to five in 1677, some whole clans seeming to have been wiped out. They also furnished the larger share of recruits for the Catholic mission colony of Caughnawága (q.v.). At the beginning of the Revolution they took sides with the British, and nearly the entire tribe, under Brant, fled to Canada, where they have resided ever since. The remainder were driven out by the Oneidas, who burned their villages.

The most reliable early estimate, about 1660, gave the Mohawk 2500 souls. Then began a rapid decline, caused by war with other tribes and with the French, and by removals to Caughnawága and other French Catholic mission settlements, and in 1677 they were estimated at only 1500. Later figures, being only partial estimates, give no idea of their full number. No Mohawk, officially so recognized, now resides on the New York reservations or elsewhere in the United States. In Canada the only Indians separately reported as Mohawk are the 'Mohawk of the Bay of Quinté,' Ontario, numbering 1230, chiefly farmers, and reported as increasing in industry year by year, making good progress and becoming richer. Besides them there are a number of this tribe living with the other Six Nations on the Grand River Reserve, Ontario, while the 'Iroquois' of the mixed Iroquois and Algonquian bands at Gibson, Ontario (total 125), and Oka or Lake of Two Mountains, Quebec (total 445), with the Iroquois of Caughnawága and Saint Regis (q.v.), numbering altogether about 4460, are largely of Mohawk origin and all use that language. See IROQUOIS.

MOHAWK RIVER. The largest affluent of the Hudson. It rises near the boundary of Oneida and Lewis counties, N. Y., and flows south to Rome, where it takes a general easterly course through Herkimer, Montgomery, Schenectady, and Saratoga counties, and joins the Hudson at Cohoes (Map: New York, F 3). In its course of nearly 150 miles it passes through the celebrated Mohawk Valley, one of the most beautiful and fertile agricultural regions in the United States. In colonial times the valley was the main highway to the Great Lakes, and during the Revolution a bitter contest was waged between the American and British forces for its control. There are many thriving manufacturing cities along the Mohawk, which is paralleled by the Erie Canal, and the New York Central and the West Shore railroads, forming a great trade route between the Atlantic seaboard and the West. See NEW YORK.

MOHE'GAN (dialectic form of *Mahican,* from which tribe the Mohegan were originally an offshoot). An Algonquian tribe formerly residing chiefly upon the Thames River in eastern Connecticut, and claiming dominion by conquest over several smaller adjoining tribes, not all of which, however, admitted the claim. They seem to have been an eastern extension from the Mahican of the Hudson, while the warlike Pequot (q.v.) were in turn a branch of the Mohegan. At the period of the first settlement of Connecticut the two last named tribes formed one body, under the rule of Sassacus. Uncas, a subordinate chieftain, rebelled against him and assumed a distinct authority as the leader of a small band on the Thames, near the present Norwich. This band became known in history as the Mohegan, while those remaining with Sassacus were distinguished as Pequot. In the struggle between the Pequot and the colonists Uncas aided the English, and in consequence on the destruction of the Pequot tribe in 1637 the greater part of the survivors were placed under the dominion of the Mohegan chief, who thus obtained control of the territory of both tribes. He took such care to strengthen his power with the English that after the death of King Philip in 1676 the Mohegan were the only important tribe remaining in Southern New England. As the settlements extended they sold most of their lands, retaining only a small reservation on the Thames River, in New London County, Connecticut, centring about their village, Mohegan. The villages of Groton and Stonington, occupied chiefly by the remnants of the conquered Pequot, were considered also as under Mohegan jurisdiction. They rapidly dwindled when surrounded by the whites, many joining the kindred mission bands at Scaticook and Brotherton in New York. The rest continued to reside at Mohegan until now they are so mixed with negro and white blood that they have practically lost their identity, although they still retain official State recognition. In 1705 they numbered 750 at Mohegan, reduced to 206 in 1774 and 69 in 1809, any larger number reported later being due to foreign admixture.

MOHILEV, mō-hē-lyĕf'. A government of European Russia, bounded by the Government of Vitebsk on the north, Smolensk on the east, Tchernigov on the southeast and south, and Minsk on the west (Map: Russia, D 4). Area, 18,522 square miles. The northern part of the government is slightly elevated, forming the watershed between the Dnieper and the Düna. The southern and larger part belongs to the region of Poliessie (q.v.) and is low and partly marshy. The government is well watered; the Dnieper and its tributary the Sozh are the chief rivers. Mohilev has a moderate but rather damp climate, and in the low and marshy parts fever is prevalent. Agriculture, which is the principal industry, is carried on by the most primitive methods and famines are not infrequent. The live stock is of a very inferior breed. Gardening is carried on extensively in the vicinity of the towns. The forests, covering more than one-third of the total area, yield turpentine and charcoal and supply the material for the production of wood implements, wagons, etc., which are manufactured on a small scale. In addition there are produced paper, spirits, oil, wire nails, flour, glass, matches, etc. The trade is largely in the hands of the Jews. Population, in 1897, 1,708,041. Capital, Mohilev (q.v.). In early times the present province of Mohilev belonged to the Principality of Smolensk. Annexed in the fourteenth century to Lithuania, it afterwards became part of the Polish monarchy and was annexed to Russia at the first partition of Poland in 1772.

MOHILEV. The capital of the Government of Mohilev in West Russia, situated on both banks of the Dnieper, 483 miles south of Saint Petersburg and 375 miles southwest of Moscow (Map: Russia, D 4). It lies in a picturesque region and has a number of interesting buildings. The cathedral, in Greek style, whose cornerstone was laid in 1780 by Catharine II. and the German Emperor Joseph II., the town hall (1679) with an octagonal tower, and the new theatre are noteworthy. There are also at Mohilev some interesting monasteries, numerous churches of different denominations, and a museum with noteworthy collections. The educational institutions include two gymnasia, two theological seminaries, several special schools, a manual training school, and a public library. Mohilev produces largely leather, linseed oil, flour, and tobacco. A considerable part of its inhabitants are also engaged in gardening and fishing. Population, in 1897, 43,106, including over 20,000 Jews.

MOHILEV. The capital of a district of the same name in the Russian Government of Podolia, situated on the Dniester, 89 miles east-southeast of Kamenetz-Podolsk (Map: Russia, C 5). The inhabitants are chiefly engaged in gardening and the transit trade in agricultural products and lumber with Galicia and Odessa. Population, in 1897, 22,100, over one-half Jewish.

MOHL, mōl, HUGO VON (1805-72). A German botanist. He was born in Stuttgart; studied medicine and natural sciences at Tübingen, and became professor of botany and director of the botanic garden there in 1835. He made contributions of the utmost importance to vegetable physiology. He wrote: *Grundzüge der Anatomie und Physiologie der vegetabilischen Zelle* (1851). His *Vermischte Schriften botanischen Inhalts* (1845) contains a considerable number of his most important monographs.

MOHL, JULIUS VON (1800-76). A German Orientalist, brother of the preceding. He was born at Stuttgart, October 28, 1800; studied Persian and Chinese at Tübingen, Paris, London, and Oxford; was professor of Oriental literature in Tübingen (1826-32); went to Paris and became professor of Persian at the Collège de France in 1845; and in 1852 inspector of the Oriental department of the national printing office. He died at Paris, January 4, 1876. His principal work is his edition of Firdausi's *Shāh Nāmah* (1831-68), of which he also made a complete French translation, published after his death, *Le livre des rois traduit et commenté* (1876-78). He wrote also *Dante et les origines de la littérature italienne.* His wife, who was Miss Mary Clarke, maintained for many years a salon frequented by the wits and scholars of her time. Consult Simpson, *Letters and Recollections of Julius and Mary Mohl* (1887).

MOHL, ROBERT VON (1799-1875). A German jurist and statesman, brother of the preceding. He was born in Stuttgart, studied law at Heidelberg, Göttingen, and Tübingen, and in 1824, after publishing *Das Bundesstaatsrecht der Vereinigten Staaten von Nord-Amerika,* was made a professor at Tübingen. But his attack on the political régime during his candidacy for the legislature in 1845 forced him from this chair and from the governmental employ. Almost immediately afterwards he was elected to the Lower Chamber of Württemberg, became professor at Heidelberg (1847), and was a member of the *Vorparlament* and of the National Assembly at Frankfort. After acting for seven months as Minister of Justice in the Imperial Ministry set up by the Frankfort Parliament he returned to his professorial duties in Heidelberg (1849), and from 1857 represented the university in the First Chamber of Baden. From 1861-66 he was representative of Baden at the German Bund at Frankfort, and from 1867-71 he was Ambassador to Munich. A year before Mohl's death he was elected to the German Reichstag. Among his writings are: *Staatsrecht des Königreichs Württemberg* (1829-31); *Die deutsche Polizeiwissenschaft* (1832-34; 3d ed. 1840); *Encyklopädie der Staatswissenschaften* (1859; 2d ed. 1872); and *Das deutsche Reichsstaatsrecht* (1873).

MÖHLER, mē′lẽr, JOHANN ADAM (1796-1838). One of the most distinguished modern polemical divines of the Roman Catholic Church. He was born at Igersheim, in Württemberg, May 6, 1796. He received his education at the gymnasium of Mergentheim, the lyceum of Ellwangen, and the University of Tübingen. He received priest's orders in 1819, and for a short time was employed in missionary duty. In 1823 he began to lecture on canon law and Church history at Tübingen, and in 1826 became professor extraordinary, in 1828 professor ordinary of theology. His earliest publication was *Die Einheit in der Kirche oder das Prinzip des Katholizismus* (1825), which was followed in 1827 by a historico-theological essay *Athanasius und die Kirche seiner Zeit.* His reputation rests mainly on his *Symbolik* (1832; Eng. trans., London, 1843). In 1835 Möhler removed to the University of Munich. His first appointment was nominally the chair of biblical exegesis, but he really devoted himself to the department of Church history, in which his opening course was eminently successful. He died in Würzburg, April 12, 1838. His miscellaneous works were collected and published posthumously in two volumes (Regensburg, 1839-40), by his friend Dr. Döllinger; his lectures on Church history by Gams (ib., 1867-70). Consult his biography by Wörner (Regensburg, 1866).

MOHLER, JOHN FREDERICK (1864—). An American physicist, born near Carlisle, Pa. He graduated at Dickinson College in 1887, and at Johns Hopkins University in 1887, and afterwards was appointed professor of physics at Dickinson. His researches include investigations on the surface tension of water below 0° Centigrade. He assisted in the discovery that the pressure surrounding the electric arc changes the wave-length of the light emitted, and discovered the relation of the 'shift' of spectral lines to the atomic volume, as well as a peculiarity in the light spectrum of magnesium. He also measured the pressure in the electric light spark. His publications include *A Manual of Practical Physics* (1897-1903), and numerous articles in scientific publications.

MOHN, mōn, Henrik (1835—). A Norwegian meteorologist, born at Bergen, and educated at Christiania. In 1860 he was made assistant in astronomy, and in 1866 director of the meteorological institute of the Christiania University. Mohn represented Norway in many international congresses of meteorology and was a member of the Polar Commission which organized magnetic and meteorological stations (1882 sqq.). His writings include *Les orages dans la peninsule scandinave* (with Hildebrandsson, 1888) and a very valuable *Grundzüge der Meteorologie* (1875; trans. into Italian, Spanish, French, Russian, Polish, and Flemish).

MO'HO. A tropical tree. See Hibiscus.

MO'HO. A honey-sucker of the Sandwich Islands whose native name has become the designation of a local genus of the family Meliphagidæ, which contains two species, the yellow-tufted moho, or 'oo' or 'uho' (*Moho nobilis*) and another (*Moho apicalis*). They are handsome, long-tailed blackish birds with bright yellow tufts of feathers on each side of the wings, and some white tail feathers. Since the disappearance of the mamo (q.v.) the feathers of the moho have been used for making the ceremonial robes and ornaments of Hawaiian chiefs, until they were superseded by European clothes and insignia of rank. Early accounts of the islands record that this bird, which frequented the mountains and forests, and had much the appearance and habits of a North American oriole, was captured by means of bird-lime. Its yellow feathers having been plucked out, it was then freed, in hope that it would furnish another supply the next year. These feathers, from which also a beautiful headdress (for women) called 'leis' was made, were received by the King as a poll-tax; yet it took many years to collect enough for a mantle, the price of which, estimating the time and labor at modern standards, would probably exceed a million dollars. A few examples of these feather cloaks are preserved in European museums. See Plate of Creepers.

MOHOCKS. The name by which the members of the Mohock or Mohawk Club of London in 1711-12 were known. The object of the club was mischief. With the Restoration it had become a favorite amusement of dissolute young gentlemen to swagger at night about the town, breaking windows, upsetting sedans, beating quiet men, and offering rude caresses to pretty women. The Mohocks, who formed one of the ruffian clubs of the time, made a specialty of slitting men's noses, beating people, and rolling women in hogsheads down Snow Hill. A royal proclamation dissolved it after about a year's existence. Consult Swift, *Journal to Stella.*

MOHR (Ar. *muhr*, colt, from *mahara*, to be adroit). A West African gazelle (*Gazella mohr*), called the 'swift,' and among the largest of its group, which is much hunted by the Arabs of Senegal because its stomach often contains the bezoars called 'mohr's eggs,' so highly valued in Morocco and the western Sahara for their supposed medicinal properties.

MOHR, Charles Theodor (1824—). An American botanist and forester. He was born at Esslingen in Württemberg; studied at the Stuttgart Polytechnic; and with Kappler explored Dutch Guiana in 1845. He went to California on the discovery of gold in 1849, and, after four years as a druggist in Louisville, Ky., removed to Mobile, Ala., in 1857. He was a member of the committee on revision of the United States Pharmacopœia in 1890, and in 1892 gave himself up to forestry and botany. He had been appointed botanist of the Alabama Geological Survey in 1884, and agent of the Forestry Division of the United States Department of Agriculture in 1889. He contributed to Berney's *Handbook of Alabama*, and wrote *The Timber Pines of the Southern United States* (1896-97) and *Plant Life of Alabama* (1901).

MO'HUN, Michael (1620?-84). A noted English actor of the period following the Restoration. He had been a soldier both in the Civil War and afterwards in Flanders, where he got the title of major, by which he was known. He was a member of the company in the early days at Drury Lane, then the Theatre Royal, and created rôles in several of the plays of Dryden and of Lee. King Charles II., for whose father he had fought, regarded him highly. He died in London in October, 1684. Consult: Geneste, *History of the English Stage* (Bath, 1832); Doran, *Annals of the Stage* (ed. Lowe, London, 1888); Downes, *Roscius Anglicanus* (repr. London, 1886).

MOIDORE, moi'dōr (Port. *moeda d'our*, money of gold). A former gold coin of Portugal, of the value of 4800 reis, or nearly $6.75. It was also called *lisbonine.*

MOIGNO, mwä'nyō', François Napoléon Marie (1804-84). A French mathematician, born at Guémené in Morbihan. He entered the Society of Jesus in 1822 and devoted himself to the study of mathematics and physics. During the Revolution of 1830 he sought refuge with others of his Order in Switzerland. In 1836 he became professor of mathematics at the preparatory school of Sainte Geneviève in Paris. He resigned from his Order in 1844 and became connected with various journals. Among his works are *Leçons de calcul différentiel et de calcul intégral* (1840-61); *Répertoire d'optique moderne* (1847-50); *Les splendeurs de la foi* (1879-83); and *Les livres saints et la science* (1884).

MOIR, David Macbeth (1798-1851). A Scottish humorist, born at Musselburgh, a small seaport near Edinburgh, January 5, 1798. He studied medicine, and practiced in his native town. Moir became widely known by his essays and poems contributed to *Blackwood's Magazine* under the signature Δ (delta). He died July 6, 1851. Moir's most interesting production is a

Scotch novel entitled *The Autobiography of Mansie Wauch* (1828; new ed. 1895). Consult also *Poetical Works*, ed. with memoir by Aird (Edinburgh, 1852).

MOI′RA, second Earl of. An English general and administrator in India. See HASTINGS, FRANCIS RAWDON HASTINGS, MARQUIS OF.

MOIRE, mwär (Fr. mohair). A silk figured by the peculiar process called watering. The silks for this purpose are moistened and then folded from one end to the other in triangular folds. After being thus reduced to a comparatively small length they are submitted to heavy pressure, generally in a hydraulic press. After being removed from the press the fabric is found to be covered with wavy lines. As only one side is to be waved, the fabric is made up for the press with a pasteboard above each second fold. The silk is next hot-pressed, and the side next to the pasteboard comes out glazed, while the other remains watered. The finest kinds of watered silks are known as *moirés antiques*. The same process has been applied to woolen fabrics called moreen.

MOIS, mō′ēz (an Annamese term corresponding to the Cambodian *Peunong*, Loatian *Kha*, Tonkinese *Myong*, etc.). An extensive group of so-called savage tribes dispersed over the tablelands and mountains between the Mekong and the Annamese coast, from the frontiers of Yun-nan to Cochin-China. They have been regarded as one of the eight groups of Farther Indian aborigines. In spite of the multitude of tribes into which the Mois are divided, they exhibit a remarkable uniformity in physical type and manners. Some scholars regard them as 'Indonesians,' but this needs proof. In physical type they are rather short, dolichocephalic, straight-eyed, somewhat wavy-haired, with reddish dirty-white skin. The Mois are as a rule of peaceful disposition, being hunters and husbandmen of a primitive sort. Some of them are noted for their poisoned arrows. In the Mois a sub-Caucasic (white) physical trait has been detected, and others ally them, by reason of their manners and customs, and implements, with the Malayan peoples. Formerly the Mois were reported to be Negritos or Papuans and classed with the black, woolly-haired peoples of the globe. Consult Dourisbouve, *Les sauvages Ba-Hnars* (Paris, 1873); Deniker, *Races of Man* (London, 1900).

MOISSAC, mwä′sȧk′. A town of France, in the Department of Tarn-et-Garonne. It is on the river Tarn, and on the railroad from Bordeaux to Cette (Map: France, H 7). The Church of Saint Pierre, dating from the year 1100, with its elaborate portal, is one of the most curious religious edifices in France. Moissac has a good trade in flour, grain, oil, and wine. Population, in 1901, 8407.

MOISSAN, mwä′sän′, HENRI (1852—). A French chemist, born in Paris. He studied at the Museum of Natural History; became connected with the School of Pharmacy (1879), its professor of toxicology (1886) and of mineral chemistry (1889). He won the Lacaze prize in 1887 for his valuable experiments with fluorine, which he was the first to isolate and to liquefy. His most striking success was the artificial production of diamonds, by sudden cooling of molten iron or silver impregnated with carbon (1893-94). More practical was his simplification of the production of acetylene gas. Moissan contributed articles on chrome, manganese, and iron to Frémy's *Encyclopédie chimique* and wrote: *L'isolement du fluor* (1886); *Reproduction du diamant* (1893); *Carbure de calcium* (1894); and *Etude complète des carbones amorphes et des graphites* (1898).

MOISTURE. See HUMIDITY.

MOIVRE, mwä′vr', ABRAHAM DE. A French-English mathematician. See DE MOIVRE.

MOJARRA, mō-här′rȧ (Port. name). (1) Any of many carnivorous sea fishes of moderate or small size, allied to the porgies (Sparidæ), and constituting the tropical family Gerridæ. Some of them are well known and of some importance as market fishes. The small silvery Pacific Coast species of the genus Eucinostomus are called 'mojarritas.' The 'mojarra blanca' or 'broad shad' (*Xystæma cinereum*) is a favorite food fish on both coasts of Central America and in Cuba. Another species of that region (*Gerres olisthostomus*) is called 'Irish pompano' and 'muttonfish' by fishermen. The term is applied, by the aid of a discriminative adjective, to various outside fishes, e.g. the cow-pilot.

MOJI, mō′jē. A town of Japan situated at the northern extremity of the island of Kiushiu, on the Strait of Shimonoseki and opposite the city of that name (Map: Japan, B 7). It has grown rapidly to an important place since 1891, when it became the terminus of the Kiushiu Railroad. The extensive coal deposits in the neighborhood also add to its importance. The Moji side of the channel, which is here one mile wide, is more convenient as a landing place for steamers than the port of Shimonoseki, and the foreign trade of the town now amounts to over $3,000,000 annually. Population, in 1898, 25,274.

MOJSISOVICS, moi′sē-sō′vĭch, EDMUND VON (1839-97). An Austrian geologist and student of the Alps. He was born and educated at Vienna; founded the Austrian Alpine Society—the first of the kind in Europe—in 1862, and in 1869 a like association in Germany, which joined the Austrian society in 1873. In the Imperial Geological Institute he became chief geologist in 1870, and assistant director in 1892. His more important works include *Das Gebirge um Hallstatt* (1873-76); *Die Dolomitriffe von Südtirol und Venetien* (1878-80); *Die Cephalopoden der mediterranen Triasprovinz* (1882); *Arktische Triasfaunen* (1886); *Die Cephalopoden der Hallstätter Kalke* (1893); and *Die Cephalopoden der oberen Trias des Himalaya* (1896).

MOKADDASI, mŏk′ȧ-dȧ-sē (Ar. *Abū 'Abd Allāh Muḥammad ibn Aḥmad al-Muḳaddasī*, or *al-Maḳdisī*). A famous Mohammedan geographer. He was born at Jerusalem (whence his name: *Muḳaddasi* = from Jerusalem) in 946. His father was an architect and gave his son a good education. In his twentieth year he made the pilgrimage to Mecca and afterwards decided to devote his life to the study of geography. For a score of years he journeyed up and down through the Moslem world, seeking information with infinite labor and excellent judgment. In 985 he published his book, dividing it into three parts: (1) what he had himself seen; (2) what he had learned from trustworthy witnesses; (3) what he had read.

He then resumed his travels and three years later issued a new and enlarged edition. Mokaddasi's travels did not reach quite as far as those of some other Arabic geographers, but, judged by the zeal with which he collected his material, the good sense he showed in sifting it, and the clear and logical arrangement of his work, he is easily the foremost of them all. It has been edited by De Goeje in his *Bibliotheca Geographorum Arabicorum*, vol. iii. (*Descriptio Imperii Moslemici Auctore Al-Mokaddasi*, Leyden, 1877); the part relating to Syria, including Palestine, has been translated into English with notes by Le Strange in the *Library of the Palestine Pilgrims' Text Society*, vol. iii. (London, 1886). Consult also: Kremer, *Culturgeschichte des Orients*, vol. ii. (Vienna, 1877); Sprenger, *Die Post- und Reise-Routen des Orients* (Leipzig, 1864); Le Strange, *Palestine Under the Moslems* (London, 1890).

MOKANNA, mȯ-kän′nȧ, Al. See Hakim ibn Allah; Mohammedan Sects.

MOKI, mō′kė. A Pueblo tribe of Arizona. See Hopi.

MOLA, mō′lȧ, Pietro Francesco (c.1621-c.1668). An Italian painter, born at Coldre, near Como. He was a pupil of Cesari in Rome, and afterwards of Albani at Bologna. Many of his religious works—somewhat in the manner of Guercino—were executed for the Popes Innocent X. and Alexander VII. Just before his death he was invited by Louis XIV. to visit France. During the latter part of his life Mola was Prince of the Academy of Saint Luke.

MOLA DI BARI, mō′lȧ dė bä′rė. A city in the Province of Bari delle Puglie, Italy, 12 miles by rail from Bari (Map: Italy, M 6). The exports comprise grain, olives, live stock, and wine. Population, in 1901 (commune), 13,962.

MOLA DI GAETA, dė gȧ-ā′tȧ. The old name of Formia (q.v.), a seaport in South Italy.

MOLASSE, mȯ-lȧs′ (Fr. fem. of *mol*, from Lat. *mollis*, soft). An extensive middle Tertiary deposit, occupying the central lake region of Switzerland between the Alps and the Jura. It consists chiefly of sandstone, marls, and limestones, but at the foot of the Alps it usually takes the form of a conglomerate called 'Nagel flue.' which is said to attain the astonishing thickness of from 6000 to 8000 feet in some localities. The molasse includes the Oenigen group of strata, which is remarkable for its fossil insects and plants.

MOLASSES. See Sugar.

MOLAY, mȯ′lȧ′, Jacques Bernard de (c.1243-1314). The last grand master of the Templars. He was a native of Burgundy, and entered the Order of Templars in 1265, and was elected grand master in 1298. About this time Philip IV. of France (1285-1314) undertook to carry out the project which he had formed to destroy the Order, chiefly because the French monarchy was in sore financial straits, and the Templars were very wealthy. With a design to impose upon the credulity of Molay, Philip pretended to be anxious for a new crusade, and at his instigation Clement V. called the grand masters of the Templars and Knights of Saint John to Europe. The call was answered by Molay, who appeared in France in the fall of 1306, accompanied by a chosen band of distinguished knights of the Order. He repaired to Poitiers in 1307 to render his allegiance to the Pope, but nothing was mentioned about investigating the affairs of the Order. Soon after Philip himself appeared before Clement and preferred charges, demanding the dissolution of the Order. The Pope, under the influence of Philip—for this was the beginning of the French or Avignon Papacy—directed that an investigation should be undertaken. The King, however, did not await the proceedings of the Pope against the Order, but procured the arrest of every Templar in France, and on October 13, 1307, Jacques de Molay was seized in the house of the Temple and taken before special commissioners of the Inquisition. Although the Pope was indignant at this presumption on the part of Philip, and suspended the power of the Inquisition in the premises, the King finally compelled him to take part in the action. Molay was examined by a Papal commission and confessed the truth of some of the charges under torture, and on March 11, 1314, he was condemned to perpetual imprisonment. He, however, immediately retracted all he had said, and thereupon was burnt the same evening, protesting the innocence of the Order. Consult: Prutz, *Entwicklung und Untergang des Tempelherrenordens* (Berlin, 1888); Lea, *History of the Inquisition*, vol. iii. (Philadelphia, 1888). See Templars.

MOLBECH, mŏl′bĕk, Christian (1783-1857). A Danish philologist and historian, born at Sorö. He had a position in the Royal Library at Copenhagen, and was professor of literature in the university of that city from 1829 to 1843, being simultaneously co-director of the Royal Theatre. He wrote several works, critical, poetical, historical, and philological, the most important of which is a Danish dictionary (1833), the first of real value ever compiled. He also wrote a Danish dialect lexicon (1833-41) and a Danish glossary (1857; 11 vols., 1866). His other works include: *Dansk Haand-Ordbog til Retskrivnings og Sprogrigtigheds Fremme* (1813); *Den Danske Riimkrönike* (1825); *Henrik Harpestrengs Lægebog* (1826); and *Den aeldste danske Bibel-Oversættelse . . .* (1828).

MOLBECH, Christian Knud Frederik (1821-88). A Danish poet and critic, born at Copenhagen, the son of Christian Molbech. He was professor of Scandinavian literature at the University of Kiel for eleven years (1853-64), and wrote several romantic dramas, such as *Klintekongens Brud* (1845), *Venusbjerget* (1842), *Dante* (1842), and *Ambrosius* (1877), and published collections of poems, such as *Billeder fra Jesu Liv* (1840), *Lyriske Digte og Romancer* (1863), *Dæmring* (1856), and *Efterladte Digte* (1889). As critic and theatrical censor Molbech was in touch with stage matters, and much of his work in this line is of interest. The most valuable contribution he made to the literature of his country was an excellent translation of Dante, *Den guddomelige Komödie* (1851).

MOLD (AS. *molde*, Goth. *mulda*, OHG. *molta*, dialectic Ger. *Molt*, dust, connected with Goth., OHG. *malan*, Ger. *mahlen*, Ir. *melim*, Lith. *malti*, Lat. *molere*, to grind). A term used somewhat loosely, so that it frequently includes the common green, yellow, and black mildews (*Penicillium*, *Aspergillus*, and *Sterigmatocystis*). It should be restricted to the large cobweb-like growths whose fructification has the form of black heads on upright filaments, the commonest being the bread mold (*Mucor*). See PHYCOMYCETES.

MOLDAU, mōl′dou (Bohem. *Vltava*). The chief river of Bohemia, and an important tributary of the Elbe (Map: Austria, D 2). It rises in the Böhmerwald, on the southwest frontier, at an elevation of 3800 feet above the sea, and flows first southeast, then northward past the city of Prague, and enters the Elbe opposite Melnik, after a course of 265 miles. It becomes navigable at Budweis.

MOLDA′VIA. A former principality in Southeastern Europe, now forming, together with Wallachia (q.v.) and the Dobrudja (q.v.), the Kingdom of Rumania (Map: Balkan Peninsula, F 1). It is bounded on the north and east by the Pruth, which separates it from Russia; on the south by Wallachia, and on the west by Transylvania. Area, 14,668 square miles. Population, in 1890, 1,832,106. The chief town is Jassy, the capital of the principality. For further description, see RUMANIA.

HISTORY. The Principality of Moldavia was founded about the middle of the fourteenth century by the Wallach Voivode Bogdan. Its cradle appears to have been in the northeastern Carpathians, near the sources of the Theiss. It soon grew to be a large State, embracing, in addition to the present Moldavia, Bukowina and Bessarabia. The dominion over this region was coveted by the kings of Poland and Hungary, and the Moldavian princes leaned now on the one power and now on the other, neither being able permanently to assert its over-lordship. Prince Stephen the Great was a powerful ruler (1457-1504). He defied the armies of the great Sultan, Mohammed II., winning a signal victory over the Turks at Rakova in 1475. His successors, however, were unable to withstand the growing power of the Moslems, and early in the sixteenth century Moldavia became tributary to the Porte. The Turks proceeded to build fortresses in the Moldavian territory, and their hold on the country was gradually tightened, although Moldavia remained without the sphere of Turkish settlement. From the early part of the eighteenth century down to the outbreak of the Greek Revolution in 1821, which began with Ypsilanti's brave deed at Jassi, Moldavia, as well as Wallachia, was governed by hospodars appointed by the Sultan, from the aristocratic Greek families, known as Fanariotes. The ambitious designs of Russia in the direction of dominion in the regions held in subjection by the Turks—designs which she sought to advance by claiming a protectorate over the Greek Christians in the Turkish dominions—violently affected the fortunes of Moldavia, which lay in the path of the Russian armies, and was repeatedly subjected to Russian occupation. In 1812 Bessarabia was ceded by Turkey to Russia, Bukowina having been previously (1777) annexed to Austria. After 1821 native princes were once more at the head of the government. But the protectorate accorded to Russia by Turkey in the Treaty of Adrianople (1829) threatened to make Moldavia and Wallachia mere dependencies of the Russian Empire. All this was changed by the results of the Crimean War, terminated by the Treaty of Paris (1856). In 1859-61 the union of Moldavia and Wallachia into the Principality of Rumania was consummated. See RUMANIA.

MOLDING. See FOUNDING.

MOLDING (from mould, OF. *moller*, *moler*, *moler*, Fr. *mouler*, Sp., Port. *moldar*, to measure, from Lat. *modulare*, to measure, from *modulus*, measure, diminutive of *modus*, measure, melody, manner, mode). A curved, plane, or irregular surface used as an ornament in cornices, panels, arches, etc., and in all enriched apertures and members of buildings. Their projections form the main element of light and shade in architecture. There has been an almost continuous increase in their variety and richness in architectural history. Baylonia, Egypt, Assyria, and other early nations produced their effects more by color than projections and were satisfied with a few simple forms such as the fillet, cavetto, ovals and torus. In classic architecture the moldings are few in number, and definitely fixed in their forms. There are eight kinds, viz.: the *cyma*, the *ovolo* (or *echinus*), the *talon*, the *cavetto*, the *torus*, the *astragal*, the *scotia*, and the *fillet*, each of these moldings having its proper place assigned to it in each order. (See COLUMN.) A great variety of effect, however, is secured, especially in the Ionic and Corinthian orders, by the carved surface ornamentation on the moldings, forming such systems as the egg-and-dart, the anthemion, the pearl, heart-leaf, and other variations.

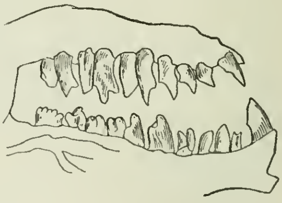
With the decline of classic architecture in the fourth century moldings went out of fashion—partly through inability to carve their ornamentation (as in the West), partly through a preference for color effects (as in the Byzantine style). But with the rise of mediæval art, especially where vaulting was used, and heavy walls became necessary, they again came into use. The doors and windows, which had always been simple in outline in ancient architecture, were deep-set recesses, and heavily-moulded. In Romanesque architecture, unlike the Classic, these openings were the main molding focus; piers, vaulting-ribs, and cornices were very subsidiary. In the Gothic style the use of moldings was extended to almost the entire surface of a structure, through the use of tracery, false galleries, and the lace-like decoration of surfaces.

In these mediæval styles the moldings are not reduced to a system as in the Greek and Roman styles, but may be used in every variety of form at the pleasure of the artist. Romanesque moldings were decorated with geometric and with stiff and conventional foliated ornament, often copied from classic models, while Gothic architecture broke from tradition, ornamenting its molded surfaces largely with foliated designs freely copied from nature with bewildering variety and truthfulness. The Renaissance naturally abandoned the wealth of Gothic ornamented moldings and returned to classic simplicity, copying ancient models with great accuracy and adding but little to the ancient material, even in decorative details. For details consult the articles on the different historic styles and the special moldings.

MOLE (abbreviation of *molewarp*, *moldwarp*, *mouldwarp*, OHG. *moltwerf*, *multwerf*, Ger. *Maulwurf*, from AS. *molde*, dust + *weorpan*, Goth. *wairpan*, OHG. *werfan*, Ger. *werfen*, to throw). A small mammal belonging to the order Insectivora and to the family Talpidæ, although the name is often applied to other nearly related forms. It is a small animal, generally less than eight inches in length, thickset, with short stout limbs, the anterior pair powerful and especially adapted for digging. The fur is dense and soft, lying backward or forward with equal ease; the tail is short; and the eyes are very small. In many species the eyes are covered over by a membrane, and recent investigations on the common American mole show that the eye itself is much degenerated, and probably is of practically no use as an organ of sight. Moles are subterranean in their habits, and more or less nocturnal. They are very voracious, and eat animal food exclusively. The earth-worm is the principal article in their diet, but all other worms, grubs, caterpillars, and insects are readily eaten, and in captivity raw meat, small birds and mammals, and even other moles, will be seized and eaten greedily. Although the limbs are short, moles are capable of very rapid movements. When in pursuit of earth-worms, moles often travel long distances underground, and frequently so near the surface that the earth becomes raised up above the tunnel which they make. Moles are therefore constantly hunted and trapped by gardeners. The favorite method of capture is by means of a trap set in one of these underground galleries. The simplest form of trap is a wire noose so arranged on a spring that when the mole enters it the spring is released and the wire is drawn taut.

Moles build very remarkable nests, or homes, consisting of two circular galleries, the smaller above the larger, and connected with it by five straight passages; at the centre is a chamber connecting with the upper gallery, while from the lower gallery horizontal passages run out in all directions. From these horizontal passages are given off the various sub-surface tunnels made when the mole is in search of food. The central chamber and circular galleries are built in a mound of earth, more or less elevated above the surface, and larger than the ordinary heaps of earth or 'molehills' thrown up by these animals. From the central chamber there is also a vertical tunnel leading downward and then bending upward again to join one of the horizontal galleries. The young are not brought forth in the central chamber, but in a special chamber formed where two or three horizontal galleries meet, which is lined with leaves and other warm materials. Four or five young ones are usually produced at a birth, and some writers state that a second brood is produced late in the summer. Moles take to water readily and swim well, so that they are able to cross considerable lakes and streams.

The anatomy of moles is interesting because it is so modified as to adapt the animal admirably to its manner of life. The fore limbs are attached to the skeleton so far forward that they lie beside the neck and thus add but little to the general width, yet remain sufficiently long to reach earth ahead of the nose. The hind limbs are also so arranged as not to occupy unnecessary space, the hip joints being closely approximated to the axis of the body. The humerus is very short and of a peculiar shape, and the carpals are very wide. On the inner (radial) side of the hand is a large sickle-shaped bone, regarded by some as a prepollex. The teeth vary in number from 36 to 44, in different genera. The Old World moles have 42 or 44 teeth, and the first and second upper incisors are of about the same size, while the moles of America have 36 or 44 teeth, and the first upper incisor is much larger than the second. The common mole of Europe (*Talpa Europæa*) is very widely distributed, ranging from England to Japan, and from the Altai to the Himalaya Mountains. The eyes in this species are not covered by a membrane, as they are in the rest of the genus. The habits of the European mole have been carefully studied, and the remarks made above in regard to the burrows and nests of moles refer especially to that species. Seven other species of Talpa are known, chiefly Asiatic, but only two occur south of the Himalayas. Moles are absent from Africa and Australasia. Two peculiar moles occur in Tibet, one of which is placed in a distinct genus, as it has a somewhat narrower hand and only 42 teeth.



DENTITION OF THE MOLE.

The American moles belong to the genera Scalops, having 36 teeth, webbed hind feet, and a narrow, slender muzzle; Scapanus, with 44 teeth and a narrow, tapering muzzle; and Condylura, with 44 teeth and a remarkable snout-like muzzle, fringed with a circle of about 20 slender, soft, cartilaginous processes. This last genus contains only a single species, the well-known star-nosed mole (*Condylura cristata*), which is not uncommon throughout the Northern United States. Its very curious snout is somewhat piglike, but the fringing processes give it a unique appearance. In habits this species closely resembles the more ordinary moles. The common mole of the Eastern United States (*Scalops aquaticus*) is a rather shrew-like animal, partial to the banks of streams. No moles occur south of the United States.

The name mole is often given to other insectivorous burrowing mammals, as the mole-shrew of Northwestern America (*Nemotrichus Gibbsii*), which in structure approaches the desman (q.v.), but in habits is somewhat like a mole. The golden moles (q.v.) of South Africa belong to an entirely different family, the Chrysochloridæ, and are not closely related to the Talpidæ, although in external appearance they are strikingly like them. There are seven or eight species in the single genus Chrysochloris. The strange 'marsupial mole' (q.v.) of Southern Australia and the 'duck mole' (i.e. the duckbill) are marsupials with more or less mole-like appearance and habits.

Moles are found fossil throughout the Tertiary strata of Europe, a fact of great significance as showing how ancient must be the insectivorous type of mammals. The genus Talpa even may be traced back as far as the Lower Miocene, with its peculiarities of structure already well developed.

MOLE. See NÆVUS.

MOLÉ, mō'lā', LOUIS MATTHIEU, Count (1781-1855). A French statesman. He was a descendant of the famous French magistrate Matthieu Molé (1584-1653), prominent at the time of the Fronde (q.v.). He was born in Paris, January 24, 1781. His father, president of the Parliament of Paris, died by the guillotine in 1794. After spending his early life in exile, he returned to France, and first attracted notice by his *Essais de morale et de politique* (1805), in which he vindicated the Government of Napoleon on the ground of necessity. The attention of the Emperor was then drawn to him; he was appointed to various offices in succession, and raised to the dignity of a count and to a place in the Cabinet (1813). After Napoleon's return from Elba he refused to subscribe to the declaration of the Council of State banishing the Bourbons forever from France, and declined a seat in the Chamber of Peers. In 1815 Louis XVIII. made him a peer of France, and he voted for the death of Marshal Ney. In 1817 he was for a short time Minister of Marine, but afterwards acted independently of party, and was one of the principal orators in the Chamber of Peers. In 1830 he became Minister of Foreign Affairs in Louis Philippe's first Cabinet, but remained in office only a short time. From 1836 to 1839 he was Prime Minister as successor to Thiers. In 1840 he was chosen a member of the French Academy. From that time he took little part in political affairs, but after the Revolution of 1848 exerted himself to rally and unite the party of order in the National Assembly, to which he had been elected. After the coup d'état he retired to private life. He died November 25, 1855.

MOLECH, mō′lĕk, also called Moloch, Milcom, and (Zeph. i. 5) Malcham. A heathen deity referred to in the Old Testament as 'the abomination of the Ammonites.' There appears, however, to be some confusion in the passages in which Molech occurs between the national deity of the Ammonites and other gods, notably a Canaanitish sun-deity who also bore the name *melek* (king), which as a general designation might naturally be applied to various gods. The form Molech is an intentional distortion of *melek,* introduced by Old Testament writers to avoid the pronunciation of a name which had associations distasteful to them. Most of the passages in which it occurs have reference to human sacrifice as forming an essential part of the cult of this deity, and particularly to child sacrifice or the sacrifice of the first-born, euphemistically referred to as 'passing through the fire' (Lev. xviii. 21; II. Kings xxiii. 10). We are told in I. Kings xi. 7 that Solomon erected a sanctuary to Milcom, the Ammonitish deity, on the Mount of Olives, which Josiah afterwards defiled (II. Kings xxiii. 13). It does not follow, however, that the sacrifice of children to Molech at Topheth (Gehenna, q.v.), referred to in II. Kings xxiii. 10; Jer. vii. 31, was identical with the Milcom cult. In II. Kings xvi. 3, child sacrifice is said to have been borrowed from the Canaanites; and Jeremiah (xix. 5) calls the deity to whom such offerings were made Baal. Hence it would appear that the rite in question has been wrongly connected with the Ammonitish cult, though it is not unlikely that on certain occasions children were sacrificed among the Ammonites as well as among the Moabites and Phœnicians. The rite is forbidden in the Deuteronomic code (Deut. xviii. 10) and in the Code of Holiness (Lev. xviii. 21; xx. 2-6); and the testimony of Jeremiah, already quoted, and of Ezekiel (xvi. 20-21; xxiii. 37-39) is sufficient to prove that to a comparatively late period the barbarous rite survived among the Hebrews, though very possibly it was only a last resort, in time of great distress, to avert disaster or placate an angered divinity (cf. II. Kings iii. 27; see Mesha). The details of the rites of Molech and circumstances of his worship that are given are inventions of the rabbis. All that we know from the Old Testament is that the victims were first slaughtered and then burned (Ezek. xvi. 20-21; xxiii. 39; Isa. lvii. 5). Consult Baethgen, *Beiträge zur semitischen Religionsgeschichte* (Berlin, 1888).

MOLE CRICKET. Any one of the crickets of the genus Gryllotalpa and its close allies, forming a tribe Gryllotalpides, remarkable for the dilated front legs, which superficially resemble those of the mole, and which are admirably adapted to an underground life. The entire existence of the insect is subterranean. It travels in burrows of its own digging, and lays its eggs and rears its young in the same excavation. The adaptation of the front legs to the economy of the insect is very striking, as the tibiæ and tarsi are so arranged as to act as shears with which rootlets are severed. Mole crickets are furnished with a curious auditory apparatus on the front leg below the knee, concealed in a deep fold of the surface. The male makes a sound which has been reduced to a scale by Scudder, and which differs from the songs of the other crickets. Sharp calls it a "dull, jarring note somewhat like that of the goat-sucker." The mole cricket is principally carnivorous in its diet, although it feeds also to some extent upon vegetation, and the principal damage it does is in cutting roots which come in the way of its burrows. It is considered the most destructive insect to agriculture in Porto Rico, where it is called 'changa.' The female lays from 200 to 400 eggs, and the young are at first gregarious, the mother watching over them and supplying them with food until their first molt; after this they disperse and begin to make burrows for themselves. These young are often devoured by the adult males. Consult: Sharp, "Insects,' in *Cambridge Natural History,* vol. v. (London, 1895); Barrett, *The Changa, or the Mole Cricket* (Department of Agriculture, Washington, 1893). See illustration under Cricket.

MOL′ECULES—MOLECULAR WEIGHTS (Fr. *molécule*, from Neo-Lat. *molecula*, diminutive of Lat. *moles*, mass). It is now universally assumed by chemists and physicists that all bodies are made up of very small but finite material particles, the weight and composition of which determine the various properties of substances. These particles are called molecules. Each of these molecules is formed by a group of elementary atoms, the sum of whose weights equals the weight of the molecule. When a substance is divided and subdivided by physical or mechanical means (e.g. by dissolving a small amount in a very large volume of some liquid and dividing the latter into small portions), its molecules become separated from one another without undergoing any change. When the substance is decomposed chemically, each molecule breaks up and its unity is destroyed; but atoms are assumed to be incapable of subdivision by any means whatever.

The relative weights of molecules, termed molecular weights, are among the most important constants of nature. Their precise experimental determination presents no difficulty whatever. But it has been shown that even the absolute dimensions of molecules, their absolute weight, their actual number in a given volume of substance, their specific gravity, etc., can be ascertained with some degree of probability. Brief mention may be made here of some of the simpler methods employed in searching for those absolute dimensions in the unseen world of molecules. Such theoretical researches are carried out mainly on the principle that when a hypothesis is admitted within the scope of an exact science, we must have exhaustive knowledge of the deductions that can possibly be made from it. Only by correlating the deductions with facts can we judge whether the hypothesis is reliable or not, and experience teaches that deductions seemingly incapable of experimental verification may ultimately not be so at all. Of course, the calculation of the absolute dimensions of molecules is also fascinating in itself. Like certain speculations in astronomy, it shows that there is no limit in the depth of the invisible and inaccessible, beyond which exact scientific thought cannot be expected to penetrate.

ABSOLUTE DIMENSIONS OF MOLECULES.

The fundamental hypotheses of the kinetic theory of gases lead to the proposition that at any given temperature the volume of a gas is inversely proportional to its pressure. This relation, which had been known as a matter of fact long before it was established deductively, may also be expressed by saying that the product of the pressure and volume of a gas is constant:

$$pv = c.$$

From the point of view of the kinetic theory, v represents in this formula the empty space within which the molecules of the gas move—i.e. the total volume filled by the gas, *minus* the volume actually occupied by its molecules. As long as the gas is not too highly compressed, the total volume may be used in the above formula instead of the unknown intermolecular space. For, under low pressures, the difference between the volume of a gas and the volume of its empty intermolecular space is very slight, and hence the error committed amounts practically to nothing. But as the pressure exerted on the gas increases, its volume becomes small, and the fraction of that volume actually occupied by the molecules becomes considerable. In other words, the difference between the volume filled by the gas and the empty intermolecular space becomes too great to be neglected. At the same time, as the distance between the molecules becomes smaller, they begin to exercise a certain amount of attraction upon one another, and therefore the pressure exerted by the gas on the vessel containing it is somewhat diminished. Under such circumstances, the simple formula mentioned above ceases to express the relation between the observed pressure and volume of gases, and the following formula, first suggested by Van der Waals, has to be employed instead:

$$\left(p + \frac{a}{v^2}\right)(v - b) = c.$$

In this formula p denotes the pressure actually observed. To conform to the theoretical law, we add to p the quantity $\frac{a}{v^2}$ depending on the specific mutual attraction of the molecules, and therefore also upon the volume occupied by the gas. The factor $(v - b)$ in the formula represents the total volume filled by the gas, diminished by four times the volume actually occupied by its molecules, which are assumed to be spherical. We thus have the ideal pressure—i.e. the pressure determined by the motion of the molecules and undiminished by their mutual attraction—and we have the actual volume within which the molecules are free to move; the product is evidently the same as in the case of the simpler law, $pv = c$, under low pressures.

The attraction of the molecules and their volume depend, of course, upon the nature of the gas. By actually determining the pressures and volumes of various gases, numbers may be substituted for c, p, and v in Van der Waals's formula, and thus equations may be obtained containing only two unknown quantities, a and b, the numerical values of which can then be easily computed. The following table shows the values of ¼ b (i.e. *the fraction of the volume of a gas actually occupied by its molecules*) for a few gases and vapors. These values are calculated for the temperature of freezing water (0° C.) and for normal atmospheric pressure:

SUBSTANCE	¼ b
Carbonic acid gas	0.00050
Nitrous oxide gas	0.00048
Sulphur dioxide gas	0.00062
Ethylene gas	0.00056
Ethyl chloride vapor	0.00097
Alcohol vapor	0.00093
Ether vapor	0.00144
Benzene vapor	0.00128
Carbon disulphide vapor	0.00082

With the aid of these figures the specific gravity of the molecules, say of carbonic acid, may be readily calculated as follows: At 0° C. and under normal atmospheric pressure, 22,350 cubic centimeters of carbonic acid gas weigh about 44 grams. The volume actually occupied by the molecules being $22{,}350 \times 0.00050$ cubic centimeters, *one* cubic centimeter entirely filled by carbonic acid molecules, with no space between them, would evidently weigh

$$\frac{44}{22{,}350 \times 0.00050}$$

or about 4 grams; i.e. the specific gravity of a molecule of carbonic acid is about 4. Similarly, the specific gravities of the molecules of other substances are found to be as follows:

SUBSTANCE	Sp. gr. of molecules
Nitrous oxide	3.7
Sulphur dioxide	4.6
Ethylene	2.4
Ethyl chloride	2.9
Alcohol	2.2
Ether	2.3
Benzene	2.7
Carbon disulphide	4.3

Considerations of a somewhat more complicated nature lead to the conclusion that at 0° C. and under a pressure of 1 atmosphere, one cubic millimeter of *any gas or vapor* contains approximately 54,000,000,000,000,000 molecules. Since 1 cubic millimeter of hydrogen weighs 0.00009 milligram, the absolute weight of a single molecule of that gas is therefore

$$\frac{0.00009}{54000000000000000} = 0.000{,}000{,}000{,}000{,}000{,}000{,}0000166 \text{ milligram.}$$

In a similar manner, the absolute weight of a molecule of any other gas or vapor may be readily calculated, by dividing the weight of one cubic millimeter by 54,000,000,000,000,000.

MOLECULAR WEIGHTS.

The practical value of the above results is, at least for the present, not nearly so great as that of the purely relative molecular weights constantly used in scientific work. For it is on our knowledge of these relative molecular weights that the modern theories concerning the structure and the mutual relations of chemical compounds, especially the numerous compounds of carbon, are based.

Vapor-Density Method. The molecular weights of gases, or of substances that can be obtained in the state of vapor, can be readily determined by ascertaining the density of the gas or vapor. The principle involved is as follows: The density (D)—i.e. the weight of a certain volume of gas—is obviously the product of the number (n) of molecules contained in that volume, and the weight (M) of each molecule:

$$D = nM,$$

whence

$$\frac{D}{M} = n.$$

Now, according to Avogadro's rule. equal volumes of all gases and vapors contain the same number of molecules, provided the temperature and pressure are the same; in other words, the number (n) contained in a given volume of gas does not vary with the nature of the latter; it is the same for *all* gases. For any two different gases we shall therefore have

$$\frac{D_1}{M_1} = \frac{D_2}{M_2} = n,$$

whence

$$\frac{M_1}{M_2} = \frac{D_1}{D_2}$$

i.e. *the molecular weights of gases are proportional to their densities.* Evidently,

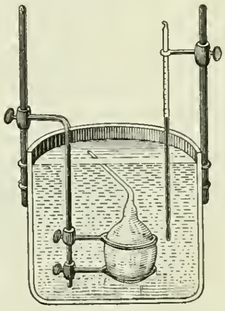
$$M_2 = \frac{D_2}{D_1} M_1;$$

so that if D_1 and M_1 stand for the density and weight of a molecule of hydrogen (the lightest known gas), the weight of a molecule, say, of oxygen, may be found by ascertaining its density referred to hydrogen (i.e. the weight of any volume divided by the weight of the same volume of hydrogen at the same pressure and temperature) and multiplying that density by the weight of a molecule of hydrogen. Now, if instead of multiplying the densities of gases by the true weight of a molecule of hydrogen, we multiply them by any arbitrary number, we obtain, instead of the true weights of the molecules of gases, a series of other numbers whose values depend on that of our arbitrary number for hydrogen. But, if we adhere to the same arbitrary number, our numbers for the various gases will bear the same ratios to one another as the true weights of their molecules. And since in studying substances and reactions we need know not the absolute, but the relative weights of molecules, we may assign to our standard gas, hydrogen, any arbitrary number whatever. For reasons explained in the article Atomic Weights (q.v.), the molecular weight of hydrogen is assumed to be 2.

Therefore, to determine the molecular weight of a volatile compound, all a chemist has to do is to ascertain the weight of a given volume of vapor, to divide that weight by the weight of an equal volume of hydrogen gas at the same pressure and temperature, and to multiply the vapor density thus obtained by 2. Water vapor is found to be 9 times as heavy as hydrogen gas; hence, its vapor density is said to be 9; multiplying 9 by 2, the molecular weight of water is seen to be 18. The vapor density of chemical compounds is usually determined with the aid of one of the following apparatus:

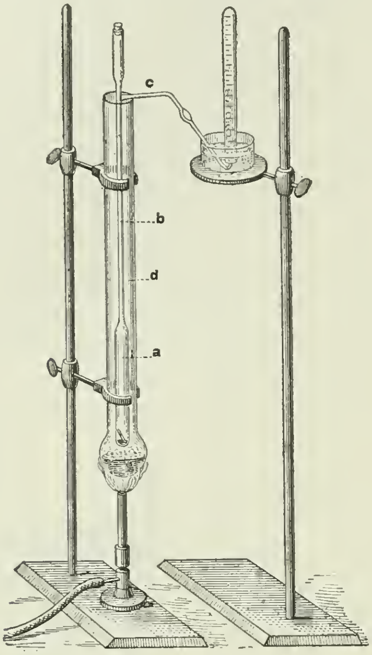
A. *Dumas's Apparatus* consists of a light glass flask (of about 250 cubic centimeters capacity), whose neck is bent and drawn out into a long and narrow point. After carefully weighing the flask, a few grams of the substance to be examined are introduced into it; it is then immersed in a bath whose temperature is constant and somewhat higher than the boiling-temperature of the substance in the flask.

The substance soon begins to boil, and its vapors drive all the air out of the flask. When the substance has completely evaporated and the flask contains nothing but its vapor, the open end is carefully sealed off with the aid of a blowpipe. On cooling, the flask is cleaned and again weighed. Finally, its end is broken off under water, which rushes into the flask owing to the low pressure within; and when the latter is completely filled, it is weighed a third and last time, together with the end that has been broken off. From the three weighings, the weight and the volume of the vaporized substance in the apparatus become known. Dividing this weight by that of an equal volume of hydrogen at the temperature of the bath and the barometric pressure under which the determination has been carried out, we get the vapor-density, and from this, by multiplying by 2, the molecular weight of the substance examined. Dumas's apparatus can be employed only when a considerable amount of substance is available.



DUMAS'S APPARATUS.

B. *Victor Meyer's Apparatus* consists of a wide glass tube (a), the lower end of which is closed, and the upper joined on to a long glass tube (b) of smaller diameter. The narrow tube is provided, near its upper end, with a side-tube (c). During a determination this apparatus is placed in a long test-tube-like vessel (d) containing some liquid boiling at a higher temperature than the substance to be experimented upon. A little of the substance is carefully weighed in a small glass capsule; the rubber stopper closing the top end of the apparatus is for an instant removed, and the weighed capsule is dropped in. The substance quickly evaporates, driving out through the side tube c a volume of air equal to the volume of its own vapor. The air is collected in a graduated tube, and thus the volume of the vaporized substance becomes known. Dividing the weight of the substance taken by the weight of an equal volume of hydrogen, at the temperature of the vaporized substance in the apparatus and at the barometric pressure under which the determination has been carried out, we get the vapor-density, and from this, by multiplying by 2, the molecular weight of the substance. Victor Meyer's apparatus yields precise results and requires but a very small quantity of the substance experimented upon. The latter circumstance forms an important advantage; for the preparation of large quantities of a substance often involves great loss of time and is sometimes very difficult.



VICTOR MEYER'S APPARATUS.

Method of Determination of Molecular Weights by Direct or Indirect Measurement of the Osmotic Pressure of Solutions. In the gaseous state a small mass of substance occupies a large volume of space, and the properties peculiar to the gaseous state are due to the fact that the molecules of a gas are separated from one another by considerable distances. But a little sugar dissolved in much water is also distributed throughout a large volume; the molecules of sugar are likewise separated from one another by considerable distances, and this is why the properties of sugar in dilute solution are very much like what they would be if the sugar existed in the gaseous state. Thus, within the volume of a solution, sugar (as well as any other substance) has been proved to exert a pressure equal to that which it would exert were it vaporized and inclosed within a vessel whose volume is equal to that of the solution. The pressure of a substance in solution is called *osmotic pressure*. When equal weights of different gases are confined within equal volumes, the pressures are inversely proportional to the molecular weights of the gases. Thus, if equal quantities by weight of oxygen and hydrogen were inclosed within vessels, say, of one liter capacity, the pressure in the vessel containing hydrogen would be 16 times as great as the pressure in the vessel containing oxygen; while, on the contrary, the molecular weight of hydrogen (2) is $\frac{1}{16}$ the molecular weight of oxygen (32). The reason is obviously this: the lighter the molecules, the greater must be their number, to constitute a given weight of gas; but the greater the number of molecules the greater the pressure of the gas; hence, the lighter the molecules, the greater the pressure of a given mass of gas. Similarly, in the case of equal weights of different substances in solution, the osmotic pressures are inversely proportional to the molecular weights. The relative molecular weights of soluble substances may therefore be found by preparing solutions having equal volumes and holding equal weights of the dissolved substances, then measuring the osmotic pressures of the solutions. See Solution.

But as the direct measurement of osmotic pressure is exceedingly difficult, indirect methods of measurement are usually employed by the investigator. When a substance enters some solvent, say water, it changes the characteristic freezing and boiling temperatures of the solvent: the freezing-point is lowered, the boiling-point is raised. Now, the depression of the freezing-point and the elevation of the boiling-point have been shown to be proportional to the osmotic pressure of the solution. Therefore, instead of carrying out a direct determination of osmotic pressure, the chemist measures the change of freezing or boiling temperature caused by dissolving a given weight of substance, and calculates the molecular weight of the latter on the principle that the change caused by a substance is inversely proportional to its molecular weight. The laboratory methods commonly employed in determining the depression of freezing-point and the rise of boiling-point are described in the articles Freezing-Point and Boiling-Point.

The direct and indirect osmotic-pressure methods just referred to are of the greatest practical importance to the chemist. For while the number of substances that can be vaporized (and hence whose molecular weights can be determined by the vapor-density method) is limited, practically all substances can be obtained in solution.

Chemical Methods. It is often possible to determine the molecular weight of a substance by purely chemical methods, i.e. by studying its formation and chemical transformations. Consider, for example, acetic acid. Analysis leads us to assign to it one of the following formulas: CH_2O, $C_2H_4O_2$, $C_3H_6O_3$, $C_4H_8O_4$, etc., corresponding to the molecular weights, 30, 60, 90, 120, etc. (See Chemistry.) The fact that acetic acid is readily formed from ordinary alcohol, whose molecule (C_2H_6O) cannot possibly contain less than two carbon atoms (because for every two carbon atoms it contains a single atom of oxygen)—this fact renders it probable that the molecule of acetic acid, too, contains two carbon atoms. In other words, it becomes probable that $C_2H_4O_2$ is the formula, and hence 60 the molecular weight, of acetic acid. That CH_2O cannot be the formula of acetic acid is shown by the fact that the molecule ($C_2H_3O_2Ag$) of silver acetate, a compound made from acetic acid, cannot possibly contain less than two carbon atoms (because for every two carbon atoms it contains a single atom of silver). To sum up, the molecular weight of acetic acid is *probably* and *at least* 60. More exact information chemical methods cannot furnish. The vapor-density method leads to the definite conclusion that the molecular weight is 60 (the vapor-density of acetic acid is 30). It is because the molecular weights found by physical methods (i.e. on the basis of Avogadro's rule) are invariably found to be in perfect agreement with chemical facts, that the molecular theory of the physicist can be, and is, inseparable from the atomic theory of the chemist, the two theories widening each other's scope of usefulness, and together forming a powerful instrument for the study of nature.

See Chemistry, and consult the literature of theoretical and physical chemistry recommended in that article. See also Avogadro's Rule; Atomic Weights; Boiling-Point; Freezing-Point; Solution; Gases, General Properties of.

MOLENAER, mō′le-när, Jan Miensze (?-1668). A Dutch painter, born at Haarlem. He is thought to have been a pupil of Frans Hals and was an excellent imitator of that master. Later he adopted the style of Rembrandt. His pictures are usually scenes of peasant life, painted with much brilliancy and variety. Some of them contain as many as forty figures.

MOLE RAT. One of the rodents of the family Spalacidæ, which spend their lives moving about through the soil like moles, and have assumed many mole-like features and traits. The countries about the Mediterranean contain the typical mole rat (*Spalax typhlus*), a queer, yellowish-brown creature about the size of a rat, with the minute eyes completely covered by the skin and the ears and tail rudimentary. Its fur lies either way, and the animal seems able to dig backward as well as forward. It constructs tunnels, like those of moles, throwing out heaps of earth at intervals. It is common in Egypt, where it burrows in sandy soil full of asphodels and hyacinths, whose bulbs it eats or stores in large quantities in deep chambers underground. South Africa contains several closely related animals of the subfamily Bathyerginæ, one of which, the coastwise 'strand mole' (*Bathyergus maritimus*), is a foot long and numerous. Its eyes are still open, but are mere beads of little use. Still stranger relatives of these are the 'sand rats' (Heterocephalus) of Somaliland, which are about the size of mice, almost naked and blind. They remain always under ground, tossing the sand out of the crater-like openings from their tunnels, but never themselves coming to the surface.

MOLESCHOTT, mō′le-shŏt, Jacob (1822-93). A physiologist and writer on dietetics, born at Bois-le-Duc, Holland. He studied at Heidelberg, and began the practice of medicine at Utrecht, whence he removed, in 1847, to Heidelberg, where for seven years he lectured on physiology at the university. A real or supposed tendency toward materialism in his lectures alarmed the authorities, and in consequence he resigned. In 1856 he was appointed professor at Zurich, and in 1861 he was called to the chair of physiology at Turin. He was called upon to fill the same chair in Rome in 1879, after having become an Italian Senator in 1876. He was a popular lecturer, and his physiological researches, particularly in regard to diet, muscular formation, the blood, and bile, are of value. Without asserting the impossibility of a spiritual life, he explained the origin and condition of animals by the working of physical causes. His characteristic formula was 'No thought without phosphorus.' His most important works are: *Physiologie des Stoffwechsels in Pflanzen und Thieren* (1851); *Der Kreislauf des Lebens* (1852); *Lehre der Nahrungsmittel* (1858); *Physiologie der Nahrungsmittel* (1859); *Physiologisches Skizzenbuch* (1861); *Lehre vom Leben* (1867).

MOLE-SHREW. A book-name for the common North American short-tailed shrew (*Blarina brevicauda*). See Shrew.

MOLESKIN (so called from its soft, thick shag, like the fur on a mole). An extra strong double-twilled fustian, dyed after the pile is cut. See Fustian.

MOLESWORTH, mōlz′wẽrth, Sir Guilford Lindsay (1828—). An English civil engineer. He was educated at the college of civil engineers at Putney. In 1852 he became chief assistant engineer of the London, Brighton, and South Coast Railroad, but soon resigned to conduct the constructions at Woolwich Arsenal during the Crimean War. After practicing his profession in London for a number of years, he went to Ceylon, and in 1862 became chief engineer of the Government railroad in that island. In 1867 he was appointed director of public works, and director general of railways to the Ceylon Government; and from 1871 to 1889 was consulting engineer to the Indian Government. He published a *Pocketbook of Engineering Formulæ*, which is regarded as authoritative. Among his other publications are: *State Railways in India* (1872); *Imperialism in India* (1885); *Imperialism and Free Trade; Political Economy in its Relation to Strikes; Reason and Instinct in Ants; Masonry Dams;* and *Graphic Statics.*

MOLESWORTH, Mary Louisa (Stewart) (1842—). An English juvenile writer. She was born on the Continent, and spent several years in France and Germany. She wrote several novels at an early age, and in 1875 published her first book for children. As a writer of juveniles her success was immediate. Through a delightful verisimilitude and an easy grace of style she found wide audience for a dozen and more volumes. Her works include: *Carrots* (1876); *Tapestry Poems* (1879); *The Green Casket* (1890); *The Laurel Walk* (1898); and *The Grim House* (1899).

MOLESWORTH, Sir William (1810-55). An English statesman, known as the originator of "colonial self-government." He was born in London, May 23, 1810, and was descended from an old Cornish family of large possessions. He early showed promise of distinction, although his university career at Cambridge was cut short by his sending a challenge to his tutor to fight a duel. He continued his education at the University of Edinburgh, and subsequently at a German university. He succeeded to the family baronetcy in 1823. After making the usual tour of Europe, he returned home, and threw himself in 1831 into the movement for Parliamentary reform. Next year, although only just of age, he was elected member of Parliament for East Cornwall. He sat for Leeds from 1837 to 1841. He was the friend of Bentham and James Mill, and was regarded as the Parliamentary representative of the "philosophical radicals." In 1839 he commenced and carried to completion, at a cost of six thousand pounds, a reprint of the entire miscellaneous and voluminous writings of Hobbes, which were placed in most of the English university and provincial libraries. The publication did him great disservice in public life, his opponents endeavoring to identify him with the freethinking opinions of Hobbes in religion as well as with the philosopher's conclusions in favor of despotic government. In 1845 he was elected to Parliament for Southwark, which he continued to represent until his death. He was the first to call attention to the abuses connected with the transportation of criminals, and as chairman of a Parliamentary committee brought to light the horrors of the convict system. He pointed out the maladministration of the colonial office, explained the true principles of colonial self-government, prepared drafts of constitutions for remote dependencies, and made investigations as to the true and natural relations between the Imperial Government and its colonial empire. Molesworth's views, although at first unwelcome to the legislature, were adopted by successive administrations, and became part of the colonial policy of Great Britain. In January, 1853, he accepted the office of first commissioner of public works in the Administration of the Earl of Aberdeen, and in 1855 the post of Secretary of State for the Colonies in that of Viscount Palmerston. Before he could give proof of his administrative capacity he died, October 22, 1855. He established the *London Review*, a new quarterly, in 1851, and afterwards purchased the *Westminster Review*, the organ of the "philosophical radicals." The two quarterlies being then merged into one, under the title of the *London and Westminster*, Molesworth contributed to it many articles on politics and political economy. The enduring influence of his views was attested by the fact that his speech on the abandonment of the Orange River Territory in 1854 was advanced by the Boer Government in 1878 as the chief argument for the British withdrawal from the Transvaal.

MOLESWORTH, William Nassau (1816-90). An English clergyman and historian. He was born near Southampton, was educated at Cambridge, and entered the English Church. He was presented to Saint Andrews, Manchester, in 1841, and to Saint Clement Spotland, Rochdale, in 1844. He was a strong advocate of coöperation and had an interest in the well-known experiment of coöperation at Rochdale. His most important writings are: *A History of the Reform Bill of 1832* (1864); *History of England from the Year 1830* (1871-73); and *History of the Church of England from 1660* (1882).

MOLFET'TA. A city in the Province of Bari delle Puglie, Italy, 16 miles by rail from Bari (Map: Italy, L 6). The city is pleasantly situated, and the old section, surrounded by walls studded with towers, presents a very striking aspect when approached from the sea. A spacious harbor adds to its attractiveness, and serves to render it an extremely important commercial centre. There are extensive manufactures of flour, vermicelli, soap, bricks, and wine; and a large export trade in oil, almonds, carobs, nitre, and fish. Population, in 1801 (commune), 40,135.

MOLIÈRE, mô'lyâr'. The name assumed by Jean Baptiste Poquelin (1622-73). The greatest dramatist and perhaps the greatest writer of France. Molière was born January 15, 1622, in Paris. His father was a well-to-do tradesman and titular 'tapissier valet-de-chambre' of the King, an office held later by Molière. Molière's mother died in 1632. He was educated by the Jesuits at the Collège de Clermont (1636-41), and came into touch with some literary men (Luillier, Chapelle, Gassendi). Some say he went to Orleans to study law; others that he studied theology at the Sorbonne, and others still that he went with the Court as a minor officer to Narbonne, and formed bohemian associations, among them being the Béjarts, whose daughter, Armande, he afterwards (1662) married. In 1643 Molière abandoned his office and family prospects for the stage. After two unsuccessful theatrical ventures he was imprisoned for debt (1645), and in the winter of 1646-47 he became chief of a troupe of players which for twelve years (1647-58) acted in the provinces. In October, 1658, Molière played for the first time before the King, acting in *Nicomède* and *Le docteur amoureux*. In these years of wandering Molière learned the practical side of his profession; as dramatic adapter and composer he learned its literary side. More than all, he learned human nature by observing the provinces in the excited period of the Fronde from the vantage ground of an actor who could view objectively the panorama of high and low life; and at the same time as manager he gained seriousness from responsibility, a seriousness that gives his satire sometimes a tinge of bitterness and always the seal of superiority.

On Molière's return to Paris (1658) he had the prestige of provincial success, and he had written two plays which he thought worthy of preservation, *L'étourdi* and *Le dépit amoureux*. These were sufficiently superior in their easy, natural dialogue and the alert brilliancy of their style to win for him a Court patronage which he never lost and a popularity which assured his troupe a permanent support in Paris. This work was, however, Italian in spirit; but in 1659 Molière discarded, with *Les précieuses ridicules*, the stereotyped pattern, with its stock characters, and inaugurated a new era in comedy with the first dramatic satire on cultured society in France. Not the affected language and manners of the Hôtel de Rambouillet, but those, rather, of its bourgeois imitators, who abounded in Paris, were ridiculed with such infinite good humor that the play has not yet lost its comic force.

As typical of Molière's genius, though of a quite other phase of it, is *Sganarelle* (1660), the first of those gay yet profound farces that still hold the stage because they evoke first a laugh and then a thoughtful smile. He was still feeling his way, and *Don Garcie de Navarre* (1661), a five-act tragi-comedy in verse, marks a relapse to the traditions of the Spanish stage. *L'école des maris* (1661) shows, however, a decided advance. The plot is from Terence, but the aged lover is treated with a pathos and a fidelity to nature that bear the print of genius. From this point onward it becomes necessary to distinguish the work of Molière the born dramatist from that of Molière the theatrical manager and purveyor of Court entertainments. He wrote very much in the latter capacity that he would not have written in the former. The financial success and prosperity of his company was also an obligation not to be neglected. To satisfy this he wrote conventional comedies and extravagant farces, and to please the royal taste he composed for festivals at Versailles some thirteen semi-operatic comedies, in which the text was only a pretext for dancing and singing, wherein high dignitaries of the Court sometimes took part. He was distracted, too, by bitter attacks which he condescended occasionally to answer in his farces, though such controversy seems to have spurred him to his greatest efforts and lent a keener edge to his attacks on hypocrisy and pharisaism.

Les fâcheux (The Bores), a comedy-ballet in three acts, acted at Vaux (August, 1661), for Fouquet on the eve of his downfall, illustrates this diversion of genius, and is interesting because Louis XIV. suggested one of its scenes; *L'école des femmes,* which follows (December, 1662), is an exhibition of Molière's mature art as a satirist aiming at social and moral reformation, and *La critique de l'école des femmes* with *L'impromptu de Versailles,* that immediately follow this in 1663, are answers to the criticism that it evoked —criticism imbittered by Molière's success and given a handle by his marriage (February, 1662) to Armande Béjart. She was the daughter of an old member of his company, herself an actress, and her indiscretions were a source of constant vexation and jealousy to Molière.

L'école des femmes is the first of Molière's great comedies, the first great serious comedy of French literature. It deals with the part of woman in society and her proper preparation for it, and treats both in a spirit more liberal than the France of to-day wholly approves. This alone would have insured violent criticism, but to it was added a bold and contemptuous satire on the prevalent materialistic views of future punishment. The play was denounced, not merely as vulgar and obscene, but as impious—for instance, by Boursault in his *Portrait du peintre.* Boursault was answered by name in the merciless *Impromptu de Versailles,* where, too, the rival company of the Hôtel de Bourgogne were parodied and ridiculed.

This controversy had by no means subsided when Molière, after the trivial *Mariage forcé* (1664) and *La princesse d'élide* (1664), two comedy-ballets, provoked redoubled fury by two attacks on hypocrisy, *Tartuffe* and *Don Juan,* or *Le festin de Pierre.* Of the former three acts only were presented in 1664. Jesuits and Jansenists alike winced at it, and five years of persistent effort barely extorted permission to present the masterpiece as a whole. *Don Juan* appeared in February, 1665, and in August the King significantly adopted Molière's troupe as his own. But even his sympathy had its limits, and this appointment was perhaps in the nature of a consolation for the suppression of *Don Juan* in the midst of a prosperous run. The full text of this play is preserved to us only in a copy kept by the chief of police.

While awaiting permission to act *Tartuffe* in its entirety, with *Don Juan* forbidden, Molière wrote *L'amour médecin* (1665), a clever attack on the medical practitioners of his day, and *Le misanthrope* (July, 1666), in which his rivals and critics rightly discerned 'a new style of comedy,' wherein the constant motive forces of universal human nature are shown modified by the highest refinement to which civilization had yet attained. The easy optimist is set off against the noble pessimist, and a social school for scandal supplies the lighter comedy and offers a pillory for fops and poetasters.

About this time Molière's health seems to have begun to fail. Cold and fatigue brought on a disease of the lungs, and what he says of the distracted and pedantic doctors of his day, when superstition and tradition were struggling with one another and with half understood fragments of science, lent sad point to the *Médecin malgré lui,* the second of his noteworthy attacks on the quackery of that time. Then follows a period of relaxed activity with only three comedy-ballets, *Mélicerte* (1666), *Le pastoral comique* (1667), and *Le Sicilien* (1667), followed by the comparatively insignificant *Amphitryon* (1668), a coarse yet witty adaptation from Plautus. In July of 1668 Molière shows his old self again in *George Dandin,* an immortal type of the man who marries above his social station and suffers the consequences with rueful self-accusation. The story is at least as old as Boccaccio, but Molière's squirarchic Sotenvilles are his creation and an abiding delight.

This little master stroke was followed in September, 1668, by a masterpiece, *L'Avare,* whose central figure, the caricatural Harpagon, is one of Molière's greatest studies of vitiated character. Several lighter pieces followed, first *M. de Pourceaugnac,* a comedy-ballet with much raillery at the physicians; then *Les amants magnifiques* (1670), a persiflage of astrological extravagances; then that excellently comic farce, *Le bourgeois gentilhomme* (1670); then *Psyché* (1671), a tragedy-ballet, written in collaboration with Corneille and Quinault. The music was by Lulli. Then followed the lively *Fourberies de Scapin* (1671); and finally the *Comtesse d'Escarbagnas,* a study of provincial manners and an attack on financiers, heralding thus Lesage's *Turcaret.* Much greater than any of these are the last legacies to French comedy of the dying Molière, *Les femmes savantes* (1672), and *Le malade imaginaire* (1673). The former recurs to the subject of the *Précieuses ridicules* and with ripest power attacks the admirers of pedantry and the affectations of learning. The latter, primarily a last gibe at physicians, is important for its widening of satiric comedy to include the perversion of childhood.

Le malade imaginaire was first acted February 10, 1673. On the 17th Moliére undertook the part of the hypochondriac invalid, though suffering from what he called a 'fluxion.' In a fit of coughing he burst a blood-vessel on the stage and died at his house a half hour later. His enemies pursued him in death. He was buried half clandestinely. The Archbishop of Paris, thinking Molière's ethics irreconcilable with Christianity, forbade public ceremony, but the command was evaded. The body was laid in Saint Joseph's churchyard, but the site of the grave is uncertain.

No dramatist, save perhaps Shakespeare and Aristophanes, ever joined so much wit to so much seriousness as did Molière. There is often a pathetic, even a sad background to his scenes, but this never gets the better of his healthy humor. This humor depends for its effects not so much on plot as on revelation of character, and the satire is directed not so much against the excesses of nature as against those social faults or conventions which disguise or suppress nature. He is more apt to typify phases of character than to present complex natures, and in doing this he gave direction to the development of French comedy for several generations. There is no question that in the analysis of character Shakespeare, even Corneille, is more profound, and they tell a story with more dramatic force, but neither Corneille nor Racine gives so accurately picturesque, so fascinatingly truthful a portrait of French society as we find in the naturalistic, observant humorist, Molière.

Of Molière's *Works* the first edition was by his friends and fellow actors, La Grange and Vinot (1682); by far the best is Despois and Mesnard's (11 vols., 1873-96). Excellent, also, are the editions of A. France (7 vols., 1876-91) and Monval (8 vols., 1882). There is a good, cheap edition in 2 vols. with a study by Sainte-Beuve and English translations by Van Laun (6 vols., London, 1875-77), Wall (3 vols., 1876-77), and Wormeley (Boston). Consult for Molière's style, vocabulary, and usage, Livet, *Lexique de la langue de Molière* (Paris, 1895-1897). Of the *Lives* of Molière that of Mahrenholtz, in German (Heilbronn, 1881), is most complete; Loiseleur, *Points obscurs de la vie de Molière* (Paris, 1877), offers some attractive modern theories. Consult also the periodical *Le Molièriste;* and the biographies by Lotheissen (Frankfort, 1880); Moland (Paris, 1886); Larroumet (ib., 1886); Baluffe (ib., 1886); Mesnard (ib., 1889); Desfeuilles (ib., 1900); and Schneegans (Berlin, 1901); and the full *Bibliographie molièresque*, by Paul Lacroix (Paris, 1875).

MOLIÈRE, House of. See Comédie Française.

MOLIN, mō′lĕn, Johan Peter (1814-73). A Swedish sculptor, born at Göteborg. He studied at Copenhagen with the medalist Christensen, and afterwards in Rome (1845-53). In 1853 he became professor at the Stockholm Academy. Among his works are "The Wrestlers" (1862), "David," and "Cupid and Psyche."

MOLINA, mȯ-lē′nȧ, Alonso de (c.1510-c.85). A Spanish missionary in Mexico. He was born at Escalona, Spain, early went to Mexico, learned the Aztec language, and was interpreter to the Franciscan friars. He subsequently joined the Franciscan Order, and rose to be the superior of Santo Evangelio Province. His publications include translations into Aztec of the catechism and of a confessional manual, and a grammar of that language. His greatest work is his *Diccionario de la lengua castellana y mexicana* (1555; rev. ed. 1571).

MOLINA, mȯ-lē′nȧ, Juan Ignazio (1740-1829). An Italian historian of Chile. He was born at Talca, Chile; studied in a Jesuit college at Santiago; taught there and at Bocalemo; and at the age of twenty became librarian at Santiago. He joined the Jesuits at the time of their expulsion from the country, and went to Italy in 1767. For several years he was a priest at Imola, and in 1774 went to Bologna, where he taught in a private school. His views of the vitality of matter and of the sensibility of metals brought him into disfavor with the Catholic Church and he was removed from his professorate for a time. A legacy which Molina received in 1815 was devoted entire to the foundation of a library in Talca. His *Compendio di storia del Chile* (1776), *Saggio sulla storia naturale del Chile* (1782), and *Saggio della storia civile del Chile* (1787) were very popular in Europe for many years, though they have little value.

MOLINA, Luis (1535-1600). A celebrated Spanish theologian, specially famous in the history of the controversy about divine grace. He was born at Cuenca, in New Castile, entered the Jesuit Order at the age of eighteen, studied and then taught theology and philosophy at the College of Coimbra in Portugal, and was later appointed professor of theology at Evora, where he taught for twenty years. He then returned to Spain to devote himself to literary work, and six months before his death was appointed professor of moral theology in Madrid. His fame rests mainly upon his celebrated work, *Concordia Liberi Arbitrii cum Grantæ Donis*, first printed in Lisbon, 1588, but not published until the following year. It was the first work of formal scholastic theology produced by the Jesuit Order, as it was the first written by any of them in the nature of a commentary on Saint Thomas Aquinas; and scarcely any theological work has ever excited so widespread and lasting a controversy. The latest edition of it is by Lethilelleux (Paris, 1876). (For further details of this controversy, see Molinism.) Among his other works are his commentaries on the first part of the *Summa* of Aquinas (1592) and *De Justitia et Jure* (1592). His complete works were published in 7 vols. (Venice, 1614), and with biography and bibliography in 5 vols. (Cologne, 1733).

MOLINA, Tirso de. A pseudonym of the Spanish dramatist Gabriel Tellez (q.v.).

MOLINARI, mȯ′lė′nȧ′rē′, Gustave de (1819 —). A Belgian political economist, born at Liège. He became a physician at Brussels, wrote works on homœopathic medicine, removed to Paris, where he gained some distinction as a radical journalist, but was obliged by the coup d'état to return to Belgium, and there was appointed professor of political economy in the Musée Royal de l'Industrie Belge (Brussels). In 1874 he was elected corresponding member of the Academy of Moral and Political Sciences of the Institut de France. He became editor of the *Journal des Economistes* at Paris in 1881. He assisted in establishing the journals *L'Economiste Belge* and *La Bourse du Travail*, and published numerous works, including *Questions d'économie politique et de droit publique* (2 vols., 1861), *L'évolution économique du XIXème siècle* (1880), *Les lois naturelles de l'économie politique* (1867), and *Comment se resoudra la question sociale* (1896).

MOLINE, mō-lēn′. A city in Rock Island County, Ill.; on the Mississippi River, three miles east of the county-seat, Rock Island, which is opposite Davenport, Iowa, the three cities being closely connected by steam and electric railroads, ferries, and bridges (Map: Illinois, B 2). The railroads entering the city are the Chicago, Milwaukee and Saint Paul, the Chicago, Rock Island and Pacific, and the Chicago, Burlington and

Quincy. Moline derives excellent water power from the river, which is here dammed from the shore to the mid-river island, an advantage which has contributed to Moline's importance as an industrial centre. Coal is mined in the vicinity. There are manufactories of steel, elevator and milling machinery, scales, pianos, organs, plows, furniture, carriages and wagons, steam-engines, saw and planing mill products, foundry and machine shop products, paper, and pumps; and the trade is extensive in machinery, farming implements, grain, lumber, etc. Moline has a high-school library and a public library, the latter, which was founded in 1872, now containing about 9000 volumes. A public library building to cost $50,000 is (1903) in course of construction and there is a new, well-equipped city hospital. The water-works are owned and operated by the municipality. Population, in 1890, 12,000; in 1900, 17,248.

MOLINET, mō̇'lē̇'nȧ', Jean (?-1507). A French poet and troubadour. He was a canon of the College Church of Valenciennes, chronicler of the House of Burgundy, and librarian to Margaret of Austria, then regent of the Low Countries. Molinet was one of the 'grands rhétoriqueurs'; his poetry is pedantic, heavy, and complicated in rhythm, and his prose full of Latinisms, while both are replete with astonishing puerilities. A volume of his poems was printed in 1531, and his chronicles were published by Buchon in 1828. He also made a prose translation of the *Roman de la rose* (1503).

MO'LINISM. The name commonly applied to the doctrine of Molina (q.v.) on the relation between divine grace and the will of man. The problem which it is meant to solve is as old as the fourth century, when it led to the well-known Pelagian controversy. (See Pelagianism.) In reconciling with the freedom of man's will the predestination of the elect to happiness and of the reprobate to punishment, Molina asserts that this predestination is consequent on God's foreknowledge of the free determination of man's will, and that therefore it in no way affects the freedom of the particular actions. Accordingly, God gives to all men sufficient grace to enable them to live virtuously and merit happiness; certain individuals freely correspond to this grace, while others resist it; God foresees both courses and on them founds His decrees. This exposition was assailed in the schools first as a revival of the Pelagian heresy, inasmuch as it appears to place the efficacy of grace in the consent of man's will, and thus to recognize a natural power in man to perform supernatural acts; secondly, as setting aside altogether what the Scriptures represent as the special election of the predestined, by making each individual the arbiter of his own predestination or reprobation. The Dominicans, who were never very friendly to the Jesuits, and who felt that this teaching misrepresented that of their great authority, Saint Thomas, entered fiercely into the controversy; the name of Thomists is generally applied to them and to the other antagonists of Molina. The dispute was brought under the cognizance of the Inquisitor-General of Spain, who referred it to Pope Clement VIII. In 1597 he appointed the celebrated *Congregatio de Auxiliis Divinæ Gratiæ* to consider the entire question; the commission consisted of eleven members, representing different orders and schools. Before the death of Clement VIII. in 1605 it had already held 68 sessions, and 17 more were held under Paul V., still without leading to any very definite result. Paul V. finally dissolved it after nine years of anxious consultation, and in 1611 forbade anything to be printed on either side without license from the Inquisition. The decree was confirmed by Urban VIII. in 1625 and again in 1641, with special reference to a new outbreak of controversy occasioned by the publication of the *Augustinus* of Jansenius. The Jesuits had never committed themselves to Molina's doctrine as a whole, and they came gradually to a general support of a modified form of it known as Congruism, taught especially by Suarez and Bellarmine. While, according to the supporters of this teaching, Molina had placed the effective power of grace altogether in the assent of the free will, Suarez found it rather in the perfect harmony (*congruentia*) of grace with the character, temperament, tendencies, and habits of the individual. The real congruism of Suarez is, however, not so much a departure from the teaching of Molina as a clearer and more precise definition of it. Consult: Schneemann, *Die Entstehung und Entwicklung der thomistisch-molinistischen Kontroverse* (Freiburg, 1880); De Régnon, *Bañes et Molina; histoire, doctrines, critique métaphysique* (Paris, 1883); Gayraud, *Thomisme et Molinisme* (Paris, 1890).

MOLINO DEL REY, mō̇-lē'nō̇ dĕl rā'ē̇ (Sp., 'King's Mill'). A series of massive stone buildings, about 3000 feet west of Chapultepec (q.v.), and about three miles southwest of the City of Mexico; the scene, September 8, 1847, of the most hotly contested battle of the war between the United States and Mexico. At the close of the armistice which followed the battle of Churubusco (see Mexican War, The), General Scott determined to destroy a cannon foundry and some military supplies supposed to be located here, and on September 7th ordered an attack. Early on the following day General Worth, at the head of about 3500 men, assaulted the buildings, which had been strongly fortified and were then garrisoned by a force of 4000 supported by an additional cavalry force of 4000. After suffering severely from the artillery fire the Americans finally drove the Mexicans from their position, and held the fortifications for the rest of the day, in spite of a large Mexican reënforcement sent forward by Santa Anna. Of the Mexicans 690 were made prisoners and probably as many as 3000 were killed or wounded. The American loss was heavier, in proportion to the force engaged, than in any other battle during the war, 116 being killed and 671 wounded. The Mexicans, supposing the attack to be part of a movement against Chapultepec (q.v.), regarded the engagement as a victory for their side, and still commemorate it as such. Consult: H. H. Bancroft, *History of Mexico*, vol. v. (San Francisco, 1885); and Wilcox, *History of the Mexican War* (Washington, 1892).

MOLINOS, mō̇-lē'nō̇s, Miguel de (1640-96). A Spanish mystic, and leading representative of the doctrines of Quietism. He was born at Patacina in Aragon of noble parents, and pursued a course of theological studies at Pampelona and Coimbra, from which university he received the degree of doctor of divinity. Having been ordained priest, he acquired a high reputation as a director of conscience and a master of the spiritual life. He went in 1669 to Rome, where he made the same impression and won the friendship of many distinguished people. He declined all preferment, and devoted himself entirely to the direction of souls. In 1675 he published an ascetical treatise in Spanish, under the name of *The Spiritual Guide*, which had a wide popularity and was translated into many languages (into English ten years later; reprinted at Glasgow, 1885). His leading principle was that of habitual abstraction of the mind from sensible objects, with a view to gain, by passive contemplation, not only a profound realization of God's presence, but so perfect a communion with Him as to end in absorption into His essence. The dangers of his doctrine (for an examination of which and its subsequent history, see QUIETISM) were pointed out by not a few, among them the distinguished Jesuit Segneri: but so great was the popularity of Molinos that no decisive steps were taken until, in 1685, he was cited before the Holy Office and submitted to close imprisonment and examination. The Inquisition finally condemned eighty-six propositions extracted from his writings, and in a decree, which was confirmed a few months later by a bull of Pope Innocent XI., required him publicly to abjure them, and sentenced him to imprisonment for life. He underwent public penance and was admitted to absolution, but was detained until his death in 1696. Consult: Bigelow, *Molinos the Quietist* (New York, 1882); Shorthouse, *Golden Thoughts from the Spiritual Guide of Molinos* (London, 1883).

MOLIQUE, mō̍′lĕk′, WILHELM BERNHARD (1802-69). A German violinist and composer, born at Nuremberg. His father was a musician and the boy studied various instruments, but finally devoted himself to the violin. In 1815 he received some lessons from Spohr, and then studied for two years under Rovelli in Munich. In 1820 he succeeded Rovelli as Court violinist, and after several successful tours became leader of the Royal Band at Stuttgart in 1826. In 1849 he resigned to go to England, in which country he remained till 1866, when he returned to Cannstadt, near Stuttgart, where he died. His compositions, especially his violin concertos, are still in use. His third concerto, in D minor, and his fifth in A minor, are remarkable works, and are the best examples of the technical skill and clear-cut harmonies which are evident to a less degree in his duets, sacred compositions, and instrumental pieces.

MOLITOR, mō̍′lē̍′tôr′, GABRIEL JEAN JOSEPH, Count (1770-1849). A French soldier, born at Hayange (Lorraine). He became a captain of volunteers in 1791, by 1799 had risen to the rank of general of brigade, subsequently was commissioned a general of division, and in 1805 fought in the Army of Italy and took part in the battle of Austerlitz. In 1807 he was appointed Governor of Pomerania, in 1809 contributed to the victory of Wagram, and in 1811-13 was in Holland. He was appointed inspector-general of infantry at the Restoration, but received a command in Alsace from Napoleon during the Hundred Days. After the second Restoration he did not again obtain his offices until 1818. In 1823 he commanded the Second Army Corps in the Spanish expedition, and defeated Ballesteros. He was commissioned marshal (1823), and in 1847 became commandant of the Invalides.

MOL′LAH (more properly *maula*, Turkish pronunciation *mevla*, from Ar. *walaya*, to be near). Among the Turks, the title of a superior judge. The mollahs are divided into two classes. Those in the first class exercise jurisdiction over the more important pashaliks. The mollahs of the second class hold office for a lunar month at a time, and their lowest rank is composed of the naibs over the inferior provinces, towns, and villages. The mollah is an expounder of civil, criminal, and canon law; he must, therefore, be a lawyer as well as an ecclesiastic. Under him is the qadi (or cadi), judge who administers the law, and superior to him are the kadhiaskar and the mufti (q.v.). They are all, however, subject to the Sheikh ul-Islam, who is the supreme mufti. In Persia, the office of mollah, who is generally called *akhūn*, is similar to what it is in Turkey. This superior there is the 'sadr,' or chief of the mollahs.

MOLLENDO, mō̍l-lān′dō̍. A seaport of Peru, situated seven miles south of Islay, on the Pacific coast (Map: Peru, C 7). It is the chief harbor of Southern Peru and the trading centre for the mining districts of the interior, with which it is connected by railroad. Its exports are alpaca, wool, quinine, antimony, silver, and copper ores. It is the seat of a United States consular agent. Population, 2200.

MÖLLENDORF, mē̆l′len-dôrf, WICHARD JOACHIM HEINRICH von (1724-1816). A Prussian general, born at Lindenberg. He was in the first and second Silesian wars, and was promoted for bravery at Soor (1746). In the Seven Years' War he rose to the rank of major and received the Order for Merit. At Torgau (1760), where he showed great bravery, he was captured by the Austrians, but he was released in 1761, and was made general a year after. Möllendorf was division commander in the War of the Bavarian Succession (1779); Governor of Berlin (1783); and commander in 1793 of the troops which put into effect the second partition of Poland. He was appointed commander-in-chief of the Army of the Rhine in 1794. In 1806 he again took the field, was wounded at Auerstädt and captured at Erfurt, but was released by Napoleon, who gave him the cross of the Legion of Honor.

MOLLENHAUER, mŏl′len-hou′ẽr, EDWARD (1827—). An American violinist and composer, born at Erfurt, Prussia. He studied under Ernst and Spohr, and had become famous in Germany and at Saint Petersburg before he was twenty-five. To escape conscription, he went to England, joined Jullien, and accompanied him to New York City in 1853. He settled there and became a founder in America of the Conservatory method of teaching the violin. Mollenhauer's best-known compositions for the violin are his quartets. He also wrote the operas, *The Corsican Bride* (1861), *Breakers* (1881), and *The Masked Ball*.

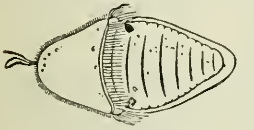
MOL′LER, GEORG (1784-1852). A German architect. He was born in Hanover, and studied architecture in Karlsruhe and Italy. After his return from Italy he was appointed Court architect to the Grand Duke of Hesse. He designed the ducal palace at Wiesbaden, a number of public buildings and private residences at Darmstadt, and the theatre at Mainz. He discovered the original design of the Cologne Cathedral, the two towers of which have been finished in accordance with his published facsimile. His most important publications include *Denkmäler deutscher Baukunst* (1815-51) and *Beiträge zu der Lehre von den Konstruktionen* (1833-44).

MÖLLHAUSEN, mēl′hou-zen, Balduin (1825—). A German traveler and novelist, born at Bonn. He studied agriculture in Pomerania, and spent several years in North America, traveling with Duke Paul of Württemberg (1851), and, at the instance of Humboldt, acting as draughtsman to a scientific expedition to the far West. After a second trip through the Western part of the United States, especially Colorado, he wrote *Tagebuch einer Reise vom Mississippi nach den Küsten der Südsee* (1858) and *Reisen in die Felsengebirge Nordamerikas* (1861). His many novels, mostly on American topics, include: *Die Halbindianer* (1861); *Das Mormonenmädchen* (1864; 3d ed. 1871); *Das Monogramm* (1874); *Die beiden Yachten* (1891); and *Fegefeuer in Frappes Wigwam* (1901).

MOLLITIES (mŏl-lĭsh′ĭ-ēz) **OS′SIUM.** See Osteo-malacia.

MOLLUS′CA (Lat. nom. pl. neu. of *molluscus*, from *mollis*, soft). One of the chief divisions, or phyla, of the animal kingdom, the study of which is Conchology or Malacology. The body is bilaterally symmetrical except in snails (Gastropoda), not segmented as in worms and arthropods, but soft, fleshy, and usually protected by a bivalve or univalve shell; moving by a 'foot' or muscular creeping disk in gastropods, or, in bivalves, by a tongue-like process; breathing by external gills which are either lamellate or plume-like. A shell is secreted by the fleshy mantle, and in nearly all except the Pelecypoda (q.v.), which are headless, the mouth is armed with an 'odontophore,' an apparatus of muscles and tendons bearing a rasp-like 'lingual ribbon' (radula) for sawing or cutting the food, or for drilling holes through shells. Many mollusca in their young or larval swimming stages begin as a 'trochosphere' (q.v.), pass through a 'veliger' stage, living at the surface of the sea and gradually sinking to the bottom by gravity as the shell grows larger and heavier. The Mollusca form a highly specialized group, the number of species amounting to upward of 40,000, about one-half of which are living, the other extinct; the earliest known species occur in Cambrian rocks. The group has a wide geographical and bathymetrical range, occurring in all seas from the shore to the abysses of the ocean and also on land and in fresh waters.

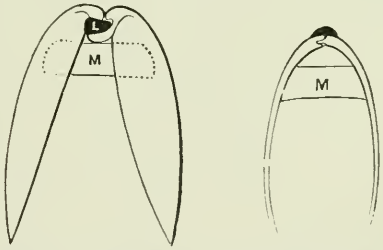
The affinities of this phylum are not yet settled. Mollusks have evidently descended from some worm-like form, as their larvæ are in some cases segmented and like the trochosphere and 'cephalula' stage of sea-worms (Annelida). In the adult segmented organs, like those of worms, are often present. On the whole they are a grade inferior to the spiders and insects. Mollusks are divided into five classes, i.e.: (1) Amphineura; (2) Pelycypoda (q.v.) or Lamellibranchiata; (3) Scaphopoda (q.v.); (4) Gastropoda (q.v.); and (5) Cephalopoda (q.v.). The Amphineura comprise a few forms formerly supposed to be worms (Chætoderma and Neomenia). These are primitive types from which, as some authors think, the other mollusks may have descended; all have a ladder-like nervous system, as in Chiton, which also has a segmented larva, and are either shell-less or somewhat like that of some Turbellaria (q.v.) and Peripatus (q.v.). See Mollusk.



A SEGMENTED LARVA.
Trochosphere of Chiton.

MOLLUSK. An animal of the phylum Mollusca (q.v.). Mollusks are usually easy to distinguish from other animals on account of their shell, whence they are commonly called 'shell-fish'; but the more we study their development and morphology the more difficult is it to draw a definite line between them and certain worm-like forms. In their early development they travel along apparently the same developmental path as the worms (planarians as well as annelids), and then diverge into a separate path. That the type is a very successful one is proved by the enormous number of species both living and extinct—a success evidently due to the protection afforded them by their shell. In bivalves as well as univalves (Gastropoda) the shell is more or less solid, is composed mainly of carbonate of lime and secreted by the mantle.

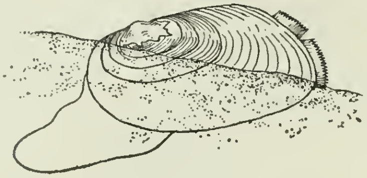
A bivalve mollusk like the clam is completely protected by a pair of solid calcareous shells connected by a hinge consisting of a large tooth (in most bivalves there are three teeth) and ligament. The shells are equivalve or with both valves alike, but unlike at each end, the head end being more rounded. On the interior are two muscular impressions or 'scars' made by the two adductor muscles. The shell of gastropods is spiral, and that part of the animal contained in the skin is asymmetrical, the twist or torsion being due to gravity or lopping over of the young shell in the larva stage.



TRANSVERSE SECTIONS OF BIVALVE MOLLUSKS.
A clam (Mya) and a fresh-water mussel (Unio), showing the ligament (L) and adductor muscle (M).

As to the most primitive forms we are in the dark. The most characteristic mollusks are the cephalopods. They are bilateral and very highly modified, with a well marked head, containing two highly specialized eyes and two ears. The concentrated ganglia form a brain with cartilaginous protections, while the parts around the mouth are modified to form the tentacles and funnel. The heart and blood vessels are highly specialized.

The 'foot' is a modification of the part of the mantle below and behind the mouth; it varies greatly in shape, and is by disuse wanting in oysters and other fixed forms; in the pelecypods or bivalves it is tongue-shaped, and by being filled with water is thrust out between the valves of the shell, so that by means of it the clam can dig deep into the mud, or the fresh-water mussel can plow its way through the sand. In the snails (q.v.) the foot forms a flattened creeping disk extending along the whole length of the body. See illustrations under CONE; CONCH-SHELL, etc.



A BIVALVE MOVING.

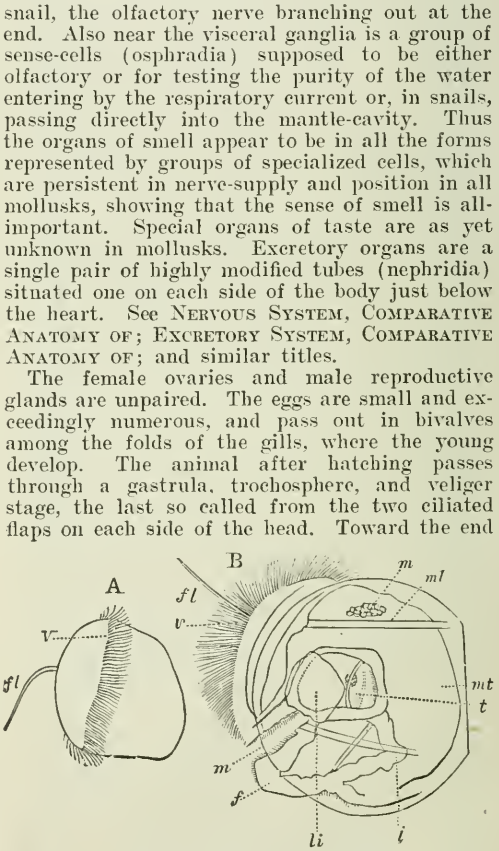
A fresh-water mussel (Unio) moving through the sand toward the left, by means of its extended 'foot.'

In the clam (q.v.) and most bivalves the hinder end of the body is prolonged into a double siphon, popularly called the 'head,' through the lower division of which enters the water laden with microscopic animals and larvæ, which pass through the mantle-cavity into the mouth, which is situated at the opposite end from the siphons. The upper division of the siphon opens out opposite the end of the intestine, which makes two and a half turns in the central or 'visceral mass,' which is composed mostly of the ovaries. The bivalves breathe by a pair of leaf-like gills, on each side of the visceral mass between it and the mantle; in the gastropods and cephalopods the gills are plume-like processes, called 'ctenidia.' There is in mollusks a definite heart, which in the primitive forms is three-chambered, i.e. a ventricle and two varicles. The ventricle in the clam and most other bivalves surrounds the intestine; the arteries and veins are well developed; the blood is colorless. Mollusks as a rule differ from other animals in the nervous system, the ganglia, connected by threads (commissures), being grouped around the œsophagus, one pair (the brain) situated above; another, the pedal ganglia, in the foot, and the pair of visceral ganglia nearer the middle of the body, and innervating the siphon, gills, digestive canal, and heart. See GASTROPODA; CLAM; OYSTER; DECAPODA; and the accompanying illustrations and plates.

Sense-organs vary much in situation, number, and size. The eyes of the scallop, which leads an active life, leaping out of the sand and skipping over the surface, are large, highly developed, and numerous, being situated around the edges of the mantle; in those mollusks which burrow (clam) or are fixed (oyster), or live in holes in limestone or coral, etc., the eyes are atrophied. In the squid and other cephalopods they are large and as complicated as those of a fish. The eyes of the land snails are borne at the ends of the tentacles, but in burrowing marine gastropods they may be wanting through disuse, though present in the larvæ.

Our knowledge of the nature of vision in gastropod mollusks has hitherto been very scanty, no observations having been made since those of Lespès in 1851, until experiments by Willem brought out the following results: (1) Snails possess a well-developed power of touch, permitting them to perceive feeble jars of the soil beneath, and slight movements of the surrounding media. (2) They see very badly and direct their movements principally by means of the senses of smell and touch. They form a confused image of large objects at an estimated distance of about a centimeter (.40 inch). They clearly distinguish the form of objects only at a distance of one or two millimeters. (3) The fresh-water snails do not have distinct vision at any distance. (4) There does not exist in mollusks a special vision of movements, such as insects possess. In general pulmonate mollusks respond to the action of light, in a degree differing in different species. They have dermatoptic perceptions, which vary much in intensity in different species. Organs of orientation, equilibrium, or hearing are the 'otocysts.' In bivalves a single one is situated in the centre of the foot; in cephalopods they are large and placed one behind each eye. The otocyst is a primitive form of ear, being a sack containing a minute particle of lime, the otolith. The sense of smell resides in the tentacles of the snail, the olfactory nerve branching out at the end. Also near the visceral ganglia is a group of sense-cells (osphradia) supposed to be either olfactory or for testing the purity of the water entering by the respiratory current or, in snails, passing directly into the mantle-cavity. Thus the organs of smell appear to be in all the forms represented by groups of specialized cells, which are persistent in nerve-supply and position in all mollusks, showing that the sense of smell is all-important. Special organs of taste are as yet unknown in mollusks. Excretory organs are a single pair of highly modified tubes (nephridia) situated one on each side of the body just below the heart. See NERVOUS SYSTEM, COMPARATIVE ANATOMY OF; EXCRETORY SYSTEM, COMPARATIVE ANATOMY OF; and similar titles.

The female ovaries and male reproductive glands are unpaired. The eggs are small and exceedingly numerous, and pass out in bivalves among the folds of the gills, where the young develop. The animal after hatching passes through a gastrula, trochosphere, and veliger stage, the last so called from the two ciliated flaps on each side of the head. Toward the end of the veliger stage the shell appears, arising from the incipient mantle as a cup-shaped body in both bivalves and univalves, but the hinge and separate valves are indicated very early in the Pelecypoda. In the young Unio, or fresh-water mussel, the development history is more condensed. The velum is wanting or vestigial, and the young live between the gills of the parent



LARVAL STAGES OF MOLLUSKS.

A. A trochosphere of the cockle (Cardium); *v*, ciliated crown; *fl*, flagellum. B. Veliger stage, with the shell developing; *v*, velum; *m*, mouth; *li*, liver lobes; *t*, stomach; *i*, intestine; *mt*, mantle; *f*, foot; *ml*, muscle; *n*, nervous ganglion.

fastened to each other by their threads (byssus). The shells (glochidium) are triangular, broader than long, with the apex hooked.

Fossil Mollusks. Remains of representatives of all the classes of mollusks occur in the lowest Paleozoic strata, having existed from the Cambrian period down to the present time. As they are so abundant, owing to their preservation as fossils (the shells in the absence of the animal being as a rule useful in classification), the mollusks are of great value as time-marks, and serve to distinguish the different formations.

The class which occurs fossil in the earliest (Cambrian) strata, and concerning which there is no doubt, is the Gastropoda. At the base of the Cambrian (Olenellus zone) have been found the shells of such primitive gastropod genera as Scenella, Stenotheca, Platyceras, Rhaphistoma, and Pleurotomaria. The last-named genus is remarkable for having persisted to the present time, as it is still found at great depths in the Atlantic Ocean. More doubtful are the pteropods of the Cambrian, of the genera Hyolithes, Forellella, etc., though their shells are much more abundantly found than those of the Gastropoda proper. Of pelecypods the Cambrian forms are obscure and doubtful, the only ones yet found being a tiny little shell (Modioloides), and Fordilla, which may turn out to be the shell of a crustacean; and this group is comparatively rare even in the Ordovician strata. Of cephalopods the earliest known genus is Volborthella, a minute orthoceratite detected in the Lower Cambrian rocks of Finland and Esthonia, and in the Saint John group, Nova Scotia.

The Cambrian, Ordovician, and Silurian mollusks present (except in generic and specific characters) comparatively unimportant differences from living forms. The earliest known pelecypods were the forerunners of the Nuculidæ; the earliest gastropods were Pleurotomaria and allied genera, some still living at great depths; the pteropods were in the main similar to existing forms, while the earliest cephalopods were the Orthoceratites, which are straight, uncoiled nautiloids. In tens of millions of years, therefore, the shelled mollusks have been one of the most numerous and characteristic groups of invertebrates, and became more and more differentiated and abundant in species, genera, and families as time went on; moreover, they are extremely abundant in the Mesozoic and Cenozoic eras, hence they afford unusually favorable data for the study of the phylogeny of both the chief and subordinate groups. This state of things was taken advantage of by Alpheus Hyatt in studies carried on for nearly forty years, during which he applied the biogenetic law of Fritz Müller and Haeckel to the cephalopods, showing that the life of the individual during its rise and decline displays phenomena correlative with the collective life of the order to which it belongs. In these and similar studies he was followed by Wurtemberger and Neumayr. Their works on fossil cephalopods bear directly on such subjects as quick evolution, the effects of changes of environment, the action of use and disuse, acting throughout numberless generations. The facts gleaned from these mollusks also bear directly on the causes and mode of origin of the different classes not only of mollusks, but of all other animal groups. The famous researches on the transmutations of the Tertiary shells of Steinheim by Hilgendorf and by Hyatt, those of Neumayr on the successive forms of Paludina, and the studies in the variations and evolution of other types by later authors, prove how valuable the shells of mollusks are in studies of this nature.

For the uses by man of mollusks, as food or ornament, or money, see under Pelecypoda; Gastropoda; Pearl; Clam; Oyster; Shell Money. Consult: Cuvier, *Mémoires pour servir à l'histoire et à l'anatomie des mollusques* (Paris, 1817); Woodward, *Manual of the Mollusca* (4th ed., London, 1880); Adams; *The Genera of Recent Shells* (ib., 1853-58); Deshayes, *Traité élementaire de conchyliologie* (Paris, 1839-57); and the new edition, by Simroth, of the third volume of Bronn's *Klassen und Ordnungen des Thierreichs;* Gould, *Invertebrates of Massachusetts* (Boston, 1870); Fischer, *Manuel de conchyliologie* (Paris, 1883-88); Pelseneer, *Introduction à l'étude des mollusques* (ib., 1900); Tryon and Pilsbury, *Manual of Conchology* (Philadelphia, 1896); Tryon, *Manual of Conchology* (Philadelphia, 1879-80); Cooke, "The Mollusca," in the *Cambridge Natural History*, vol. iii. (New York, 1896). Morphological works of Owen, Gegenbaur, Huxley, Lamarck, Spengel, Lacaze-Duthiers, Bouvier, Bourne, Peck, Ihering, Brooks, Ryder, Hyatt, with monographs by Dall on deep-sea forms and numerous recent and fossil groups, by Binney, Verrill, Bush, Conrad, Kobelt, Pfeiffer, Martens, Reeves, Stearns, Chemnitz, Bourguignant, Pilsbury, and others.

MOLLWITZ, mŏl′wĭts. A village of Prussian Silesia, in the Government of Breslau, seven miles west of Brieg. To the east of it lies the battle-field where Frederick II. of Prussia gained his first victory over the Austrians under Marshal Neipperg, April 10, 1741. The Prussian cavalry was thrown into confusion by the Austrian and put to flight. Frederick left the field at the earnest solicitation of Marshal Schwerin, who saved the day with the infantry after a five hours' battle. The Austrians suffered heavily in killed, wounded, and prisoners.

MOLLY MAGUIRES, mȧ-gwīrz′. A secret order which existed in 1854-77, and possibly afterwards, in the anthracite coal mining region of northeastern Pennsylvania. Here 400 collieries employed 60,000 men; Americans, Germans, Welshmen, Englishmen, and Swedes comprised in one-half the number, the remainder being Irish. Among the latter appeared the Molly Maguires, a branch of the Physical Force Party of Ireland. The order is alleged to have been affiliated with the 'Ancient Order of Hibernians.' About 1865 the Molly Maguires first became generally known as a dangerous organization. In 1875, having been instrumental in forcing a general strike in the coal regions, it succeeded in obtaining an ascendency in the councils of the miners, and from that period was prominent in assassinations and other outrages, committed usually on the persons and against the property of justices of the peace, police officers, and mining bosses. Only Irishmen, or the sons of Irishmen, who professed the Catholic faith, were admitted to membership; but by the laws of the Church they could not remain Catholics in good standing. The order was organized in divisions, each having a chief official known as a 'body-master'; and there were signs and passwords to enable members to distinguish each other. These signs and passwords were given to the members by the body-masters, who received them from the county delegate, who got them from the State delegate, to whom they were furnished by the national delegate or national board in New York City; to the latter they came quarterly from Ireland, by the hands of the steward of one of the transatlantic steamships. A central and governing organization known as 'The Board of Erin' held quarterly meetings in England, Scotland, or Ireland. The final exposure, capture, and punishment of the Molly Maguires was largely due to the energy and determination of Franklin B. Gowan, president of the Pennsylvania and Reading Coal and Iron Company, through the immediate instrumentality of James McParlan, a detective, who joined the Molly Maguires and became acquainted with their members and the secrets of their organization. Many members of the organization were apprehended, tried, and condemned, and their execution—that of a number of them occurring on the same day—so alarmed the members of the order that it ceased to have any extended influence. Consult: Dewees, *The Molly Maguires, the Origin, Growth, and Character of the Organization* (Philadelphia, 1877); and Pinkerton, *The Molly Maguires and the Detectives* (New York, 1877).

MOLLYMOKE. One of the many variants of mallemuck (q.v.).

MOLMENTI, mô̇l-mān′tė, POMPEO GHERARDO (1852—). An Italian author, born in Venice. He studied law at Pisa and Padua, and practiced it in his native city, where he subsequently became professor of Italian literature at the Liceo Marco Foscarini, and first attracted attention by his critical essays, *Impressioni letterarie* (1873), followed by a new series in 1879. Of several historical works concerning Venice, the *Storia di Venezia nella vita privata* (1880; 4th ed. 1885) was honored with a prize. His studies in literary and art history resulted in the publication of monographs on *Carlo Goldoni* (1879); *Antonio Fogazzaro* (1900); on the painters *Giorgione* (1878), *Tiepolo* (1885), and *Carpaccio* (1893); and of *Studi e ricerche di storia e d'arte* (1892 and 1897), besides which he also wrote a number of tales, such as *Storie vecchie* (1883) and *La dogaressa di Venezia* (1884).

MOLOCH. See MOLECH.

MOLOCH, mō′lŏk. An extremely spinose lizard (*Moloch horridus*) of Western and Southern Australia, belonging to the family Agamidæ (see AGAMA), and locally known as 'York devil' or 'mountain devil.' I is 5 to 7 inches long, broad and flat, and its thick skin is covered with spines and tubercles much like those of the American 'horned toad.' This skin, which is yellowish, with reddish-brown blotches, is highly hygroscopic, absorbing water like blotting paper. It inhabits sandy districts, is quite harmless, and apparently lives entirely upon ants, which it catches in enormous quantities upon its long, glutinous tongue. Consult Saville Kent, *The Naturalist in Australia*. See Plate of LIZARDS OF THE OLD WORLD.

MOLO DI GIRGENTI, mō′lô̇ dė jĕr-jȧn′tė. The former name of Porto Empedocle (q.v.), a seaport in Sicily.

MOLOKAI, mō′lô̇-kī′. One of the Hawaiian Islands. See HAWAIIAN ISLANDS.

MOLOKANI, mō′lô̇-kä′nė (Russ., pl. of *molokanŭ*, from *moloko*, milk). A Russian sect. It is said the name was given them in derision by the orthodox because, unlike the latter, they do not observe fasts. They call themselves Spiritual Christians. They are rationalists, basing doctrine and practice on the Scriptures interpreted by the individual judgment. As a consequence much diversity of opinion prevails among them, a condition which they do not consider reprehensible. They take the early Apostolic Church as depicted in the New Testament for the model of their ecclesiastical organization and have no hierarchy or paid clergy. A presbyter and assistants are chosen from their own number to care for the spiritual and moral interests of the community. At their religious services, held on Sunday in private houses, as they are not allowed to build churches, they sing psalms, read the Scriptures, and engage in religious conversation. Doctrinal difficulties and questions of interpretation are freely discussed. They reverence Jesus, but do not believe in His divinity, and consider the miraculous portions of the New Testament narrative as fabulous. They have a system of strict supervision of the conduct of individuals. Offenders against morality are admonished in private or public, sometimes excluded from the religious meetings, or even expelled. They are described as intelligent, well versed in the Scriptures, and in moral conduct and material prosperity decidedly superior to their orthodox neighbors. Because of their principle of private judgment and readiness to change their views, they are easily influenced by adventurers or fanatics; in several instances communities of them have been led astray by such individuals. They have also developed a tendency to break up into different sects, one of which has adopted many of the canons of the Jewish religion; another has made the common ownership of property one of its principles. Their origin is uncertain. A vague tradition says the sect was founded in the sixteenth century by foreign Protestants. Their original seat was in the south. They have been persecuted by the Government, and many have been transported to remote parts of the Empire. Their number is estimated at several hundred thousand.

MOLTING (MEng. *mouten*, *mowten*, from Lat. *mutare*, to change, frequentative of *movere*, to move, Skt. *mīv*, to push), or ECDYSIS. The process of periodically shedding the skin, or integument, or its appendages, as hair or feathers; exuviation.

MOLTING OF PLUMAGE IN BIRDS. The change of plumage, or shedding of the old feathers, and their replacement by a new set. The whole plumage, says Dwight, may be renewed or only a part of it. In the case of most of the passerine birds there are two seasons of molts peculiar to the adults, a complete one, in all species, following the breeding season, and an incomplete molt which in certain species precedes the nuptial season. "The first, the post-nuptial, restores the worn-out plumage, the second (when it is not suppressed), the pre-nuptial, adorns birds for the nuptial season." In a few species the pre-nuptial molt is complete, though usually the wing and tail are not involved, and often the renewal is confined to "a sprinkling of new feathers here and there." Young birds may also molt several times before they even acquire the feathers of adult structure, and many species need to pass through at least two molts besides those of the first summer before the plumage becomes wholly of the pattern and color of the adult. The loss of feathers during the molting process is so compensated for by the renewal of feathers that few birds (the Anatidæ and some other groups excepted) lose either the ability to fly or the protection afforded by their plumage. The feather areas are systematically replaced, the remiges falling out one after another in definite sequence and almost synchronously from each wing. The greater coverts are regularly replaced before the fall of the secondaries beneath them, the lesser coverts before the median, while even in the rows of the lesser coverts an alternation appears to be attempted. On the body the protective sequence is less obvious, but the molt regularly begins at fairly definite points.

The month of August marks the maximum of the molting season, though there is more or less shedding of feathers in nearly every month of the year. A complete molt is accomplished in from four to six weeks, while partial molts require much less time. A resemblance to the shedding of the skin of reptiles is seen in the ecdysis of the scaly feathers of the penguin, which peel off in flakes.

In certain species of European grouse the claws, which grow to an inordinate length in winter, may be partly shed or worn off as spring advances; the white pelican, both sexes of which during the breeding season bear on the ridge of the bill a horny projection, sheds it, so that these excrescences may be 'gathered by the bushel.' The puffin (q.v.) and some of its allies molt even the horny sheath of the bill, together with the outgrowths over the eyes.

Shedding of Horns, etc., by Mammals. In mammals the periodic shedding of the hair or pelage is comparable with molting; as is also the process of annually shedding the antlers, the new antler being larger and consisting of a larger number of branches or tines. In the deer family the horns of the male are deciduous toward spring, while the pronghorn drops its horns in the autumn.

Molting, or Ecdysis in the Lower Classes. In animals like Crustacea, Myriapoda, insects, and spiders, with a more or less solid exoskeleton, too dense to permit of gradual growth or increase in volume, there must be a periodical casting of the skin, or ecdysis. The same occurs in salamanders, and especially in the scaly reptiles, as snakes and lizards.

In the Crustacea, insects, and similar animals the old skin dies and the new integument is formed by a secretion thrown out by the inner layer of epithelial cells called the hypodermis. On removing the shell of the lobster the hypodermis is seen to be a richly colored reddish soft layer. The formation of the new layer of chitin arrests the supply of nourishment to the old skin, so that it dries and hardens, and is finally shuffled off. In the crayfish and presumably in the lobster (q.v.), as well as in lizards and snakes, the casting of the old skin is materially induced and aided by the growth on the surface of the hypodermis of a layer of very fine and equally distributed hairs, called 'casting hairs,' which, by their rigidity and position, mechanically loosen and raise the old skin. These remain as vestiges, forming spikes, ridges, or warts, serving to ornament the crust of crabs, or the outer edges of the skin-scales of snakes and lizards.

In insects, where casting hairs are exceptional, the loosening and casting of the skin is brought about by the secretion of a fluid by the cells of the hypodermis. This fluid spreads over the whole surface when the cells are still soft and not hardened by exposure to the air. This same fluid, when the pupa extricates itself from the larval skin, extends around the whole pupa and serves to protect it and to glue together the wings, legs, antennæ, etc., in their new position.

The process of molting as seen in caterpillars (e.g. *Telea Polyphemus*) is thus. It changes its skin five times before changing to a chrysalis; and the ecdysis occurs at regular periods, i.e. about every ten days for the first four moltings, while about twenty days elapse between the fourth and fifth casting. The operation usually takes place after 4 P.M. A little before this time it holds its body erect, grasping a leaf with the two pairs of hind legs only; the skin is wrinkled and detached from the body by the fluid previously mentioned; the body now energetically contracts, so that the skin is pulled off and pushed toward the end of the body; the skin thus becomes so stretched that it soon tears just under the neck, and then separates from the head. When this is accomplished the most difficult operation is over, and now the process of casting goes on very rapidly. By repeated contractions the skin is folded toward the tail, like a glove when taken off, and the lining of the spiracles, mouth, fore stomach, and rectum comes out in long filaments. When about one-half of the body appears, the shell still remains like a cap, inclosing the jaws; then the worm, says Trouvelot, as if reminded of this loose skull-cap, removes it by rubbing it on a leaf; this done, the worm finally crawls out of its skin, which is attached to the fastening made for the purpose. Directly after the ecdysis the larva increases in size, the head being distinctly larger as well as the body, which soon fills out.

The lobster frequently molts after maturity. But in insects which undergo a complete metamorphosis and which have the longest lives the number of molts is greatest. When the number is excessive this seems to be due to some physical cause, such as lack of food combined with low temperature. In caterpillars the number of ecdyses appears to be dependent on climate.

Bibliography. For birds, consult: J. Dwight, Jr., "The Sequence of Plumage and Molts of the Passerine Birds," in *Annals of the New York Academy of Sciences*, vol. xiii., part I. (New York, 1900), with a full bibliography as regards passerine birds; Newton (with Gadow), *Dictionary of Birds* (London, 1893-96); also the authorities mentioned under Cage-Birds.

For mammals: Beddard, *Mammalia* (London, 1902); Caton, *Antelope and Deer of America* (New York, 1877).

For reptiles and Amphibia, authorities mentioned under Amphibia; Snake.

For insects, etc.: Semper, *Animal Life as Affected by the Natural Conditions of Existence* (New York, 1881); Packard, *Text-book of Entomology* (New York, 1898); Max Braun, *Ueber*

die histologischen Vongänge bei der Häutung von Astacus Fluviatilis (Semper's *Arbeiten aus dem zoologischen Institut in Würzburg.* vol. ii., 1875), with the writings of Trouvelot, Riley, Newport, Bugnion, Gonin, and Tower.

MOLTKE, môlt'ke, HELMUTH KARL BERNHARD. Count von (1800-91). A famous Prussian general. He was born at Parchim, Mecklenburg-Schwerin, October 26, 1800. In 1811 he was sent to the Military Academy at Copenhagen, and in 1819 became an officer in the Danish service, but in 1822 entered the Prussian Army as second lieutenant. From 1823 to 1826 he studied at the military college at Berlin. In 1832 he served on the general staff, and was several times promoted, attaining the rank of captain in 1835. In the same year he went to the Orient, and, with the sanction of the Prussian authorities, took a prominent part in the reorganization of the Turkish Army initiated by Mahmud II. In 1839 Moltke returned to Prussia. His promotion was fairly rapid; in 1856 he was created major-general, and in 1858 he became chief of the general staff. In 1859 he was appointed lieutenant-general. While on the general staff Moltke continued that remarkable development of the Prussian Army which had been begun by Scharnhorst in 1807. Staff schools were established, and Moltke, who was himself a lucid lecturer, succeeded in inspiring his officers with an enthusiastic interest in their work. A constant interchange of line and staff duties kept the staff in touch with the actual discipline, drill, and handling of troops, and the business administration of each corps and division. Moreover, plans for possible campaigns and topographical surveys of neighboring countries were made in the minutest details.

The first test of the system came in 1864, with the war of Prussia and Austria against Denmark. The full revelation of the Prussian efficiency was brought about by the Seven Weeks' War between Prussia and Austria in 1866. Europe was surprised to see a campaign so rapid and successful directed, so to say, from the seat of government, for Moltke had not gone to the front until shortly before the end of the war. The great strategist was given by his King. William I., the Order of the Black Eagle, and by the Prussian Parliament fifty thousand marks. The Franco-German War of 1870-71 was the crowning triumph of Moltke's career. The war had been long expected, and the marvelous readiness of the Prussian Army was in striking contrast to the disorder existing in French military affairs. Moltke did not himself enter France until the war had already been strategically decided, but it was his plan that had been carried out with an astounding certainty and precision. He was rewarded in September, 1871, by promotion to the rank of field-marshal and a large grant of money; the title of Count had been conferred upon him in 1870. Other European States also showered honors upon him. On August 9, 1888, Moltke retired from active service, but remained chairman of the National Defense Commission. He died April 24, 1891. In 1841 he had married a stepdaughter of his sister, Mary von Burt, who died as early as 1868.

Moltke's writings on military matters, which include valuable essays on Turkish affairs, have all been published in various editions, the best being *Gesammelte Schriften und Denkwürdigkeiten* (8 vols., Berlin, 1892). Some of his letters have been translated into English by Napier (London, 1878); and by Bell and Fischer, *Letters of Moltke to His Mother and Brothers* (London, 1891). Consult, also: *Militärische Werke Moltkes*, edited by the general staff (Berlin, 1892 et seq.); Morris, *Biographical and Critical Study of Moltke* (London, 1894); Herms, *Von Moltke, His Life and Character* (ib., 1892); Buchner, *Feldmarschall Graf Helmut von Moltke* (Lahr, 1895); Jähns, *Feldmarschall Moltke* (Berlin, 1900); Müller, *Moltke* (3d ed., Stuttgart, 1889); Fircks, *Feldmarschall Graf Moltke und der preussische Generalstab* (2d ed., Berlin, 1887).

MOLUC'CAS, or SPICE ISLANDS. An archipelago constituting part of the Dutch possessions in the East Indies, and comprising most of the islands situated between Celebes and New Guinea, and between the Philippines and the Timor Archipelago (Map: Australasia, E 2). The archipelago lies on both sides of the equator. Its aggregate area is 21,516 square miles. It is divided into the Northern and Southern Moluccas. The former comprise the islands of Gilolo, the Obi group, Ternate, Tidore, and Morotai, with the adjacent islets, while the latter take in the islands of Ceram, Buru, and the Kei, Aru, and Banda groups with their surrounding islands. In geological structure the Moluccas resemble the island of Celebes, being mostly composed of Archæan or Paleozoic rocks. The highest point is Mount Nusa Heli in Ceram, 10,000 feet high. The Moluccas lie in the line of volcanic activity which extends from the Sunda Islands northward through the Philippines and Japan. Many of the smaller islands are of volcanic formation throughout, and on Ternate, as well as in Gilolo, Morotai, Banda, and Tidore, there are active cones. The climate is hot, but as a rule not unhealthful. The Moluccas are not so well watered or rich in vegetation as the more westerly islands in the Dutch East Indies, but the production of spices, from which they derive their name, is very large. The betelnut, nutmeg trees, and various other spice-producing plants are here indigenous. Coffee, cacao, tobacco, indigo, and rice are cultivated with success, and the sage tree yields the staple fruit for native consumption. In regard to the fauna, the islands resemble the other parts of the Australasian region. Besides species of marsupials, there are wild hogs, civet cats, and an indigenous species of goats. Birds of bright plumage abound in the forests. Among the insects, the butterflies are remarkable for their size and the brilliancy of their colors. Sulphur is the most important mineral of the islands, but petroleum, porcelain clay, tin, and coal are also found.

Industry is chiefly confined to the raising of spices and food products. While the clove-tree and the nutmeg occur in all the islands, clove-culture is carried on especially in Amboyna and the Uliassers, and the cultivation of the nutmeg in the Banda Islands. This is due mainly to the fact that the Dutch, in their desire to retain their supremacy in the spice market, restricted the cultivation of these spices to the above-mentioned islands until 1863, when the restriction was taken off. The trade of the group is centred chiefly around Amboyna and Ternate. The exports consist mostly of cloves and other spices, sago, and cocoanuts. Administratively the archipelago is divided into the three residencies of Ternate, Amboyna, and Banda. The chief city as well as the commercial centre is Amboyna (q.v.), on the island of the same name. The population is estimated at 400,000, and consists chiefly of Alfurese (q.v.) and Malays, the former being the original inhabitants, and found especially in the interior of the islands. Some of them are in a comparatively high state of civilization. The number of Papuans and foreigners is insignificant.

The Moluccas were discovered by the Portuguese in 1512 and were formally taken possession of by them in 1521. They were soon, however, taken by the Dutch, who started the cultivation of spices here. In 1605 Amboyna was made the chief station of the Dutch East India Company, which also built forts on several other islands. With the annexation of the Moluccas to the Dutch possessions in the East Indies, the Government also acquired a part of New Guinea and Celebes and a few other islands which constituted parts of the former vast possessions of the sultans of Ternate and Tidore.

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MOLUCHE, mȯ-lōō′chȧ (Western people). An important tribe of Araucan stock (q.v.), residing on the northern headstreams of the Limay River in Southwestern Argentina. They are distinguished for their light complexion and regular features. Unlike most of their kindred, they are sedentary and industrial, having large herds of sheep and extensive apple orchards, whence they are sometimes called by the Spaniards *Manzaneros*, or 'Apple people.'

MOLY (Lat., from Gk. *μῶλυ*). A magic herb with a black root and white flower, given by Hermes to Odysseus as a protection against the magic of Circe. In later writers, the word is applied to garlic. See *Odyssey*, X. 305.

MOLYB′DENITE (from *molybdena*, from Lat. *molybdæna*, from Gk. μολύβδαινα, *molybdaina*, galena or litharge, from μόλυβδος, *molybdos*, lead). A mineral molybdenum disulphide that crystallizes in the hexagonal system, has a metallic lustre, and is of a bluish gray color. It occurs in granite, gneiss, limestone, and other crystalline rocks, and is found at various localities in Sweden, Norway, Finland, Saxony, France, Italy, Canada, and in the United States at various points in New England, New York, Pennsylvania, and California. It was long confounded with certain compounds of lead and of antimony until about 1778, when Scheele clearly showed that it was quite distinct from those substances. It is said that a fine blue pigment can be prepared from this mineral, which has been proposed as a substitute for indigo in dyeing silk, cotton, and linen. See Molybdenum.

MOL′YBDE′NUM (Neo-Lat., from Lat. *molybdæna*, galena or litharge). A metallic element discovered in 1782 by Hjelm. The name was applied by the ancients to various substances containing lead. Subsequently it was applied to graphite and the mineral molybdenite. Molybdenum is not found native, but in combination as the sulphide (*molybdenite*), as the oxide (*molybdite*), with lead (*wulfenite*), and with cobalt (*pateraite*). In smaller quantities it is also found in other minerals. The metal itself is obtained by heating its chloride or trioxide to redness in a current of hydrogen. Molybdenum (symbol, Mo; atomic weight, 95.99) is a silver-white metal with a specific gravity of 8.6, and a melting point above that of platinum. It combines with oxygen to form the following four oxides: a monoxide (MoO), a sesquioxide (Mo_2O_3), a dioxide (MoO_2), and a trioxide (MoO_3), of which the trioxide is the only important commercial compound of molybdenum. The trioxide, usually called 'molybdic acid,' combines with bases to form molybdates, of which the ammonium molybdate, $(NH_4)_2MoO_4$, is of value as a laboratory reagent for phosphoric acid.

MOLYN, mȯ-līn′, Pieter de (c.1596-1661). A Dutch landscape and genre painter, born in London. A pupil of Frans Hals at Haarlem, he was received into the guild there in 1616, and elected dean in 1633. Besides landscapes in the style of Jan van Goven, enlivened with biblical and other accessory figures or animals, he painted village festivals, military scenes, and the like, with a broad touch and warm, forcible coloring. His pictures are very rare. The Brunswick Gallery contains a fine landscape of "Sandhills with Group of Trees" (1626); the Berlin Museum a "Ravine with Figures" of very powerful effect. In the Museum at Brussels may be seen a "Night Festival" (1625); at Haarlem the "Sacking of a Village" (1630); at Hanover a "Surprise by Robbers" (1640); and in the Louvre a "Cavalry Attack" (1643). Several of those attributed to him in other galleries are probably by Pieter Mulier (q.v.).

MOLYN, Pieter de, the younger. See Mulier.

MOLYNEUX, mŭl′ĭ-nụks, William (1656-98). An Irish philosopher and author, born in Dublin. He graduated at Trinity College, Dublin, in 1675; studied law at the Middle Temple, London, in 1675-78; published a translation (1680) of Descartes's *Meditationes de Prima Philosophia* (1641); and in 1683 assisted in founding the Dublin Philosophical Society. In 1680-90, owing to the disturbances attending Tyrconnel's government, he resided in Chester, England, where he wrote the major part of his *Dioptrica Nova: A Treatise of Dioptrics* (1692), which long continued to be the most important work on the subject. From 1692 until his death he represented Dublin University in the Irish Parliament. He published in 1698 his *Case of Ireland Stated, in Relation to Its Being Bound by Acts of Parliament Made in England* (1698), his best-known work, in which he sought to prove the independence of the Irish Parliament, and which evoked much discussion. His further writings include *Sciothericum Telescopicum* (1686), describing "a new contrivance of adapting a telescope to a horizontal dial." The philosophical society of which he was a founder was dissolved in 1688, and later succeeded by the Royal Irish Academy.

MOLZA, môl'tsȧ, FRANCESCO MARIA (1489-1544). An Italian poet, born at Modena. He went as a youth to Rome, and after living for five years in Modena, returned to Rome in 1516. From this time he led a life of reckless dissipation. At times he was in the service of Cardinal Ippolito de' Medici, and again in that of Cardinal Alessandro Farnesse, but he wrote much graceful verse in the meantime. The most celebrated of his poems is the *Ninfa Tiberina*, composed in honor of Faustina Mancini. Garnett compares this effort with Gray's *Elegy* for faultless technique. He wrote, besides this poem, sonnets, burlesques, romances, elegies, and epigrams. His complete works, under the title *Poesie volgari e latine*, were published in 1747-54. His granddaughter, TARQUINIA MOLZA (1542-1607), was also a poet. Several of her poems have been printed with the works of her grandfather.

MOMBASA, mŏm-bä'sȧ, or **MOMBAZ.** The chief seaport town and capital of the British East Africa Protectorate, situated on a small coral island off the coast in latitute 4° 3′ S. and longitude 39° 43′ E., about 150 miles north of Zanzibar Island (Map: Africa, H 5). The shores of the island are rocky and abrupt; the island is connected with the mainland by a railway line. Mombasa is an important commercial centre, a naval coaling station, and the terminus of the Uganda Railway. It has a fine harbor with an iron pier and a stone wharf. There are remains of ancient buildings which testify to the former prosperity of the place, but the houses generally are poorly built. The chief object of interest is an extensive fort on a scarped rock built in 1596 by the Portuguese and restored in 1635. Here are the offices and workshops of the British East Africa Company, and a new European hospital. The inhabitants, the majority of whom are sunk in abject poverty, mostly live in wretched hovels. Mombasa was visited by Vasco da Gama in 1497, and held by the Portuguese during the greater part of the period from 1529 to 1698, when it appears to have become independent. The English held it from 1824 to 1826, after which it passed to Zanzibar, and was ceded in 1891 to the Imperial British East Africa Company. At present it is under the direct administration of the Crown. Population, in 1901, estimated, 27,000.

MOMBERT, môm'bĕrt, JACOB ISIDOR (1829—). A Protestant Episcopal scholar. He was born at Cassel, Germany, November 6, 1829; studied in England and at Leipzig and Heidelberg; became curate at Quebec, Canada, 1857; rector at Lancaster, Pa., 1859; rector of Saint John's American Church, Dresden, Saxony, 1870; returned to America in 1875, and has since devoted himself chiefly to literary work. He has written *Faith Victorious*, a life of Archdeacon Johann Ebel of Königsberg (1882); *Handbook of the English Version of the Bible* (1883); *Great Lives* (1886); *Life of Charles the Great* (1889); *Short History of the Crusades* (1894). In 1884 he brought out a verbatim reprint of the edition of 1530 of William Tyndale's *Five Books of Moses*, with various collations and prolegomena.

MOMENT (Fr. *moment*, from Lat. *momentum*, movement, alteration, particle sufficient to turn the scales, moment, from *movere*, to move, Skt. *mīv*, to push). When portions of matter are in rotation about an axis, those physical quantities which are used to describe motion of translation—e.g. force, momentum, inertia, or mass—cease to be useful in expressing the properties of the angular motion. Analogous expressions, however, can be found which are called 'moment of force,' 'moment of momentum,' 'moment of inertia'—all with reference to the axis of rotation, which play the same part in the equations of rotation as do force, momentum, and mass in translation. The moment of a force about an axis is the product of the numerical value of the force by the perpendicular distance from the axis to the line of action of the force. The moment of momentum of a particle about the axis is the product of the momentum by the perpendicular distance from the axis to the direction of the velocity of the particle. (If the particle forms part of a rigid body rotating about a fixed axis, the moment of momentum equals the product of the moment of inertia and the angular velocity.) The moment of inertia of a rigid body about an axis is the summation of a series of terms, $m_1r_1^2 + m_2r_2^2 +$, etc. (or Σmr^2), where m_1 is the mass of a particle of the body and r is its distance from the axis, etc. See MECHANICS.

MOMENTUM (Lat., movement, alteration, particle sufficient to turn the scales, moment), or QUANTITY OF MOTION. The product of the mass of a moving particle and its linear velocity. (It is a vector quantity.) Both terms were used by Galileo; the latter by Newton. It is a fundamental principle of mechanics (q.v.) that the numerical value of the influence of any external body in changing the motion of a moving particle is the rate of change of momentum with reference to the time, or the change in one second if the change is uniform. The total change of momentum in any time equals the 'impulse' of the external force, or the product of the force and the interval of time. If a bullet enters a target, the *time* required for it to come to rest depends upon its *momentum;* but the *distance* it enters, upon its *kinetic energy*. Thus to produce a powerful blow a great momentum (mv) is required; but to do destructive damage, great kinetic energy ($\frac{1}{2}mv^2$). If a system of bodies is moving free from external influence, the geometrical sum of the linear momenta of all the bodies of the system remains unchanged regardless of how the momenta of the individual bodies are altered by impacts, explosions, etc. This is called the 'principle of the conservation of linear momentum.' (By geometrical sum is meant the process of adding geometrically the lines which indicate the momenta of the individual bodies of the system.)

If a rigid body is rotating about a fixed axis, the product of its moment of inertia about this axis and its angular velocity is called its 'angular momentum;' and it plays the same part in motion of rotation that linear momentum does in translation. See MECHANICS.

MOMIERS, mȯ'myȧ' (Fr., mummers). The name given in derision to a class of evangelical Protestants of Switzerland and adjacent parts of Germany and France, which sprang up about 1817, and whose members exhibited an uncommon degree of fervor in their religious services. They charged the national Church with apostasy from the reformed faith, especially by denying the divinity of Christ. This subjected them to opposition, restraint, and fines. Among those who belonged to the Momiers or sympathized with them were César Malan, Louis Gaussen, Merle d'Aubigné, and F. Monod (qq.v.). Out of this sect sprang the French society styled the Evangelical Society for the Conversion of Roman Catholics, and the Free Church of Switzerland. Consult: *Geschichte der Momiers* (Basel, 1825); Von der Goltz, *Die reformirte Kirche Genfs im 19. Jahrhundert* (Basel, 1864); Chenevière, *Quelques mots sur la Genère religieuse au XIXème siècle, de M. le Baron de Goltz* (Geneva, 1863).

MOMMSEN, môm′zen, THEODOR (1817—). An eminent German historian and archæologist. He was born November 30, 1817, at Garding, in Schleswig, where his father was a pastor. From 1838 to 1843 he studied at the University of Kiel, devoting himself especially to legal and historical subjects. From 1844 to 1847 he traveled and studied in Italy and France; in 1848 he became editor of the *Schleswigholsteinische Zeitung* at Rendsburg, and in the autumn of the same year was called to Leipzig as professor extraordinarius of law. Two years later, however, having been removed for political reasons, he withdrew to Switzerland, where he became professor of Roman law at the University of Zurich in 1852. After two years he was called to a similar position at Breslau, and since 1858 he has been professor of ancient history at Berlin. From 1874 to 1895 he was permanent secretary of the Berlin Royal Academy of Sciences. He also served as Deputy in the Prussian Parliament from 1873 to 1882, and has been a powerful factor in all liberal movements. Mommsen's literary activity began in 1843 with his famous monograph, *De Collegiis et Sodaliciis Romanorum*, and from that time he continued to make most important contributions to almost every field of classical learning. His greatest works are: *Die unteritalischen Dialekte* (1850); *Römische Geschichte* (1854-56; vols. i.-iii., in 8th ed., 1888; Eng. trans., New York, 1894), unquestionably one of the most masterly histories ever written; *Römische Chronologie* (2d ed. 1859); *Die Geschichte des römischen Münzwesens* (1860); *Römisches Staatsrecht* (3d ed. 1887-88); *Römisches Strafrecht* (1899). Mommsen more than any other man became the founder of modern Latin epigraphy. By his publication of the volume *Inscriptiones Regni Neapolitani Latinæ* (1852) and his *Inscriptiones Confœderationis Helveticæ Latinæ* (1854), he set the model which has been followed in the great collection of Latin inscriptions, the *Corpus Inscriptionum Latinarum*, which has been published at the expense of the Berlin Academy since 1863. Of this great work Mommsen himself edited vols. i., iii., viii., and ix., and published a large number of epigraphical works, one of the most important of which is the *Monumentum Ancyranum*, with extensive commentary (2d ed. 1883). He also edited many Latin authors, the *Digest*, and served as co-editor of the *Monumenta Germaniæ Historica*. For a full list of his publications up to 1887, consult Zangemeister, *Theodor Mommsen als Schriftsteller* (Heidelberg, 1887). Two of Theodor Mommsen's brothers are eminent scholars in special fields. TYCHO, born at Garding, May 23, 1819, studied at Kiel and was engaged in educative work until 1885, when he retired. He published a critical edition of Pindar (1864) and other works on the Greek poet. He died December 1, 1900. AUGUST, born at Oldesloe, July 25, 1821, studied at Kiel, was also engaged in educational work, and published several volumes relating to Greek and Roman chronology.

MOMOR′DICA (Neo-Lat., from Lat. *mordere*, to bite; so called because the seeds look as if bitten). A genus of the natural order Cucurbitaceæ. *Momordica Balsamina*, a native of Southern Europe and of the East, used to cover arbors, produces a curious, oblong, much-warted fruit, called the balsam apple, which, when green, is infused in oil to form a vulnerary much esteemed in Syria and some other countries. The large, red, thorny fruit of *Momordica cochinchinensis*, called gol-kakra in India, is there used for food. *Momordica Charantia*, a native of Asia and Africa, grown as an ornamental in the United States, is noted for its peculiarly sculptured seeds, the pulp surrounding which is eaten by the Chinese. *Momordica involucrata* is also cultivated as an ornamental.

MOMOSTENANGO, mō′môs-tȧ-nän′gô. A town of the department of Totonicapan, Guatemala, 60 miles northwest of the city of Guatemala (Map: Central America B 3). It is situated on a high plateau in the midst of an important agricultural region. Its inhabitants, chiefly Indians, are also engaged in weaving woolen cloth. Population, in 1899, about 18,000.

MO′MOTOM′BO. A volcano in Central America, situated on the northwestern shore of Lake Managua in Nicaragua (Map: Central America, D 4). Its height is 6124 feet. It is still active, its last great eruption having occurred in 1852.

MOMPOS, môm′pôs, or **MOMPOX.** A town of the Department of Bolívar, Colombia, situated on the Magdalena, 110 miles southeast of Cartagena (Map: Colombia, C 2). The town has two colleges and several elementary schools. It was formerly an important port, but the river at this point is no longer navigable; the chief occupation of the inhabitants is the manufacture of jewelry, tools, and instruments. Population, 10,000.

MO′MUS (Gk. Μῶμος, ridicule). The personification of mocking censure. In Hesiod he is the offspring of Night, and in the lost epic poem, *Cypria*, he seems to have suggested to Zeus the marriage of Thetis and the birth of a fair daughter, which would together bring about the Trojan War. His story was chosen for satyr dramas, and his name became proverbial for a carping and mocking critic. In Lucian and his contemporaries Momus is more prominent than in the earlier writers, and criticises all the gods for their defects, even to the shoes of Aphrodite, who was otherwise faultless. For this Zeus finally drove him out of heaven.

MONACHISM. See MONASTICISM.

MONACI, mô-nä′chē, ERNESTO (1844—). An Italian Romance philologist, born at Soriano (Province of Rome). He studied the Romance languages and became professor of Romance philology at the University of Rome in 1876. The *Rivista di Filologia*, which he founded in 1872, with Stengel and Manzoni, ceased publication in 1876, but the *Giornale di Filologia Romanza*

(1878-84) was virtually a continuation of it. Monaci published detached essays along the same line in the *Studi di Filologia Romanza,* and under the following titles: *Uffizi drammatici dei disciplinati dell' Umbria,* in the *Rivista di Filologia* (1872); *Il Canzoniere portoghese della Biblioteca Vaticana* (1875); *Il Canzoniere portoghese Brancuti-Colocci* (1875-80); *Il Canzoniere chigiano* (with Molteni, 1878); *Testi antichi provenzali* (1889).

MONACO, mŏn′ȧ-kō. An independent Italian principality and the smallest sovereign State of Europe, bounded by the Mediterranean and the French Department of Alpes-Maritimes (Map: France, O 8). Its area is about 8½ square miles, and the principality practically consists of the capital, Monaco, Monte Carlo (q.v.), and the village of Condamine, between the two towns. It is in a mountainous country, renowned for its picturesque scenery. It is without industry or commerce, and its inhabitants are engaged chiefly in providing accommodations for tourists. The government of the principality is that of an absolute hereditary monarchy. The internal affairs are in the hands of a Governor-General, who is also the president of the Council of State, whose functions are merely advisory. There is a court of first instance and a court of justices of the peace, but no jail, all prisoners being sent to France. The judges are appointed by the Prince, mostly from members of judicial bodies in France, and the French Code has been adopted with some modifications by the principality. The army, including the guard of honor, numbers about 200 men. There is no obligatory military service and little taxation, the revenue being derived almost entirely from the gaming tables at Monte Carlo. The principality forms a Roman Catholic bishopric, and the Roman Catholic Church is recognized and supported by the State. Population, in 1896, 15,180.

Monaco was conferred on a member of the Genoese House of Grimaldi in 980. In 1450 the principality passed under the protection of Aragon, but, dissatisfied with the Spanish rule, it came under the protection of France in 1641. The National Convention annexed the principality to France in 1793. By the Treaty of Vienna it came under the protection of Sardinia. In 1861 the communes of Mentone and Roccabruna (Roquebrune) were ceded by Sardinia to France, for which the Prince of Monaco received in the following year an indemnity of 4,000,000 francs. Consult: Métivier, *Monaco et ses princes* (La Flèche, 1865); Pemberton, *The History of Monaco, Past and Present* (London, 1867); Harris, *Monaco: pièces historiques et traités* (Nice, 1882); Boyer de Saint Suzanne, *Les petits états de l'Europe: la principauté de Monaco* (Paris, 1884); Saige, *Documents historiques relatifs à la principauté de Monaco* (Monaco, 1890-91); id., *Monaco, ses origines et son histoire* (Paris, 1898); Moncharville, *Monaco, son histoire diplomatique: la question des jeux* (Paris, 1898).

MONACO. The capital of the Principality of Monaco, situated on a promontory in the Mediterranean, about midway between Nice and Mentone (Map: France, O 8). Its chief buildings are the palace of the Prince, with a beautiful garden, and the new cathedral, built in the Romano-Byzantine style. Near the town is the famous gambling resort of Monte Carlo (q.v.). The adjoining commune of Condamine has a railway station and some industries. Monaco is a sea-bathing resort, and its climate is considered very healthful. Population, with Condamine, about 10,000.

MONACO, Il. A name sometimes applied to the Italian painter and monk Don Lorenzo (q.v.).

MO′NAD (from Lat. *monas,* from Gk. μονάς, unit, from μόνος, *monos,* single; connected with Ger. *man,* only, Lith. *mináu,* throughout). (1) In early modern philosophy, a term used to designate the ultimate elements of reality (Bruno). By Leibnitz, from whose system the name has derived importance, it is used to designate the spiritual atoms which compose the universe. (See Leibnitz.) (2) In biology, a generic term for a simplest organism defined as being without a nucleus. In the old system of Ehrenberg, Monas was a large genus, but it has become more and more restricted, as better methods and apparatus have resulted in the discovery of a nucleus where none was believed to occur. The forms once included in the genus are now distributed among the flagellate Infusoria on the one hand (Haeckel's Monera; see Moner), and the bacteria on the other. As it is quite probable that there is no organism without nuclear matter, the name is practically obsolete.

MONAD′NOCK, Grand. An isolated mountain in Cheshire County, in the southwestern corner of New Hampshire (Map: New Hampshire, F 10). It is regarded as an outlying member of the White Mountain group, is 3186 feet high, and commands a fine view from its summit.

MONAGAS, mō-nä′gȧs, José Tadeo (1784-1868). A Venezuelan soldier and politician, born near Maturin. He served with distinction during the War for Independence (1813-21), and in 1846 was elected President of the Republic. At first he posed as a reformer, but he soon forsook this rôle and made himself dictator. Congress refusing longer to support him, he dissolved that body, and in 1850 defeated ex-President Paez (q.v.), who headed an insurrection against his authority. The next year he secured the election of his brother José Gregorio to the Presidency, and at the expiration of the latter's term, in 1855, was himself reëlected. Two years later, however, another insurrection broke out against him, and on March 15, 1858, he was forced to abdicate and to leave the country. Ten years later he returned and overthrew President Falcon. Congress then elected him Falcon's successor, but he died before taking office.

MONAGHAN, mŏn′*a*-gan. An inland county in the southern part of Ulster, Ireland (Map: Ireland, E 2). Area, 496 square miles. The surface is in general undulating with some steep hills, the highest point being 1250 feet above the sea. The soil is varied in character, less than half the area of the county being arable, but in general it is suitable for cereal crops (with the exception of wheat) and flax. The principal towns are Monaghan (q.v.), the county-seat, Carrickmacross, Clones, and Castle Blayney. The population declined from 200,500 in 1841 to 74,500 in 1901.

MONAGHAN. The capital of County Monaghan, Ireland, 76 miles northwest of Dublin

(Map: Ireland, D 3). Among its public buildings are the market-house, court-house, Roman Catholic college, and the cathedral of Saint MacCarthain. The town is the centre of a trade in flax and grain. Two markets for agricultural produce are held weekly, and there is also a monthly fair. Population, in 1901, 2932.

MONALDESCHI, mō′nȧl-dĕs′kē, GIOVANNI, Marchese. An Italian noble of the seventeenth century, a favorite of Christina of Sweden. He was a member of a noble family of Ascoli and a leader of the French party at Rome; and after the disgrace of Pimentelli and the Spanish party at the Swedish Court, came into the favor of the Queen. In 1657, during her visit at the French Court, she accused him of high treason and had him assassinated at Fontainebleau. The real reason for his murder is unknown. Consult Martens, *Causes célèbres* (Leipzig, 1858).

MO′NA MONKEY (Sp., Port., It., female monkey). A West African guenon (*Cercopithecus mona*), familiar in menageries and as a pet. It is of small size, black on the back, with the face purple, except the pink lips and chin. The under surface is white, abruptly demarked from the black mantle; the bushy whiskers are yellow; a gray band extends across the forehead; and there is an oval white spot on each side of the root of the tail. It is a docile and interesting animal. Compare GUENON and DIANA MONKEY.

MONARCH. See MILKWEED BUTTERFLY.

MONARCHIANS (from Gk. μοναρχία, *monarchia*, sole power, from μόναρχος, *monarchos*, monarch, from μόνος, *monos*, single + ἄρχειν, *archein*, to rule). A term of Christian theology, applied to certain persons in the early Church who objected to the orthodox Christology, on the ground that it suggested two gods (or three, if the Holy Spirit was included), and who maintained, in opposition, what was called the divine 'Monarchy' (Gk. μοναρχία), or essential oneness of the Deity. The questions at issue were the relationship of Christ to the Father and Christ's preëxistence. If Christ was God incarnate, as the Church taught, then it must follow, said some, that God the Father has entered the world, and has lived, suffered, and died among men. Christ then would be merely a form or mode of manifestation of the supreme Deity, who might reveal Himself as Father, Son, or Spirit. This doctrine was called Modalism, or, more exactly, Modalistic Monarchianism. It was also known as Patripassianism, from the fact that it represented the Father as suffering. Among its adherents were Praxeas, an Asiatic Christian, who visited Rome late in the second century, and was opposed by Tertullian (q.v.), and Noëtus of Smyrna, whose views were combated by Hippolytus. The most celebrated Modalist, however, was Sabellius (q.v.), who flourished early in the third century, and who taught that the Trinity consisted of three successive manifestations of God in history. Eastern Modalism was commonly called Sabellianism after him, and this name ultimately came into use in the West also.

But there were some Christians who attempted, in just the opposite fashion, to answer the question how Christ was related to God. Their method was not identification, but distinction. Christ they held to be a created being, a man like other men, but they believed He became the Son of God by adoption, through an impartation of divine powers, usually regarded as received at His baptism. These persons are known as Dynamic Monarchians (from Gk. δυνάμεις, powers), to distinguish them from the other Monarchians described above. One of the leaders of this school was Theodotus the Tanner, who came to Rome from Byzantium late in the second century, and was there excommunicated by Pope Victor I. Another leader also bore the name Theodotus. He was a money-changer, a disciple of Theodotus the Tanner. Artemon, in the third century, continued the same teaching. All these three appear to have been laymen. The Theodotians and Artemonites were called after them, and figure prominently among the third century heretics. Dynamic Monarchianism found an able representative in Paul, Bishop of Samosata and Prime Minister of Zenobia, Queen of Palmyra, who was excommunicated by an Asiatic synod about 268. (See PAUL OF SAMOSATA.) The Dynamic Monarchians were probably much less numerous than the Modalists.

Over against all these Monarchians of either type the main body of the Church maintained the divinity of Christ along with His personal distinction from the Father. The orthodox Logos-Christology was developed into the doctrine that Christ is a preëxistent divine hypostasis (q.v.), who became man through the incarnation, and is therefore both God and man, two natures in one person. A similar view was held, although with less distinctiveness as yet, respecting the Holy Spirit, the third person of the Trinity (q.v.). Irenæus, Tertullian, Hippolytus, Novatian, and especially Origen, all contributed toward this doctrinal development. Yet by teaching that the Son was subordinate to the Father, as he was forced to do in refuting Monarchianism, Origen prepared the way for Arianism, the most serious heresy of the fourth century. (See ARIUS.) Consult: Harnack, *History of Dogma*, vol. iii. (London, 1897); Fisher, *History of Christian Doctrine* (New York, 1896); Smith and Wace, *Dictionary of Christian Biography*, articles "Theodotus," "Artemon," "Praxeas," "Noëtus," "Sabellius," "Paul of Samosata," etc.

MONARCHY (Lat. *monarchia*, from Gk. μοναρχία, sole power). In the strict sense of the term, that form of State in which the sovereign authority is vested in a single person. It is only when the king or chief magistrate of the community possesses the entire ruling power that he is, in the proper acceptation of the term, a monarch; but in a mere popular sense the term 'monarchy' is applied to any State in which the chief executive authority is vested in a single hereditary ruler. The degenerate form of monarchy is tyranny, or government for the exclusive benefit of the ruler. When the head of the State, still possessing the status and dignity of royalty, shares the supreme power with a class of nobles, with a popular representative body, or with both, the government, though no longer in strictness monarchical, is called in popular language a mixed or limited monarchy, the term absolute monarchy being applied to a government properly monarchical. If the monarch in the exercise of his powers is restrained by the precepts of a constitution, the State is commonly styled a 'constitutional monarchy.' Monarchy, most usually hereditary, has sometimes been elective, a condition generally attended with feuds and distractions, as was the case in Poland (q.v.). Constitutional monarchy may be in its origin elective, or combine both systems, as when one family is disinherited and the sceptre declared hereditary in the hands of another under certain conditions, as occurred in England in 1688. See GOVERNMENT; KING; REPUBLIC.

MONAS. See MONAD.

MONASTERY (Lat. *monasterium*, from Gk. *μοναστήριον*, monastery, solitary dwelling, from *μοναστής*, *monastēs*, solitary man, monk, from *μονάζειν*, *monazein*, to dwell alone, from *μόνος*, *monos*, single). The generic name of the residence of any body of men (or even, though more rarely, of women) bound by monastic vows. In its strict application, it is confined to the houses of monks properly so called, but is frequently used of the establishments of the mendicant and more modern orders. The older monasteries were divided into two great classes, abbeys and priories. The former name was given only to the important or mother houses, governed by an abbot, who was commonly assisted by a prior, sub-prior, and other functionaries. An abbey always included a church, and the English word minster, still applied to churches no longer part of a monastic establishment, had its origin in the Latin *monasterium*. A priory supposed a less extensive and less numerous community. It was governed by a prior, and was originally subject to the jurisdiction of an abbey. This was the Benedictine rule; but in other orders, such as the Carthusian, the title of prior was uniformly used instead of abbot. In the military orders the names commandery and preceptory were used instead of abbey and priory. The name cloister is sometimes applied to the whole monastery, considered as an inclosed place; the term is also used, in a narrower sense, to designate the arcaded ambulatory which runs around the inner court of the buildings. Below the officials mentioned above, the ordinary monks were generally divided into two great classes: choir brothers (frequently, in later times almost universally, in holy orders), so called because they were required and by their education qualified to take part in the singing of the choir offices, and lay brothers, who, instead of this duty, had the household cares of the community. For the principles of monastic life and the history of its development, see MONASTICISM; and, for the important part played by monasteries in the growth of architecture and its kindred arts, see MONASTIC ART.

MONASTERY, THE. A novel by Sir Walter Scott (1820). It is a story of the sixteenth century, of the days of Murray, the Regent, and had for its sequel *The Abbot*. It was not as successful as most of Scott's works, partly from the supernatural element in the appearance of the White Lady of Avenal.

MONASTIC ART. The art peculiar to the monastic orders. In the development of Christian art monasticism was at times the determining cause. The *Basilian* and other groups of monks in the East during the entire Middle Ages; the *Benedictines* in the West from the eighth to the eleventh century; the *Cistercians* during the twelfth; the *Franciscans* and *Dominicans*, especially in Italy, during the thirteenth and fourteenth centuries, produced a large proportion of the works of art of those periods. The influence of these orders was seldom exercised on the material side of the various arts, but more generally and radically on the choice and treatment of subject.

BASILIAN ART. The monks of the Order of Saint Basil were the best organized and most numerous of the monastic aggregations in the East, and their influence upon Christian art was the most important produced by Eastern monasticism. Oriental monasteries cannot compare with the largest in the West; but, on the other hand, study of them is more interesting, because so many more remain comparatively intact and are of so early a date. The groups in the Egyptian Desert, for example, date mainly from the fourth and fifth centuries, and some of those in Old Cairo are not much later. The usual type is an immense inclosure surrounded by a high wall, like that around an Egyptian temple. Within the court the monks' cells are built against the inner edge of this wall, leaving the central space free for two or three churches, a large refectory, a strong watch tower which contains the treasury and library. Next in age come the monasteries of the cities of Central Syria (fifth and sixth centuries), with a common cloister. Scattered over Syria and Palestine, beginning with Justinian's famous monastery of Saint Laba, on Mount Sinai, are monastic establishments of the Syrian monks which rivaled those of Egypt. They have been very little studied. But the period succeeding the Iconoclastic movement is represented by some monasteries at Constantinople (e.g. Saint John Stoudios), Salonica, Chios, Daphne, and Saint Luke in Greece, and especially by those of the Holy Mountain, Mount Athos, the centre of Hellenic monasticism from the eleventh century to the present day. The general plan of the Mount Athos monasteries was similar to that of the Egyptians, with the difference that a better organization had brought. The separate monasteries were dotted over the mountain, each in its inclosing wall. Their churches, treasuries, frescoes, and manuscripts have been carefully studied; they form one of the most interesting groups remaining from the Middle Ages. Some of the buildings are as early as the tenth and eleventh centuries, with mosaic pavements, decorative sculptures and mosaics, but the frescoes are all much later. The most interesting group in Thessaly are the famous monasteries of Meteora, which the visitor can reach only by being hauled in a basket to the top of a high precipitous rock. Here the buildings are not as old as at Mount Athos. In the strong Byzantine revival under Basil the Macedonian and his successors (ninth and tenth centuries), the monks played an important part as colonists. Traces of their monasteries and hundreds of their anchoretic caves with Byzantine frescoes are found, for example, in Calabria, Apulia, and other parts of Southern Italy. Before then, in the eighth century, the Iconoclastic persecutions had driven to Italy many Basilian monks, who as painters could no longer practice their art safely in the East. They gave the strongly Byzantine tinge to the art, especially the painting and decorative sculpture of the Roman school, which thence spread over the rest of Europe. There were over twenty Greek monasteries in Rome, large and small, before the eleventh century. That of Grottaferrata, near Rome, became the greatest representative of the Basilians in the West outside of Southern Italy, and still has interesting early mosaics and sculptures.

While the monastic and lay artists of Europe developed their styles of architecture with but little reference to the East, the arts of ivory carving, enameling, goldsmith work, mosaic, tapestry, and embroidery were perpetuated in the Eastern monasteries and by them transmitted to the Western monks of the Carlovingian age. To the Eastern monks also was due a dominant part in perfecting the system of Christian iconography which was in part, at least, adopted in the West, including the artistic types of Christ, the Virgin, John the Baptist, the Apostles, angels, and saints, as well as the arrangement of most of the subjects of the Old and New Testaments. This influence was supreme in Italian painting, for example, up to the time of Giotto. With the name of the monk Panselinos will always be connected that written text-book of painters used until the present day by Neo-Byzantine artists.

Benedictine Art. The earliest establishments of the founder of the Order of Saint Benedict at Subiaco and Monte Cassino have left no traces to show that they had any special artistic significance. Most of the Western monasteries of the seventh century were of wood, and the life was still largely anchoretic. It was in the eighth century, as the Carlovingian era approaches, that Benedictine life became more highly organized, types of monastic buildings were created for all time, and monasteries of great wealth and power arose, taking a leading part in art. Centula, Lorsch, Fontanella, and Fulda were followed by Nanantula, Monte Cassino, Cava, Saint Gall, Tours, Reichenau, and many other great artistic centres. The cloister, a new architectural form adapted from the atrium of the early Christian basilica, became the centre around which the monastic buildings were grouped. For the general plan and organization of the monastery and its early artistic activity, consult the article Benedictines.

In the tenth century the great Benedictine reform took place at Cluny, which henceforth was the leading monastery of the Order, using the establishments of Hirsau and Farfa to further her artistic and other reforms in Germany and Italy. The plans used in rebuilding and reorganizing these two monasteries were borrowed from Cluny. The revival which ensued led to an immense increase in the number of establishments. In Italy alone art became partly enfranchised, with a notable increase of lay artists, due to the great prosperity of the free communal cities.

The style of architecture practiced by the Benedictines during these centuries did not show much originality. It retained in the churches the old basilical type, with columns and wooden roof, though piers were occasionally used. The lack of close, organized union between the different monasteries of the Order prevented the creation of a special Benedictine style. The work had local characteristics. In newly converted and civilized regions the monks were always the pioneers of art, and in this way, even without special style, became a paramount influence. But in fresco painting and in the minor and industrial arts, the case was different. (See Benedictines.) The monks partly introduced Byzantine methods and ideas, as in the school founded in the eleventh century by Desiderius at Monte Cassino, for nearly all branches of art, partly evolved a special style and iconography, as in Germany and France. The lay guilds of the late Romanesque and Gothic periods were merely offshoots from these monastic schools. The intellectual attainments of the monks peculiarly qualified them in developing systematically the themes of religious art, which they handed on to their lay successors, who had but to accept and vary them.

Cistercian Art. The Cistercian monasteries were not, like the Benedictine, centres of the industrial and minor arts; no provision was made for the practice of ivory carving, goldsmith work, enameling, illuminating manuscripts or fresco painting, mosaic work, and monumental sculpture. On the other hand, it was necessary to train a school of architects that should understand the special needs of the Order and build according to its rules. This school originated in Burgundy, and as the Order spread over the whole of Europe and part of the Orient during the twelfth century and became the most powerful of all monastic institutions, as well as the most perfectly organized, its architects carried the Burgundian Cistercian style over a large part of the then civilized world. Pontigny in France, Maulbronn in Germany, Fossanova in Italy, Veruela in Spain are typical establishments in good preservation of the twelfth and thirteenth centuries. The high walls inclosing the entire establishment, and insuring protection against raids, as well as marking the cloistral limits, were entered through a monumental gateway, and contained large warehouses, barns, and stables, and often a mill, a hospital, and chapel, as well as the main quadrangle of buildings, flanked by a cemetery, garden, and orchard. Of this quadrangle the church usually occupied the left flank, facing the gateway, the dormitories being on the front and rear of the quadrangle around the cloister, on the second floor, the ground floor being occupied by a chapel and chapter-house on the side near the church, a refectory and kitchen on the side opposite the church, and reception rooms, passageways, and staircases on the front.

The architectural style of these buildings was plain on principle. The church had a plain gable front without towers, and its material was of stone or brick, left undecorated by figured sculptures or frescoes. The practical element, being so strongly developed, led to a divorce of the decorative from the structural elements in architecture. Stress was laid upon forms of vaulting, and the Order became associated with the substitution of tunnel, groin, and ribbed vaulting for wooden roofs throughout a large part of Europe. But the influence of the new Gothic constructive forms commenced in Burgundy toward 1160, and the Cistercian architects quickly adopted them as in harmony with their own ideas, and propagated them throughout Europe. Nevertheless the Order never developed the Gothic style in its entirety nor to its ultimate forms, but rested satisfied with its elementary stage as more in harmony with the simple ideas of the Order.

The monastic buildings of Fossanova in Italy are a good example of structures built by French Cistercian constructors imported from Burgundy; those of the neighboring Casamari exemplify the handiwork of the native artists taught by these Frenchmen. So it was everywhere, especially in Germany and England, where local peculiarities soon strongly modified the imported styles, and before the close of the thirteenth century the original strictness of the Order was relaxed, and, especially in France, the entire rich system of Gothic decoration adopted, with its tracery, floral sculpture, and stained glass. With the fourteenth century the decadence of the Order, replaced in popularity by the Franciscans and Dominicans, removed it as a serious factor from the field of art.

Franciscan and Dominican Art. The monasteries of these Orders were in or near the cities, so that the members could take part in the daily life of the people. There were ordinarily no high encircling cloistral walls, no arrangements for teaching the arts (except occasionally that of illuminating manuscripts or doing goldsmith work), no warehouses. The art of the mendicant orders was especially important in Italy. At the beginning the Cistercian style furnished models for church and cloistral architecture, but soon these borrowed traits dropped into insignificance, when compared with the original features that were developed. The emphasis laid upon preaching in their churches to the masses, and thus influencing public sentiment, led to the creation of two new types of monastic church—that with lofty aisles and with widely spaced supports between nave and aisles, and the hall church type with no aisles. In both cases the object was to place large congregations within sight and hearing of the pulpit. San Francesco at Assisi, the mother monastery, was the model for the hall-church type; San Francesco and San Domenico at Bologna for the three-aisled type. Of the greatest churches of the thirteenth century in Italy, nearly all were built by monks of these two Orders—Santa Maria Novella and Santa Croce at Florence, Santa Maria dei Frari and Santi Giovanni e Paolo at Venice, Santa Maria sopra Minerva in Rome, Sant' Anastasia at Verona, San Francesco at Ascoli.

While the Orders were less prominent in the architecture of the rest of Europe, they certainly popularized in Germany the use of the hall church, which became a very common type; but the predominance of cathedral architecture and the continued prosperity of the Cistercians limited their sphere.

Of even greater importance was the effect of the Orders on sculpture and painting. The thought and feeling, the system and symbolism that lay behind the great schools of fresco painting of Florence, Siena, and other Italian centres, as well as the French schools of cathedral sculpture at Chartres, Rheims, Amiens, Bourges, Paris, are due to the influence of Saint Francis, Saint Dominic, and their successors, such as Saint Bonaventura and Thomas Aquinas. The encyclopædic thinkers who furnished the ideas and directed the hand of sculptors and painters were the teachers of these Orders, who also directed the thought of the universities of Europe. The frescoes in the Church of San Francesco at Assisi, in the Cappelli dei Spagnuoli at Florence, the Plazzo Pubblico at Siena, the tower at Florence, and of Orvieto Cathedral, are their work, in symbolism, in teaching, in all their higher value. The bold attempt to represent the origin, character, and history of the universe in art, made by the decorators of the French Gothic cathedrals, had precisely the same source. The corresponding printed pages are to be found in Vincent of Beauvais's *Speculum Universale* and other similar literary encyclopædias. It is by reading the life and legends of Saint Francis, by studying the important rôle of the preachers in the popular movements, by reading the sermons of the great preachers, that one can realize how clearly the mystic and allegorical art of the thirteenth and fourteenth centuries is a creation of these Orders and merely a part of a great wave of social reform that was due largely to them. Giotto, the Gaddi, Orcagna, Andrea Pisano, and other artists, while not members of the Orders, expressed their ideals.

Other Orders. Of all the Western Orders, only one returned in the Middle Ages to the anchoretic idea and expressed it in beautiful architectural movements. This was the Carthusian Order (Chartreux) of Saint Bruno, founded in the eleventh century. The individual cell life of each member determined the form and character of the monastic buildings, which covered a great extent of ground, usually around two immense cloisters or open courts.

The secularizing of art, which began in the thirteenth century, was carried further forward by each century of the Renaissance. What the art-guilds commenced humanism completed. The monastic Orders exercised no influence in art after the fourteenth century, even though some individual members were prominent artists, such as Fra Angelico, Filippo Lippi, Bartolommeo, the painters; Fra Giocondo, the architect; etc.

Bibliography. The entire theme of monastic art is so interwoven with the history of Christian art as a whole, as to have eluded treatment. Lenoir, *Architecture monastique* (Paris, 1852-56), has given a very good summary of this part of the subject. Other general works are: Wiese, *Ueber das Verhältnis der Kunst zur Religion* (Berlin, 1878); Springer, *Klosterleben und Klosterkunst* (Bonn, 1886); Schlosser, *Die abendländische Klosteranlage des früheren Mittelalters* (Vienna, 1889); Kraus, *Geschichte der christlichen Kunst* (Freiburg, 1896); for the Basilians, Brockhaus, *Die Kunst in den Athos-Klöstern* (Leipzig, 1890), and Balhr, *Le monastère byzantin de Tebrassa* (Paris, 1897); for the Benedictines, Krätzinger, *Die Benediktinerorden und die Kultur* (Heidelberg, 1876); for the Cistercians, Sharpe, *The Architecture of the Cistercians* (London, 1874); for the Dominicans and Franciscans, Enlart, *Origines françaises de l'architecture gothique en Italie* (Paris, 1894). Consult, also, the authorities referred to under Christian Art; Benedictines; Cistercians.

MONASTICISM. The general term used to describe the system under which those men and women live who have abandoned the world for religious reasons, and live, whether separately or in community, in the pursuit of perfection. The vows under which they live (for details see Vow) are based upon what are known as the evangelical counsels (q.v.), or maxims collected from the teachings of Christ to guide those who are desirous of attaining perfection in this life. From their being bound by such vows, these people are known as religious (Lat. *religare,* to bind). The term monk is correctly applied only to the members of the older or more strictly cloistered societies, and not to the mendicant Orders, such as the Dominicans and Franciscans, whose members are termed friars. The word monk is, however, sometimes loosely applied to any who sacrifice worldly advantages and relationships to give themselves wholly to the service of God and their neighbor under the vows of poverty, chastity, and obedience.

Forms of monasticism existed among the so-called pagan nations long before Christ. Buddha found the institution a practically essential feature of Brahmanism when he began his work about the sixth century before Christ. Among the Brahmans, all of the members of the three highest castes were supposed to pass through a stage of life as anchorites, apart from all family relations, or were to be mendicants absorbed entirely in religious contemplation. Not all of the high-caste Brahmans followed this religious prescription. Out of these anchorites and mendicants Buddha created a monastic Order, for whom he drew up a set of rules that contain many analogies with the rules of Christian religious Orders. Confucius also taught at least the principles of monasticism, and there seem to have been some followers of his advice in this matter among his disciples at all times. Among the Greeks the members of the Orphic brotherhood and the followers of Pythagoras showed marked tendencies to monasticism. In Egypt the worship of Serapis was associated with the foundation of monasteries. The largest institution of the kind was that at Memphis, which flourished just after the Alexandrian period. German antiquaries have pointed out many similarities between the old Egyptian monasticism and the later Christian monastic foundations in the same country.

Among the Jews, the Nazarites (q.v.) of the Old Testament may be regarded as a sort of monastic Order, to which, it is supposed, Samuel, Samson, John the Baptist, and James the Just belonged. The prophet Elijah is known as a hermit and an encourager of this life. There is a very old tradition that he was the original founder of the Carmelites (q.v.); and when Saint Jerome founded his Order of monks at Bethlehem he said, "We have our example in Elijah, the prince of monks; our chief is Elisha; our leaders the prophets who dwelt in fields and solitudes and built their tents along the streams of the Jordan." The Essenes (q.v.) seem to have had some of the characteristics of a religious Order; in fact, it has been thought that their mode of life was the same in many particulars as that prescribed centuries later by the rule of Saint Benedict.

The first reference to the monastic life in Christian writers is considered by some to be a letter of Saint Ignatius of Antioch, a disciple of the Apostle John, who writes A.D. 107 to a convent of virgins. The Council of Chalcedon (454) formulated rules for those who assumed the monastic life, and especially for the regulation of their relations to bishops. The first Christian hermits seem to have established themselves on the shores of the Red Sea, where in ante-Christian times the Therapeutæ, an Order of pagan hermits, had been established. Not long afterwards the desert regions of upper Egypt became a favorite retreat for those who fled from the persecutions of the Christians so frequent during the third century, or who found the vices of the decadent Roman Empire intolerable. Among the earliest of these fathers of the desert was Paul of Thebes (q.v.), who lived for over one hundred years (228-340?) on the fruit of the date tree and water, clothing himself in palm leaves. After Paul came Anthony (q.v.), who was the first to gather together the scattered hermits in lauras. These first cœnobites had their collections of cells in the deserts of the Thebaid. The life of Saint Anthony was written by Athanasius, at whose request he abandoned his solitude for a time during the troubles caused by the Arians. While the heresy was rampant Anthony established himself at Alexandria, and the fame of his sanctity, as well as his gentleness and learning, drew many disciples to him. Not a few of these new followers accompanied Anthony when he again retired to the desert. His greatest disciple was Macarius of Alexandria, who died in 394, and whose reputation for wisdom and saintliness attracted many monks to the various hermitages over which he ruled. Apparently about the beginning of the fourth century monks began to live together under a common roof, and buildings began to be erected as monasteries instead of the separate cells in which the hermits had lived. Pachomius (q.v.) founded an immense monastery about 340, on the island of Tabennæ, in the Nile. He drew up for his subjects a monastic rule, the first definite set of regulations of the kind on record. Many thousands of disciples flocked to him, and he founded several other monasteries for men, and one for women under the direction of his sister. All of these institutions recognized the authority of a single superior—an abbot or archimandrite. They constitute the original type of the religious Order. Saint Basil the Great (q.v.) made a visit to the Egyptian monasteries shortly after his student days at Athens, about the time that Pachomius was beginning his work. Basil, on his return to Asia, founded monasteries in Pontus and Cappadocia, thus acquiring the name of Father of Monasticism in the East. The Greek Father drew up a set of rules, still extant, which has influenced subsequent founders of religious Orders more than any other.

Saint Jerome translated the rule of Pachomius into Latin for the use of his own monks at Bethlehem and of certain of the Latins in Italy. Dom Gasquet says that in the time of Saint Jerome and Saint Augustine the monastic life was well recognized as an integral part of the Church's system. There was no established code of rules, however, to which all the monks were bound to conform themselves; an individual might pass from this or that house to any other in which the monastic life was led. Monasteries continued to spring up in many parts of the West during the fourth, fifth, and sixth centuries. One of the most famous of these was situated on the islands of Lérins in the Mediterranean Sea, off the coast of France, near the present town of Cannes. Another was that founded by Saint Martin of Tours at Poitiers, under the direction of Saint Hilary, Bishop of that city. Many monasteries flourished in Ireland during these centuries and furnished missionary monks who spread not only Christianity, but also civilization and an awakening love for literature and the arts, among the barbarians who had overrun the Continent of Europe. Columbanus, an

Irish monk of the end of the sixth century, drew up a monastic rule that because of its strictness has been the model of many subsequent austere Orders. Perpetual silence, complete abstinence from flesh meat, daily fasting, labor, reading, prayer, poverty, humility, and chastity are the essence of his prescriptions.

The monastic rule which had most influence in the West, however, was that of Saint Benedict, who about 529, after a youth passed as a solitary, gathered some monks who had been attracted to his solitude at Subiaco and founded the Monastery of Monte Cassino. This became the mother house of Western monasticism. Benedict founded seven other monasteries (among them one for women under the direction of his sister, Saint Scholastica, at Piombiarole, about five miles from Monte Cassino), and deservedly bears the name of patriarch of the monks of the West. Benedict's rule is characterized by a wide and wise discretion. To secure the end more certainly, those who desired to walk in the path of the Gospel counsels under his guidance promised a lifelong obedience. "This was the first introduction of a *profession* for life according to the rule: and it was known to the monk who wished to fight under the law that as the rule says 'From that day it was not lawful for him to withdraw his neck from the yoke of the rule.' The result of this introduction was twofold: on the one hand it established firmly the perpetuity of the cloistral family life, that stability in the community which has since become the characteristic mark of monasticism; and on the other hand for the only will of the abbot or superior, it substituted a code of laws by which his government was to be guided." (Gasquet.) Nevertheless the rule itself shows that though Saint Benedict required obedience to his code of regulations, he never intended to forbid other customs and practices. In fact, he expressly refers his followers to the rule of Saint Basil and others for further guidance.

The immediately succeeding centuries saw a wonderful development of monasticism in the West. The monasteries became the home of learning. Monks were the teachers of the world, and went forth as missionary preachers into England, Germany, and the nations of Northern and Central Europe. Agriculture as well as civilization became their care, and the first serious attempt to do away with serfdom was under their rule. Education for women developed first in the convents and then spread to their sisters in the world, until women were better educated than at any preceding period in history. In the monasteries and convents expert nursing of the sick and wounded and the first germs of modern clinical medicine developed. Many members of royal families became monks and nuns, and the first glimmer of understanding between different orders of society appeared.

According to the rule of Saint Benedict, each monastery was separate and wholly distinct, with an independent life of its own. The first serious attempt at union was made at a great assembly held at Aix-la-Chapelle in 1817, under the guidance of Saint Benedict of Aniane. Here rules for the better regulation of monastic life were passed. Benedict had great influence with the Emperor Louis the Pious, the son of Charlemagne. He planned securing the most absolute uniformity among the monks of all monasteries, and was seconded in his effort by the sovereign. Benedict was chosen as general. This assembly caused a reawakening of the monastic spirit throughout Europe, and affected also England, where the *Concordia Regularis*, which prescribed one set of monastic customs for the whole of England, was adopted. In the next century occurs the greatest name in monastic history, that of Cluny. The ideal of Cluny was the existence of one great central monastery, with dependencies spread over many lands and forming a vast feudal hierarchy. The subordinate monasteries were dependents in the strictest sense. Their superiors were not called abbots, but priors. The superior of every house, however great, was the nominee of the Abbot of Cluny; the profession of every member was made in the name and with the sanction of the Abbot of Cluny. Cluny remains, in spite of the defects of its feudal character, one of the chief factors in the history of the eleventh century. The authority of Peter the Venerable, the contemporary of Saint Bernard, was recognized by 2000 dependent monasteries. The Cistercian system of monasticism is the next feature of historical development. It was founded by Saint Stephen Harding, an Englishman, who early left his own country to live in France. He adopted the rule of Saint Benedict; the heads of other houses were abbots, but attached to the mother house by the obligation of yearly assembling at Cîteaux, while the Abbot of Cîteaux had the right to visit all other monasteries, and, while forbidden to interfere with the management of their temporalities without the consent of the community, could insist on reforms in discipline if he deemed them necessary. The greatest of the Cistercians was Saint Bernard, who founded, with thirty-two young nobles, the Monastery of Clairvaux.

During the Crusades came the organization of religious bodies for definite pious purposes whose members were bound by the usual obligations of monasticism, yet did not withdraw entirely from the world. The Knights of Saint John (see SAINT JOHN, KNIGHTS OF), the Knights Templars (see TEMPLARS), and the Teutonic Knights (q.v.) are the best known of these. Incited by their example, or as a result of the same spirit, many non-military religious Orders were founded during and just after the Crusades, with the purpose of definite work to be accomplished outside of the monasteries.

The fourth Lateran Council decreed that no further religious Orders should be founded, yet the first quarter of the thirteenth century saw the rise of two great mendicant Orders, those of Saint Francis (see FRANCISCANS) and of Saint Dominic (see DOMINICANS). The members of these Orders, in spite of their vow of absolute poverty, soon became prominent in the Church and in the universities, and as poets, preachers, philosophers, writers, scientists, and teachers. The next great advance in monasticism was the foundation of the Jesuits (q.v.), a teaching, preaching missionary Order with a special vow to go wherever they should be sent by the Pope. Their institute has proved the model on which most modern religious congregations have been based.

Monasticism has been, at least in the West, in constant development, always growing more closely in touch with the shifting environment in which it was placed in the course of time. The skeptical spirit of the eighteenth century was unfavorable to monastic evolution, but the nineteenth saw a reawakening. Persecution and confiscation for political and pecuniary reasons have reduced the numbers of religious communities; but under a system of true religious liberty, as in the United States, wide extension of the religious Orders has come about. There are over 8000 members of religious Orders for men, about two-thirds of whom are priests, and about 45,000 members of religious Orders for women.

For further details of the monastic life, the general arrangement of monasteries, and the relation of the older Orders to the development of European civilization, see the articles on the various Orders, and especially BENEDICTINES.

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MONASTIR, mŏn′ȧ-stēr′. A fortified seaport on the east coast of Tunis, 65 miles southeast of the city of Tunis (Map: Africa, F 1). It is surrounded by a strong wall crowned with towers, and has a number of mosques, and a normal school established by the French. The chief manufactures are soap and oil. Population, about 6000.

MONASTIR BITO′LIA. The capital of the Vilayet of Monastir, Macedonia, European Turkey, in a broad valley of the Nije Mountains, 85 miles northwest of Saloniki, with which it is connected by rail (Map: Turkey in Europe, C 4). It is an important garrison town, with large barracks, military hospital, arsenal, etc. There are several mosques, a school of arts and sciences, and other educational institutions. The town carries on a large trade in wheat, tobacco, woolens, and skins, principally with Constantinople, and makes gold and silver ware, and carpets. Population, about 45,000, of whom two-fifths are Mohammedans. Monastir is the ancient Ruspina.

MONAUL, mō̂-nạl′. The Anglo-Indian name for any of the gorgeously plumaged and crested pheasants of the genus Lophopterus, which inhabit the forests of the Himalayas. The three or four species are objects of sport, and their skins are in demand for millinery. See PHEASANT.

MON′AZITE (from Gk. μονάζειν, *monazein*, to be solitary, from μόνος, *monos*, single). A phosphate of the cerium group of metals, principally cerium, lanthanum, and didymium, with varying amounts of thoria and silica. It is yellow, red, or reddish brown in color, has a resinous lustre, and crystallizes in the monoclinic system, the crystal individuals measuring only a fraction of an inch in length. Monazite is commercially valuable owing to its containing thorium, which is utilized in the form of oxide in the manufacture of Welsbach and other gas-mantles. The cerium obtained from the separation of the metallic oxides is employed as cerium oxalate in pharmacy. Monazite occurs in association with the older crystalline rocks, especially granite and gneiss, in the Southern Appalachians, Brazil, Norway, Silesia, and Russia, but the only important sources of the mineral are North Carolina and Brazil. The deposits in North Carolina are of placer nature and occur along the channels of the streams which have concentrated the heavier minerals in the lower layers of the sands and gravels. In Brazil the deposits are found along the seashore. The monazite is obtained by washing the sands and gravels in sluices, a process similar to gold-washing. The concentrates thus obtained contain from 70 to 90 per cent. of monazite, with 1.587 per cent. of thoria. The output of monazite in the United States in 1901 was 748,736 pounds, valued at $59,262.

MONBOD′DO, JAMES BURNETT, Lord (so called, by Scotch custom, as lord of session) (1714-99). A Scottish judge and author, born at Monboddo, Kincardineshire. He was educated at Marischal College, Aberdeen, at Edinburgh, and, in civil law, at Groningen, was admitted a member of the Faculty of Advocates at Edinburgh in 1737, and gained some distinction at the bar from his management of the well-known Douglas cause. He was well versed in the law, both at the bar and on the bench, and prepared a collection of the *Decisions of the Lords of Council and Session* (1826; in Brown's *Supplement to the Dictionary of Decisions*). He was, however, far better known as a littérateur, in particular through his *Origin and Progress of Language* (6 vols., 1773-92) and *Ancient Metaphysics* (6 vols., 1779-99), in defense respectively of Greek literature and Greek philosophy, both erudite, formerly ridiculed for their eccentricities and paradoxes, and now generally regarded as singularly acute in their observations, and scientifically in advance of their time. They exhibit some interesting correspondences with the Neo-Kantian philosophy and the Darwinian theory.

MONBÚTTU, mŏn-bụt′tōō, or MANGBATTU. A country in Central Africa, between latitudes 3° and 4° N., and longitudes 28° and 29° E., containing about 4000 square miles, with a population once estimated at 1,000,000. It is an elevated tableland, 2500 feet above the sea, and through it the Kibaly and Gadda rivers flow to form the Welle. The soil (producing tobacco, sugar cane, sesame) is so fruitful that little cultivation is necessary. The inhabitants are cannibals of chocolate-color, practicing polygamy and circumcision, and wearing garments made of bark cloth. They are skillful smiths. Since

Schweinfurth visited their powerful and populous kingdom, it is said to have been almost depopulated by slave-traders and Mahdists.

MONCADA, môn-kä'ᴅa, Francisco de, Conde d'Osuna, Marques d'Aitona (1586-1635). A Spanish diplomat, soldier, and historian, born at Valencia. At first ambassador at the Court of the Emperor Ferdinand II., he was in 1633 appointed generalissimo of the Spanish forces in the Netherlands, and twice defeated the Prince of Orange. He published a work of considerable historical value entitled *Expedición de los Catalanes y Aragoneses contra Turcos y Griegos* (1623).

MONCALIERI, môn'kȧ-lyā'rē. A town in the Province of Turin, Italy, situated on the Po, five miles south of Turin (Map: Italy, B 3). The royal palace, built in the fifteenth century, has a picture gallery. The town has brick and lime kilns, and manufactures matches. Population (commune), in 1881, 11,379; in 1901, 11,561.

MONCEAUX, môɴ'sō', Parc de. A Paris park, attractively laid out in 1778 by the Duke of Orleans, afterwards known as Philippe Egalité, which became a fashionable resort and a favorite place for fêtes and balls. It became national property during the Revolution, was restored to the Orleans family at the Restoration, and was finally purchased by the city of Paris, and converted into a public park. The grounds originally covered some 50 acres, of which half were sold by the municipality for building purposes. It contains an oval lake with a Corinthian colonnade, a number of statues, and a fine collection of plants.

MONCEY, môɴ'sā', Bon Adrien Jeannot de, Duke of Conegliano (1754-1842). A French soldier, born at Moncey (Doubs). He took an active part in the campaign of the Pyrenees in 1794, and was made a general in the same year. In the Italian campaign of 1800-01 he greatly distinguished himself, and after his return to France received the title of Duke of Conegliano (1808). In the succeeding war with Spain he fought brilliantly, especially at Saragossa in 1809. Moncey advised against the invasion of Russia, and did not accompany the army thither in 1812, but he was prominent in the defense of Paris against the allied forces in 1814. Louis XVIII. made him a peer, and Moncey remained faithful to the King during the events of the Hundred Days. His refusal of the presidency of the Council deputed to try Marshal Ney lost him all his honors; but a year later, after a brief imprisonment, these were returned to him. He made his last active campaign in Spain in 1823.

MONCK, mŭŋk, Charles Stanley, fourth Viscount (1819-94). A British politician, born at Templemore in Tipperary, Ireland. He was educated at Trinity College, Dublin, and was called to the Irish bar in 1841. He was elected to Parliament as a Liberal member for Portsmouth in 1852, and was reëlected in 1855, but was unsuccessful in 1857. He was a Lord of the Treasury from 1855 to 1858, and was appointed Governor-General of Canada in 1861. He was reappointed in 1867 on the confederation of the provinces into the Dominion, but resigned the next year. In 1871 he served on the Irish national education commission, and on the commission to carry out the act for the disestablishment of the Irish Church. He succeeded his father as viscount in the Irish peerage in 1849, and was made a viscount in the peerage of Great Britain in 1866.

MONCLOVA, mȯn-klō'vȧ. A town of the State of Coahuila, Mexico, situated 103 miles northwest of the capital, Saltillo, on the Mexican International Railroad. and the terminus of a branch line to Cuatro Cienegas (Map: Mexico, H 4). It is the centre of an agricultural and stock-raising district, and contains some railroad shops. Monclova was settled during the last quarter of the seventeenth century, and was important as the starting-point for the early Spanish *entradas* into Texas. Under their rule it continued to be the seat of government for this portion of New Spain, and during a brief period was the capital of the dual State of Coahuila and Texas. The population of the municipality is about 15,000.

MONCRIEFF, mŏn-krēf', William Thomas (1794-1857). An English dramatist, born in London, son of a Strand tradesman, named Thomas. The name Moncrieff he assumed for theatrical purposes. Moncrieff's first success was at Ashley's with *The Dandy Family;* and in 1820 *The Lear of Private Life*, with Junius Brutus Booth as hero, enjoyed a long run. But his most popular production was *Tom and Jerry* (1821), a dramatization of *Life in London* by Pierce Egan (q.v.), whose *Boxiana* Moncrieff had begun to publish in 1818. He managed Vauxhall Gardens in 1827, and in 1833 leased the City Theatre. Soon afterwards his sight failed, and in 1843 he became totally blind. The following year he entered the Charterhouse in London. Moncrieff's theatrical reminiscences were published in the *Sunday Times* in 1851. He edited *Selections from Dramatic Works* (London, 1850), with 24 of his own plays.

MONCRIEFF PITS. Excavations used in the system of gun-mounting originated by Sir Alexander Moncrieff (1829—), for the heavy ordnance of coast batteries, first introduced about 1868. This system utilizes the recoil of the gun after discharge to return it to the loading position, at the bottom of the pit. It is replaced in the firing position by means of hydropneumatic machinery. See Fortification.

MONCTON, mŭŋk'ton. A town and port of entry in Westmoreland County, New Brunswick, Canada: on the Petitcodiac River, and the Intercolonial Railroad; 89 miles northeast of Saint John (Map: New Brunswick, E 3). It is at the head of river navigation, and has a fine harbor. There are manufactures of cotton, flour, and planing mill products, leather, iron, and wooden ware. The general offices and principal shops of the Intercolonial Railroad are located here; and there is a large trade in lumber and agricultural products. The United States is represented by a commercial agent. A feature of the river is the bore or tidal wave, four to six feet high, which flows in from the Bay of Fundy at high water. Population, in 1891, 8762; in 1901, 9026.

MONDOÑEDO, môn'dô-nyā'ᴅô. A town of Northwestern Spain, in the Province of Lugo, situated in a mountain valley 12 miles from the Biscayan coast (Map: Spain, B 1). It was anciently an important town. It has a cathedral begun in the thirteenth century, with a baroque façade. There are marble quarries in the neighborhood. The town manufactures cotton and linen fabrics. Population, in 1900, 10,619.

MONDOVÌ, mŏn′dô-vē′. A town of Northwestern Italy, in the Province of Cuneo, 42 miles south of Turin (Map: Italy, B 3). It had a university from 1560 to 1719. Among its notable structures are the Cathedral of San Donato, dating from 1450, a citadel with a Gothic tower, a royal lyceum, and a bishop's palace. There are three public libraries. In the vicinity are interesting remains of ruined buildings. There are manufactures of machinery, cloth, silk, paper, and earthenware. At the battle of Mondovì, on April 21, 1796, the Sardinians were totally defeated by the French. Population (commune), in 1881, 17,902; in 1901, 19,255.

MONER (from Neo-Lat. *moneron*, from Gk. μονήρης, *monērēs*, solitary, from μόνος, *monos*, single + ἀραρίνκειν, *ararinkein*, to join). The simplest form of Protozoa, and the nearest to what may have been the most primitive living being. The Monera of Haeckel differ from the rhizopods (Amœba, etc.), in wanting a nucleus and contractile vesicles. Their body-substance is homogeneous throughout, not divided into a tenacious outer and soft inner mass, as in Amœba. They move by the contraction of the body and the irregular protrusion of portions of the body, forming either simple processes (pseudopodia) or a network of gelatinous threads. The food, as some diatom, desmid, or protozoan, is swallowed whole, being surrounded and engulfed by the body, and the protoplasmic matter then absorbed. The simplest form known, and supposed to be really a living being, is Haeckel's Protamœba. It is like an Amœba, but is not known to have a nucleus and vacuoles. It reproduces by simple self-division, much as in Amœba. The individual moner—for example, Protamœba—is simply a speck or drop of transparent, often colorless, viscid fluid. This drop of protoplasm has the power of absorbing the protoplasm of other living beings, and thus of increasing in size—i.e. growing; and in taking its food makes various movements, one or more parts of its body being more movable than others, the faculty of motion thus being for the moment specialized; it has apparently the power of selecting one kind of food in preference to another, and, finally, of reproducing its kind by a process not only of simple self-division, but also of germ-production. Consult: Haeckel, *History of Creation* (New York, 1876). See PROTISTA.

MONET, mō̇′nȧ′, CLAUDE (1840—). A French landscape painter, the leader of the Impressionist School. He was born in Paris. When a youth he entered the atelier of the Classicist Gleyre, but lack of sympathy with the style of work executed there caused his withdrawal. In the beginning his fancy was strongly drawn to the work of Corot, and certain mannerisms, which disappeared with increasing years, indicate the influence of the Barbison School. He, however, admitted no master, and for the most part drew his inspiration directly from nature, apparently caring little for subject, detail, or composition. His aim is chiefly to reproduce the effects of light and air, to portray the fleeting aspect of things. To Monet the effects of complementary contrasts and color mixtures are so distinctive and certain, that to those not similarily trained his representation of them appears affected and exaggerated, but when seen under subdued light and from the requisite point of distance, they show great excellence. His earlier style may be studied in "The Mouth of the Seine at Honfleur" (1865); "Camille;" "Fontainebleau Forest" (1866); "Vessels Leaving Havre" (1868), and many landscapes produced before 1875. Among his later works may be mentioned: "Bordighera"—the town in the half distance, led up to by a foliaged foreground; "The Orchard"—a landscape, vibrating with light and showing well the possibilities of Monet's use of pure color; "On Cape Martin, Near Mentone;" "Studies of Rouen and its Cathedral;" "Low Tide at Pourville;" "Snow at Port Villers;" "Church of Verna;" "Church of Varangeville." Consult: Duret, *Le peintre Claude Monet* (Paris, 1878); Van Dyke, *Modern French Masters* (New York, 1896).

MONETARY COMMISSION OF THE U. S. CONGRESS. The fall in the value of silver after 1873 was the source of much debate in the Forty-fourth Congress, and in August, 1876, a joint resolution was passed for the appointment of a commission of three Senators and three Representatives, together with experts chosen by the former, to inquire into: (1) the causes and economic effects of the decline in silver; (2) the policy of restoring the double standard; (3) the policy of retaining in circulation the legal tender notes; and (4) the best means for resuming specie payments. The commission as organized consisted of Senators John P. Jones, Lewis V. Bogy, and George S. Boutwell; Representatives Randall L. Gibson, George Willard, and Richard P. Bland. William S. Groesbeck of Ohio and Prof. Francis Bowen of Massachusetts were the expert members of the commission, and George M. Weston of Maine was appointed its secretary. The meetings of the commission were held in New York and Washington in the winter of 1876-77. The majority report of the commission declared that the recent production of silver relatively to gold had not been greater than formerly, but that the decline in the value of silver had resulted mainly from the demonetization of silver in Germany, the United States, and the Scandinavian States, the closure of the mints of Europe to its coinage, the temporary diminution of the Asiatic demand, the exaggeration of the yield of the Nevada silver mines, and the fear of further action against silver coinage by the governments. The policy of adopting the gold standard was condemned in severe terms, and the unrestricted coinage of both metals was recommended. The report further stated that an attempt to introduce monometallism would result in a ruinous contest for a gold standard with the European nations, while if silver were remonetized by the United States the effect would be to attract that metal from other countries while it was cheap, in exchange for what the United States had to export; and that the latter country would thus have the benefit of the rise which the commission believed would take place in its value when the temporary causes of its depression had passed. Boutwell made a minority report against remonetization of silver except on the basis of international agreement, and Prof. Francis Bowen dissented from the majority report arguing in general for the gold basis, but declaring in favor of the remonetization of silver on adding to the quantity of pure silver in a dollar enough to make its bullion value equal to the then value of a gold dollar.

The Government published a summary of this report together with papers prepared for the commission on "Asiatic trade and flow of silver to the East;" "Constitutional powers of Congress and the States with respect to metallic money;" "Legislation on subsidiary silver coin;" and "The Trade Dollar." In addition to these the Government published a collection of valuable statistics gathered by the commission relating to the production, distribution, and relative value of the two metals and to the monetary systems of foreign countries.

MONETARY CONFERENCES, INTERNATIONAL. Conferences between representatives of the United States and various European powers for the discussion of united action with reference to monetary matters were held in 1867, 1878, 1881, and 1892.

France, on completing the Latin Monetary Union (q.v.), indulged in the hope that other nations might join the union, and brought the matter to the attention of other governments through diplomatic channels. France called the conference of 1867 during the exposition of that year with the thought of furthering this project. Nineteen States were represented at the conference. The first question debated was whether an existing system or a wholly new one was best adapted to secure international coinage. The answer was in favor of an existing system, and it was admitted that the system of the Latin Union would probably be best adapted to this purpose. A second question was: "Is there a possibility of establishing at this time identities or partial coincidences of monetary types on a wide scale, on the basis and with the condition of the adoption of the silver standard exclusively?" A third question repeats this inquiry for the gold standard exclusively, and a fourth for the double standards with a common ratio. These questions were discussed together, but the debate was not properly one of standards. The conference declared unanimously in favor of the gold standard as a basis of an international coinage. But in this conference the whole question of standards was incidental. Whether a unit should be adopted for all the nations or whether coincidences in the value of the coins should be effected were the most important questions considered. Finally a resolution was adopted that all gold coins which were multiples of 5 francs should have legal circulation in all the contracting States. The work seemed to be complete and the conference adjourned with mutual congratulations. But there the matter ended, as no treaties to carry out the plans were contracted.

Quite different was the purpose of the conferences of 1878, 1881, and 1892. A fall in the value of silver as compared with gold had taken place and the silver currency threatened to depreciate seriously and perhaps endanger the monetary systems of those countries in which the double standard existed. In 1867 the ratio between silver and gold, which for many years had been below the French ratio of 1 to 15½, rose above it and in 1874 rose above the American ratio of 1 to 16, and by 1878 had reached 1 to 17.94. In the meantime prices had begun to fall. The initiative for the conference of 1878 proceeded from the United States. The coinage law of February of that year authorized the President to invite "the governments of the countries composing the Latin Union so called, and of such other European nations as he may deem advisable, to join the United States in a conference to adopt a common ratio between gold and silver, for the purpose of establishing, internationally, the use of bimetallic money, and securing fixity of relative value between those metals." In response to the invitation of the United States, the principal nations except Germany sent representatives to the conference, which met in Paris in August, 1878. Considerable solicitude was expressed at the conference lest silver should be wholly discarded, though no agreement could be reached on bimetallism. This in particular was the attitude of Great Britain, concerned as she was for the currency of India. The most bitter hostility to bimetallism was exhibited by Belgium and Switzerland, while France, their partner in the Latin Union, was distinctly in favor of it. In its advocacy of the principle the United States was handicapped by the fact that it was on a paper basis and that it was a producer of silver. The proposals of the United States were rejected, the European nations uniting in the declaration "that it is necessary to maintain in the world the monetary functions of silver as well as those of gold, but that the selection for use of one or of the other of the two metals, or of both simultaneously, should be governed by the special position of each State, or of each group of States." The conference was thus without result.

In 1881 another conference was held at Paris. Events were rapidly proving that the alleged scarcity of gold was a fact. The United States began to import gold and this drew upon the European stock. The Bank of England saw its gold reserves diminish and seemed unable to check the outflow. In France the reserve of gold in the Bank declined, while silver increased. As the proportion of silver in the metallic reserve increased doubts began to be expressed whether gold payments would be maintained. Germany saw the completion of her monetary reform indefinitely postponed by her inability to sell her stock of silver coin except at a great sacrifice. In the United States the pressure for free silver continued. France was the prime mover in this conference, though the United States joined in issuing the invitations. Great Britain exhibited great reserve in the conference and the delegates of other States declared themselves bound by strict instructions. The discussions were able and learned, but fruitless, and the conference adjourned without result.

It was not until 1892 that another effort was made to effect monetary reform by means of a conference. In 1891 the President was authorized to call a conference. Great Britain exhibited more interest than usual, and while she declined to join a conference whose only object was the discussion of bimetallism, consented to take part in a conference to discuss an enlarged monetary use of silver. The British Government appointed delegates in sympathy with bimetallic proposals and sanctioned the appointment of pronounced bimetallists by the Government of India.

The reception of the proposals of the United States on the Continent of Europe was less cordial. France was especially lukewarm, and did not accept the proposal that the conference should be held at Paris. Arrangements were finally made for a meeting at Brussels. Germany was non-committal, but consented to be represented at the conference. England and the United States, as it appeared, were to be the moving forces in this conference. All was in readiness for a meeting in May, 1892, when the fear of cholera in Europe caused its postponement to November.

This delay was fatal, for in the meantime two political events had occurred which altered the attitude of the leading nations. In England the Conservative Party was overthrown and gave place to the Liberals, who had little sympathy with bimetallism. The new Ministry added to the delegation two men who were avowed opponents of bimetallism. In the United States the election of 1892 resulted in the defeat of the party in power. Under these circumstances the delegation from the United States could not make any binding promises for the incoming Administration. Accordingly the conference had little promise of success. When it met it was proposed to discuss any plans for enlarging the use of silver, especially such as might be proposed in the conference before taking up the subject of bimetallism. This was a programme of discussion rather than of action, and after some twelve sessions of fruitless debate the conference adjourned without any action.

Consult the reports of the conferences—that for 1867 being included in the appendix of that of 1878—issued by the United States Government; Wallace, *International Monetary Conferences*, in which the events leading up to the conferences are carefully portrayed. See also the general reference under the article Money.

MONEY (OF. *moneie*, *monoie*, *monpoye*, Fr. *monnaie*, from Lat. *moneta*, money, mint, from *Moneta*, an epithet of Juno, in whose temple at Rome money was coined, from *monere*, to warn, connected with *meminisse*, to remember, Gk. *μέριμνος*, *merimnos*, anxious, Skt. *smar*, to remember). The medium of exchange and measure of value. Whatever fills these functions, however crudely, is money. Of all the substances which have been used as money, gold and silver take the first place, and the discussion of money usually has these in view. It is well to remember, however, that some of the humbler functions of money are to-day performed by nickel and copper, and that in times past not only other metals, tin, lead, iron, and platinum, have been used as money, but also, especially among primitive peoples, a wide variety of other objects. Jevons enumerates among other things, furs, skins, leather, sheep, cattle, wampum, cowries, grains, olive oil, tobacco, and salt, as being in use at one time or another for this purpose. Primitive as these may be, the enumeration seems to emphasize the fact that it is not a substance *per se* that we designate as money, but a substance invested with a certain utility.

So important is this function in modern life that we cannot readily conceive of a society without some mechanism to perform it. And indeed from the earliest days of recorded history we find references to money, and there are few among the primitive peoples of our own time which do not possess it in rudimentary form. The difference between the highly civilized nations of modern Europe and America and their early progenitors or the savage tribes of Africa does not consist so much in the fact that we use money and they do not, as in the extent to which it is used. Even though money is recorded as known among the most primitive peoples, it is then of only occasional use, it does not penetrate into every relation of social life. Peoples whose social organization is based upon slavery and patriarchal conditions have little need for money, nor is the need great among a pastoral or agricultural people when there is little differentiation of occupation. On the other hand, among highly organized industrial peoples where nearly all produce not for individual needs, but for sale in the market, money is in constant and universal demand.

The primary function of money is that of a medium of exchange; and if in the theory of money to-day this characteristic receives scant notice, it is not because it is not fundamentally important, but rather because it is comprehended with comparative ease. Other functions are all derived from the primary function, medium of exchange.

Whatever the substance used as money may be it becomes an object of universal desire. In primitive society the most widely desired object came to be used as money. The fact that an object is universally desired fits it in the first instance for use as money, but after it acquires that function it is desired not chiefly for its own sake, but for its command over other things. At an early date the desire for personal adornment singled out the precious metals as money *par excellence*, but at the present time it is not because gold is beautiful that we desire it, but because as money it procures for us whatever we may desire.

In the second place, money is the measure of value. The acts of buying and selling fix upon the objects bought and sold relative values, and it was only a slight step to extend the conception of value to things not sold or bought, or which are not intended for sale. All things capable of sale can be valued in terms of money. All credit operations depend upon this fact. Since the value of the money in use in any society is insignificant as compared with its total wealth valued in terms of money, it has been argued that the function of money as a measure of value is far more important than its function as a medium of exchange. And in fact the further we get away from primitive conditions of trading, the more important does this derivative function become. When all wealth is valued in terms of money barter of a higher order becomes possible. In the new form of barter, however, the exchange of commodities is indirect. Modern commerce is largely based upon it, and while it is most apparent in international trade, where balances only are settled by the transfer of money, it is no less widespread and fundamental in domestic trade. See Credit; Banking.

From the function of a measure of value is derived a subordinate function of the greatest practical importance, namely the function of money as a standard of value. A standard of value is simply a measure by which values at different periods are compared. The measure of value contemplates the estimation of commodities at the same time; the standard of value, their estimation at different times. The standard of value is often called the standard of deferred payments. Credit organization involves future payments. These payments are expressed in money and present goods are transferred for a promise to pay money in the future. In the ordinary transactions of mercantile life the futurity contemplated is not far distant, but in many operations, both public and private, a lapse of years is contemplated. In such contracts stability in the value of money is of the highest importance; and were it not that money has been subject to certain variations, it is quite possible that it would not have been found necessary to differentiate this function from that of a measure of value.

The substances which at various times in the world's history have fulfilled these several functions have not performed the office equally well, and gradually all except gold, silver, certain minor metals, and paper have been eliminated among advanced nations. The selection of the precious metals for this purpose is due in part to certain physical characteristics and in part to economic conditions. In the first place, they are durable, and while it is true that there is always some loss through abrasion, the process is a remarkably slow one. Secondly, they are homogeneous and divisible. If a given quantity be divided into parts, those parts will be absolutely alike, and the sum of the parts will equal the whole. Finally, they are portable, since relatively to their weight they are of high value. Other objects such as precious stones excel the metals in portability, but they do not present the other necessary qualities of divisibility and homogeneity. Furthermore, it should be remarked that the metals are relatively stable in value, a result of their durability, since the existing stock is always so much greater than the annual output that violent fluctuations in supply are avoided. Some writers have insisted that the money substance should itself possess value, and have gone so far as to speak of the necessity of 'intrinsic' or inherent value. The use of the word 'intrinsic' evidently indicates a confusion of thought. These writers mean that the money substance should possess a 'utility' apart from that which it gains by virtue of its money function. It may be true that no substance without utility could have become established as money, but this initial primary utility is insignificant after it has acquired the greater utility which attaches to it as a medium of exchange and measure of value.

It has already been noted that besides the precious metals which possess in a high degree the qualities named, other substances, minor metals and paper, are used as money among advanced peoples. The rôle of the former is quite subordinate. For use in minor exchanges they are sufficiently portable and they possess the other physical qualities named. Since their quantity is limited, and provision is usually made for convertibility into money made of the precious metals, their value is not less stable than that of gold and silver. The problems of paper money are more complicated, since it is used in far greater quantities and for large payments. In portability it excels the metals, and while not literally indestructible or divisible, the ease of replacement of old notes by new, or one denomination by another, is a substitute for these qualities. Its 'intrinsic value,' i.e. its utility for nonmonetary uses, is of course a negligible quantity. Far more important is the question of the stability of its value. This question we can answer only after an investigation of the laws which govern the value of money.

There are two explanations of the value of money, one that it is fixed by the law of supply and demand, the other that it is fixed by the costs of production. These are the general explanations of value and are complementary rather than antagonistic. The first is the law of market value, the second of normal value. In the case of freely reproducible goods, while market value may at a given moment vary from normal value, it cannot maintain such variation for any length of time. Money is in a less degree freely reproduced than most of the other goods with which it can be compared. We should, therefore, without neglecting the influence of the cost of production, expect to find that in the fixation of the value of money supply and demand are the dominant factors.

Before discussing what the supply of money and the demand for it are, it may be well to call attention to the way in which the value of money is expressed. The values of all commodities are expressed in money as prices. Conversely, the prices of commodities express the value of money. We speak of prices as high or low, but we might as well speak of money as cheap or dear. Money is cheap when prices are high, and is dear when prices are low. When wheat rises from 50 cents a bushel to $1 a bushel we say it has risen in value, but we might also say that the wheat price of money has fallen, because in the first instance it required two bushels of wheat to secure a dollar in exchange and in the second instance only one bushel. Wheat in our illustration stands for commodities in general, and while the rise in price of one commodity does not mean that money has fallen in value, yet if all commodities rise in price we cannot escape the conclusion that it has so fallen. Prices and the value of money are therefore reciprocals.

The supply of money is the amount of money in existence. This has led some writers to say that the value of money depends upon its quantity. Other things being equal, this is true; but it does not in itself furnish an adequate explanation of the value of money. Assuming that no other influences are at work, it must be admitted that any increase in the quantity of money will lower its value and that any decrease will enhance it. There is a certain money work to be performed, a certain volume of exchanges to be transacted. If the units of money are numerous, each transaction will call for a larger number of units than when the money units are relatively few. Every increase in the world's money supply has been followed by a rising in prices or a fall in the value of money. If the fall is not commensurate with the increase in amount, it is because the quantity of money is not the exclusive factor in fixing the value of money. Monetary legislation endeavors to adjust supply to demand by providing an automatic regulation of the quantity of money. Under a metallic currency system we usually find provisions for the free coinage of the standard money metal. Should money increase in value, i.e. should prices fall and thus reveal an inadequate supply, free coinage will in a measure correct this by attracting to monetary use such supplies of the metal as are available for this purpose. So far as nations using the same standard are concerned there is a natural flow of the metals from one country to another which prevents any undue deficit or redundancy in any one of the countries involved. This adjustment takes place automatically through the course of trade. When currency is redundant in any country prices will be high in that country and imports will be large relatively to exports. The settlement of the resulting unfavorable balances will diminish the currency of the country where it was formerly redundant and so diminish prices. If money is scarce in any country, prices will be low, exports large relatively to imports, and the resulting favorable balances will bring gold into the country. It is obvious, therefore, that international trade speedily corrects any local excess or deficit.

A general excess or deficit in the money supply carries with it a certain correction also, but the operation is slower. If prices rise, showing a fall in the value of money, mining enterprises become less profitable, and the additions to the volume of money will tend to grow less. On the other hand, if prices fall, showing a rise in the value of money, mining enterprises become correspondingly profitable and capital will seek employment in them. This is likely to increase the production of the metals and by increasing the supply to check the rise in value. These effects will not be immediate, as capital has great inertia, and its withdrawal from one line of activity and transfer to another cannot be instantaneous.

The value of money, as of any other commodity, is immediately dependent upon supply and demand. The supply of money admits of easy definition; but the demand for money cannot be so precisely stated. It has been paraphrased as the amount of money work to be done, but this money work cannot be expressed in statistical statements. The elements which enter into it can, however, be stated. The most important and the positive element in the case is the volume of exchanges to be accomplished. Whatever increases the volume of exchanges increases the demand for money; whatever diminishes the volume diminishes the demand. Division of labor and the evolution of a money economy are the most important factors in this increase of the money demand. Without a commensurate increase of supply, prices under such conditions must fall. A diminution in the world's demand for money is not likely, but a diminution in the local demand, effecting a temporary rise of prices before the correcting influence of international trade is felt, may and does occur.

But the volume of the exchanges is only one of several elements in determining the demand for money. The first of these is the rapidity of monetary circulation, the second the use of credit, both of which economize the use of money. It is obvious that all simultaneous cash transactions require the use of different pieces of money. But the transactions of a day or a year are not simultaneous and the same piece of money may fill its functions as a medium of exchange many times. When the circulation is sluggish the demand for money for a given volume of exchanges is far greater than when it is rapid. Savings banks, for example, serve to increase the rapidity of circulation. They gather up the savings of the poor which would otherwise be locked up, and restore this money to circulation. In countries where savings take the form of private hoards, as is largely the case in France, more money is required per capita than in Great Britain or the United States.

Far more important in its effect upon the money demand is the use of credit (q.v.), balances only being paid in money. The country storekeeper who takes from the farmer butter and eggs on account, paying in supplies as his customer's needs arise, furnishes a homely illustration of the way in which credit minimizes the demand for money. In the larger business world the trade relations are rarely of such great simplicity, but by the mechanism of centres of credit or banks the transactions of a town or of even larger areas are reduced to a mutual exchange of goods and debts are canceled without the intervention of money. Banks and clearing houses (see those articles) are the agencies by which credit is organized.

Supply and demand as affecting the value of money are not wholly unrelated phenomena, and the explanation of monetary changes cannot be found in one element without the other. An excess of supply stimulates demand, and prevents prices from rising as high as they otherwise would. A diminution of supply slackens demand and prevents prices from falling as much as they otherwise would. This interaction of supply and demand prevents changes in the money supply from producing effects in the increase or decrease of prices commensurate with the changes in the volume of money. It modifies but does not obliterate the significance of such changes.

Having considered what fixes the value of metallic money, we are now ready for the question what determines the value of paper money. Despite differences of detail, there are for the purpose of this discussion but two classes of paper money—convertible and inconvertible. The first is secondary money, representing metallic money, and deriving its value from the latter; the second is itself primary money, and, like all primary or standard money, derives its value from the relation of supply and demand.

Paper money in the first instance was purely secondary or representative money. It was practically a storage receipt for gold and silver. Such receipts calling for metallic money on demand could and did serve in lieu of the latter in making exchanges. Such money offers no theoretical difficulties. Its circulation is that of metallic money in another form. The advantage of such money is that it forms a convenient mode of avoiding the cumbersomeness of metallic money. This is the function of the gold and silver certificates issued by the United States Government, each of which represents a corresponding quantity of metal in the United States Treasury, and whose presence in the monetary circulation does not in the slightest degree affect its volume.

But such certificates are not the only form of representative paper money, nor the most important. The history of banking shows that the depositaries of metallic money soon learned that under normal conditions coin would not be demanded at any one time for the full amount of the outstanding notes or certificates, and that a considerably larger sum could be kept in circulation than the metallic reserve. They began, therefore, to issue notes in excess of the reserve without infringing upon the characteristics of convertibility in coin on demand. Such money is called by the economists bank money, and it is immaterial whether it is issued by banks or by the Government. Such money derives its value from the metallic currency upon which it is based, but, unlike the certificates already described, it enlarges the volume of the monetary circulation. The issue of such money economizes the use of the metals, and in so far as it substitutes an inexpensive for an expensive substance as money is a saving of wealth to the community.

If the principle of convertibility is not maintained, bank money becomes paper money pure and simple. It has usually been by the failure of banks or of governments to maintain the promise of redemption that such money has arisen. When this takes place paper money falls in value, or, as it is usually expressed, coin is at a premium. This would not of itself cause a disappearance of coin, but it usually happens that paper money is so multiplied in volume that coin disappears and paper becomes the sole standard. This substitution takes place by virtue of Gresham's law (q.v.). Such changes from a metallic to a paper currency are not effected without violent convulsions and much suffering; but there can be no doubt that, however ill it does the work, paper money under such circumstances performs all the functions of a medium of exchange, a measure of value, and a standard of deferred payments. Its value, like that of other money, depends upon its quantity in relation to the demand for money. As its quantity is likely to be increased without reference to the demands of trade in response to the fiscal necessities of the Government, its value is unstable and uncertain. But this is not inherent in the nature of paper money; and there may be conditions, as in Austria during the greater part of the nineteenth century, under which paper money maintains a relative stability in value.

The adjustment of the monetary circulation to the needs of trade has given rise to composite money systems, in which, whatever may be the standard, gold, silver, and paper are usually combined. Under a single gold standard paper is generally used for larger payments, while silver is used for the smaller. Both are representative money in such cases. Silver is issued as token coinage. A token coin is one whose bullion value is less than its face value and whose legal power to pay debts is limited. Such coins are issued by Government authority only, and pass current at their nominal values by virtue of legal enactment. In a well-ordered system, provision is usually made for the redemption of such coins in standard money when presented in specified quantities. Of such nature are the fractional silver coins of the United States and the minor coinage.

Under a single silver standard there is no theoretical reason why gold tokens should not be used for larger payments, but there is the practical reason that gold is expensive and that it is not absolutely necessary for such payments to be made in metal. Under such a standard as prevailed in Germany before 1873, paper is used for larger payments, and it was one of the objections to such a silver standard that it afforded so wide a scope for the issue of paper money.

Before the introduction of token coins nations had for centuries endeavored to secure the concurrent circulation of gold and silver under a system of bimetallism. Under such a system, if the market ratio between the two metals diverged from the legal ratio one of the metals was certain to be exported. When this occurred it always occasioned much distress if the silver were the metal exported, for it robbed the people of the small change of daily life. Hence we find among the nations which clung the longest to the bimetallic theory, that before it was abandoned measures had been taken to reduce the minor silver coins to the character of tokens in order that they might not be withdrawn from the country for export. With the introduction of token coinage and the adoption of the plan of issuing certificates to represent the larger coins the discussion of bimetallism assumed quite a different aspect. The arguments drawn from the difficulty of insuring the circulation of silver were almost entirely excluded from the discussion, which then centred upon the question whether gold alone or gold and silver in combination, provided the combination could be kept intact, furnished the better standard of value. See BIMETALLISM.

HISTORY OF MONEY IN THE UNITED STATES. The situation in which the early colonists in America found themselves was such that they could draw little from the monetary experience of the mother country. During the colonial period they took from the mother country the designations pounds, shillings, and pence. Having no mines, their stock of money had to be imported, and since they drew more wealth from England than they could export to that country, it was quite impossible to accumulate a monetary stock in this way. The little that was brought over by the colonists soon found its way back to the mother country, and, in the early days especially, resort was had to various shifts to remedy the dearth of money. Various articles of food and produce were made receivable for taxes and other purposes. Of these the most widely known was the tobacco currency of Maryland and Virginia. In some of the colonies resort was had to the wampum currency of the Indians. But far more important in their effects were the measures taken to prevent coin from leaving the country and the issue of paper money. One of the early devices resorted to was to give the English currency a higher nominal value that its face value. It was argued that if in the colonies a shilling piece circulated as one and a half shillings, it would not be exported. This process of rating coins had been used frequently in England for the gold coinage. The different colonies acting independently rated the shilling at different values, and the result was a series of colonial pounds differing from each other and from the English pound. In 1706 a proclamation of Queen Anne put a stop to this practice and fixed the nominal value of the pound in each of the colonies at the existing rate. While the money of account was for each colony a colonial pound, the actual money in circulation was a motley collection of coins of English, French, Portuguese, and Spanish origin. The Spanish dollar was the most widely known and circulated, and it thus became the term by which the currencies of the colonies were compared. In retail trade the shilling as a division of the dollar has persisted to our own day. Furthermore, as the Spanish dollar was common to all the colonies, it was the term in which later the common obligations were expressed by the Continental Congress, and thus became the basis of our national coinage.

Of even greater importance in fixing the monetary habits of the people was the issue of paper money. The first issue was in 1690 in Massachusetts, and was made to meet the expenses of an expedition against the French in Canada. The notes were received with reluctance by the people, and fell to a discount, which was removed by an act of the Colonial Legislature, which placed a premium on them, as compared with coin, in the payment of taxes. Then South Carolina issued bills in 1712, and in the first half of the eighteenth century all the colonies followed these examples. Issued at first to meet extraordinary expenses of the governments, the public clamor for more money became so great that notes were issued later without any such plea in extenuation. In the situation of the colonies the plea for more money to make trade easy was urged with peculiar force. In Massachusetts a series of issues had taken place; and in 1749 exchange upon London, which was normally 133 pounds colonial for 100 pounds sterling, had risen to 1100 pounds for 100 pounds sterling. Parliament having voted £138,649 to reimburse the colony for its share in the expedition against Louisburg, this sum was used by the colony to redeem its paper issues at the rate of 11 to 1, and from that time onward Massachusetts was on a specie basis. Some of the colonies, as for example Rhode Island, North and South Carolina, had issued paper money far more extravagantly than Massachusetts; while others, notably Pennsylvania, had pursued a more conservative policy. In the latter colony there were two kinds of bills, exchequer and loan bills. The first were issued by the colonial treasury in anticipation of taxes, but the amount outstanding is said not to have exceeded the probable receipts of two or three years. There were no sudden issues of large quantities and the amount of the issue was kept fairly uniform. The loan bills were issued to individuals on landed security, plate, or other valuable assets. With such security there was comparatively little danger of an overissue, and the records show that there were comparatively few bad debts.

In 1751 Parliament forbade the further issue of notes by the colonies, and more or less successful efforts were made by them to redeem their outstanding notes. When, however, the colonies united for their struggle with Great Britain, the only fiscal resource which seemed open to them was the issue of paper money. The first issue was in August, 1775, for 300,000 Spanish dollars. Elaborate provision was made in the law for the redemption of this currency, and the amount fixed for which each colony was held responsible. Other issues followed in rapid succession, and the pretense of redemption provisions was soon dropped. As much as nine millions was issued before any depreciation took place, but with the constantly expanding volume of the currency this could not last long. The following figures tell the story of the rapid multiplication and depreciation of this money:

			Price of a Spanish silver dollar in Continental currency	
Issued	1776	20,064,464	January 1, 1777	1¼
Added	1777	26,426,333	" 1778	4
	1778	66,965,269	" 1779	9
	1779	149,703,856	" 1780	45
	1780	82,908,320	" 1781	100
	1781	11,408,095	" 1782	500
		357,476,541		

In the meantime every device known to the law was tried in vain to prevent the depreciation. The most stringent penalties enacted against those who refused to receive Continental money at its face value failed utterly to arrest the fall in value. Such enormous issues together with those of the several State governments practically destroyed the value of the paper money. As this paper was never redeemed, it was in effect a tax upon the people which caused much suffering and distress.

After the collapse of the Continental currency the circulation of the country consisted of specie, largely obtained through foreign loans, State notes, and, to a very limited extent, bank notes. In 1782 the Bank of North America, at Philadelphia, was chartered by the Continental Congress. It was a private institution with a large Government subsidy and issued notes. It rendered important services to the nation, but its note issues amounted to only $400,000. Before the Federal Constitution was adopted banks of like character had been chartered in Boston, New York, and Baltimore, and bank issues acquired a recognized place in our monetary circulation.

The Federal Constitution vested the power to coin money in the Central Government, and forbade the States making anything but gold and silver a legal tender for the payment of debt. This eliminated State issues, and from this time until the Civil War the monetary circulation consisted of United States specie, foreign specie, and bank notes.

Among the first acts of Congress was to declare the values at which foreign coins should circulate and be received at the Government offices. Of these foreign coins the most common was the Spanish dollar, which as late as 1857 was received in all payments at the post-offices of the United States. In 1792 a law was passed establishing a national gold and silver coinage. In the history of money prior to the gold discoveries of California specie played a subordinate part, its chief function being for small change and as a reserve for banking operations. We may therefore glance at the history of bank-note issues before taking up that of metallic currency.

While the Constitution debarred the States from issuing money, it did not prevent them from establishing banks and giving to the latter the power to issue notes as they might see fit. After the adoption of the Constitution State banks multiplied rapidly. In 1791 the Bank of the United States was chartered with a capital of $10,000,000. Its notes were received everywhere and were the natural medium of payments between different parts of the country. The bank acted as a controlling agent over the State banks, since by receiving or refusing to accept their notes, it could make or mar their credit. When in 1811 its charter expired the State banks were unrestrained in their issue of notes. In 1811 Gallatin estimated the note circulation of these banks at $46,000,000, but in 1814 it had swelled to $100,-

000,000, while trade was crippled by war, and specie was drained from the country. Great embarrassment was felt by the Government from the fact that as the only medium of exchange such State bank notes could hardly be refused in payments, while with the suspension of specie payments by the banks their value depended upon the vagaries of bank management. This state of affairs called loudly for a remedy, and the reorganization of the Bank of the United States was planned. It was eventually accomplished in 1816, and for twenty years it exercised on the whole a salutary influence upon the monetary circulation. When in 1836 its charter expired State bank notes again ran riot and precipitated the disastrous panic of 1837. In the days of depression which followed the States generally put their banking systems in order. So long, however, as any State countenanced the loose methods which had formerly brought the whole system into disrepute, some were bound to suffer from such iniquity, but the mass of suffering was greatly reduced. This was in part due to the gold discoveries of California, which furnished the nation with a larger supply of metal than had ever been known, and made it comparatively easy for the banks to maintain an adequate reserve. When the Civil War broke out the State bank system was at its best, and the agitation which culminated in 1863 in the national banking system had its origin more in the fiscal necessities of the Government than in any immediate need of reform of the State banks.

The unit of value adopted in the act of 1792 mentioned above was a dollar of 371¼ grains of pure silver—practically the Spanish dollar then current—or a gold dollar of 24.75 grains, thus providing a bimetallic system with free coinage of the two metals at a ratio of 15 to 1. There had not been for many years any material change in the production of the precious metals, and the ratio adopted corresponded fairly well with the market ratio. While no great quantity of metal was coined in the mints of the United States for the first twenty years of our history, and as before the outbreak of the War of 1812 the tide of importation was in our favor, the system worked satisfactorily. With the war and the heavy importations of merchandise which followed an export of specie began and it was found that gold was favored. This change in the market ratio was largely due to the outbreak of the revolt against the Spanish domination in South America and the slackening of supplies of silver from that region. Agitation began for a new ratio, which did not culminate in legislation until 1834. At this epoch the United States mined no silver, while a certain amount of gold, considerable for that time, was being drawn from the Appalachian gold region. When, therefore, the new ratio was adopted it was deemed wise to be upon the side of favoring gold rather than silver. Laws of 1834 and 1835 changing the weight and fineness of the coins established the ratio of 15.988 to 1, familiarly 16 to 1, although the market ratio was 15.625 to 1. The divergence was, however, too slight to affect materially the supply of silver, but in 1849 gold was discovered in California, resulting in a decreased value of gold as compared with silver. Moreover, a metallic surplus appeared in our own markets, and silver began to be exported. As all the silver in circulation was divisionary coin, it was feared that a dearth of small change would result. The exportation of silver had already seriously depleted the stock of half dollars, the largest silver coin in use, and had begun to threaten the quarter dollars when in 1853 Congress reduced the fineness of silver coins less than one dollar from 900 to 835 and made them tokens to be issued only on Government account. In so doing it did not affect the status of the silver dollar, for which as before free coinage existed—an empty privilege, since the silver dollar had a higher bullion value than the gold dollar. From the establishment of the mint until 1850 the aggregate coinage of the United States was $196,000,000, and in this total gold and silver were about equally represented. In the next ten years, 1851-60, no less than $403,000,000 were coined, of which less than $48,000,000 were silver. Such a change denotes not only that gold predominated in the metallic circulation of the period, but also that the metallic circulation itself became a thing of moment in the community.

The Civil War introduced new elements into our monetary circulation—paper money and the national bank note. Soon after the outbreak of hostilities specie payments were suspended. The Government seemed to have exhausted every device of borrowing when it grasped the dangerous expedient of paper issues. Treasury notes bearing interest had several times in the history of the nation been resorted to, but it was not until the act of February 25, 1862, was passed that non-interest-bearing notes were issued. One hundred and fifty million dollars of notes were authorized and they were declared a legal tender for all debts, public and private, except duties upon imports and interest upon the public debt. Subsequent issues in July, 1862, and March, 1863, brought up the aggregate amount authorized to $450,000,000. This flood of paper money drove gold to a premium and swept away the silver subsidiary coinage. It became necessary to supply the place of the latter, and small notes called postage and later fractional currency were authorized in 1862 to the extent of $50,000,000. From the highest denominations down to three cents, the monetary circulation of the nation was paper only, the issues of the United States Government and the issues of the banks. In 1863 the national banking system was organized, but few banks availed themselves of the privilege of a national charter until after March 31, 1865, when a tax of 10 per cent. on the circulation of State banks outstanding after August 1, 1866, was enacted. This doomed the State bank notes, and banks which clung to the note-issuing privilege organized under the national law.

When peace had been declared the condition of the currency received attention. The volume of paper outstanding was reduced to $356,000,000 before 1868. In that year the fear of a monetary stringency due to contraction of the currency caused Congress to abandon this policy, and this postponed the day of redemption. In 1873 additional issues were made and the amount outstanding raised to $382,000,000, which limit was fixed as a maximum. In 1875 the Resumption Act was passed providing for a return to specie payments January 1, 1879. Some slight progress toward a metallic basis had already been made by calling in the fractional currency. The Resumption Act authorized the Secretary of the Treasury to sell bonds for the purpose of providing a gold supply sufficient to redeem the notes. It also removed the restriction which had previously rested on the volume of the national bank currency, and provided that when additional bank notes were issued an amount of legal-tender notes equal to 80 per cent. of such issues should be retired. The fear of contraction which had dictated a bill to repeal the entire Resumption Act, which failed only through the President's veto, succeeded in May, 1878, in abolishing this retirement provision, but not before the volume of notes had been reduced to $346,681,016, at which point the issue stands to-day. Much trepidation was felt lest resumption should not succeed and lest the applications for the redemption of notes should exhaust the reserve provided. But these fears proved groundless, and resumption was effected quietly and without difficulty. From 1879 the notes have been convertible into gold upon demand. No fixed reserve of gold for this purpose was prescribed by law, but the practice of the Treasury has been to keep on hand nominally at least $100,000,000 for this purpose. Whenever the reserve fell below this limit grave concern was felt, and more than once resort was had to the issue of bonds to sustain the reserve. The law of 1900 provides a reserve of $150,000,000 for the redemption of these notes, and provides more effective and more expeditious means for its replenishment.

Before 1862 the centre of interest and discussion in our monetary circulation lay in the notes of banks. It was then transferred to the paper issues of the Government, and after 1876 to silver. During the Civil War period the United States began to produce silver as well as gold in considerable quantities, but as all our money was paper this did not affect the monetary circulation. In 1870 a revision of the coinage laws was undertaken with the purpose of codifying existing law. One of the features of the codification was the omission of the silver dollar from the list of coins. The measure was an executive one and there was considerable difficulty in securing for it the attention of Congress, which listened impatiently while its provisions were being explained. Between 1870 and 1873, when it became a law, it had been thoroughly discussed in Congress and should have been well understood. The omission of the silver dollar made the United States theoretically a gold standard country. This law which effected the demonetization of silver was the famous 'crime of 1873,' concerning the passage of which the wildest statements were current at a later date. The simple fact is that at the time no one was aware of the significance of the demonetization of silver.

The agitation for the resumption of specie payment brought forward the contest between contractionists and inflationists. The latter failed in their efforts to balk the resumption policy, but the general feeling on which their argument rested, that a healthy currency must expand with the needs of the country, had to be reckoned with. This led in 1876 to the appointment of the Monetary Commission (q.v.) whose report presented in 1877 favored the free coinage of silver and thus began the long battle for that ideal. Germany had adopted the gold standard and was selling silver, the mines of the United States continued to increase their output, and silver was falling in the market below the legal ratios established by long usage in bimetallic countries. A bill for the free coinage of silver passed the House of Representatives in 1878. The Senate, however, was unwilling to accept for the United States alone the whole burden of the rehabilitation of silver, and a compromise resulted in the Bland-Allison Act, which was passed over the President's veto, February 28, 1878. It provided that not less than $2,000,000 worth of silver nor more than $4,000,000 worth should be purchased monthly and coined into standard silver dollars (412½ grains of silver 900 fine), which should be a full legal tender for all debts, public and private, without exception. It also authorized the President to call an international conference for the adoption of international bimetallism at a common ratio to be agreed upon. It also permitted the issue of silver certificates in sums of $10 and upward for standard silver dollars deposited in the Treasury. No relief came from the international conference, and the coinage went on increasing in volume as the price of silver fell. Soon embarrassment was caused by the tendency of these dollars to return to the Treasury, as less than $60,000,000 were absorbed by the circulation. There was no difficulty, however, after a law of 1886 permitted the issue of certificates in denominations of $1, $2, and $5. While the number of dollars in circulation is not large, there is no obstacle to the circulation of silver certificates.

Under the law of 1878, which continued in force until 1890, $378,000,000 were coined. The price of silver continued to fall and with it the price of other commodities. International bimetallism as a remedy for falling prices continued to gain favor among economists, and the agitation for free silver coinage in the United States grew in strength. In 1890 again the House of Representatives passed a free coinage bill, but a compromise worked out in the Senate was finally accepted and became law. This provided for the purchase of 4,500,000 ounces of silver monthly and the issue of Treasury notes for the cost price thereof. These notes were a legal tender, and the privilege was given to the Treasury Department to coin the silver thus purchased and replace the notes with silver certificates. The embarrassments of the Treasury and the difficulty of keeping the growing mass of silver money at a parity with gold led in 1893 to the repeal of the compulsory silver purchase provision. Under this law 168,000,000 ounces of silver had been purchased and Treasury notes to the amount of $155,000,000 issued. The repeal of the act in 1893 took place only after a severe struggle, and the friends of silver did not give up the fight. The Presidential contest of 1896 was fought out on the free coinage question and resulted in the signal defeat of the Silver Party. In 1900 a new currency law was passed which squarely defined the gold dollar as the standard of value in the United States. It provided, as already stated, a larger reserve for the redemption of the legal-tender notes. The attempt to make silver dollars redeemable in gold was, however, unsuccessful. The same measure favored the expansion of the national bank note issues by permitting note issues to the amount of the par value of the bonds deposited and by reducing the tax upon the circulation of banks.

See articles BANKS; BIMETALLISM; CREDIT; CURRENCY; FOREIGN MONEY; GRESHAM'S LAW;

Latin Union; Monetary Commission; Monetary Conferences.

Bibliography. The mass of literature relating to money is so enormous that the selection of references must be confined chiefly to those which deal with the question from the American viewpoint. Reference should, however, be made to the *Reports* of the International Monetary Conferences of 1867, 1878, 1881, and 1892, and the *Reports* of the English Commissions on the Depression of Trade, on the Relative Value of Gold and Silver, and on the Indian Currency. Among works which deal with the theory of money, mention may be made of: Jevons, *Money and the Mechanism of Exchange* (New York, 1894); id., *Investigations in Currency and Finance* (London, 1884); Nicholson, *Money and Monetary Problems* (3d ed., ib., 1895); Walker, *Money* (New York, 1878); id., *Money, in Its Relation to Trade and Industry* (ib., 1883). In reference to the money question in the United States, the following works may be consulted with profit: Gouge, *Paper Money and Banking in the United States* (Philadelphia, 1833); Sumner, *History of American Currency* (New York, 1878); Knox, *United States Notes* (ib., 1884); Laughlin, *History of Bimetallism in the United States* (ib., 1886); Taussig, *The Silver Situation in the United States* (1893); Laughlin, *Report of the Monetary Commission of the Indianapolis Conference* (Chicago, 1898); Noyes, *Thirty Years of American Finance* (New York, 1898); Watson, *The History of American Coinage* (ib., 1899); Bullock, The *Monetary History of the United States* (ib., 1900); White, *Money and Banking* (2d ed., Boston, 1902).

MONEYWORT. A popular name for various plants of the genus Lysimachia (q.v).

MONFORTE DE LEMOS, môn-fôr'tȧ dȧ lā'môs. A town of Northwestern Spain, in the Province of Lugo, situated in a fertile valley, 35 miles south of Lugo, with which it has railroad connection (Map: Spain, B 1). Near by is a hill on which are the ruins of a castle of the lords of Lemos. The town has a secondary school installed in an attractive old Jesuit convent. The chief industry is cattle-raising, and there are some manufactures of cloth, soap, and chocolate. Population, in 1900, 12,999.

MONGE, mônzh, Gaspard (1746-1818). A French mathematician, born at Beaune. He was educated at Beaune and at Lyons, and when only sixteen years old obtained a position to teach physics and mathematics at the latter place. From there he went, in 1765, to the school of engineering at Mézières as designer. He was soon made assistant, and in 1768 professor of mathematics in the military school itself. In 1780 he became a member of the Academy of Sciences at Paris, and in 1783 was appointed examiner of the naval pupils. From that time he lived in Paris. In 1792 he was appointed Minister of Marine, and the next year he took an active part in organizing the national defense. He was also active in the organization of public education, was one of the first professors in the Ecole Normale, and was one of the founders of the Ecole Polytechnique. He went with Bonaparte to Egypt in 1798, undertook the direction of the Egyptian Institute, and conducted the search for Egyptian antiquities. In 1805 he was appointed Senator, and in 1806 received the title of Comte de Péluse. After the Restoration he lost his offices, and at this time he fell into a state of melancholy from which he never recovered. He is famous chiefly as the founder of descriptive geometry (see Geometry), a science long kept as a Government secret. But he made important contributions to other branches of mathematics as well. The development of modern geometry dates from him; he introduced into analytic geometry of three dimensions a thorough treatment of linear equations, completed the study of surfaces of the second degree which had been begun by Euler, and established the principles of the integration of partial differential equations in connection with the theory of surfaces. Following are his principal publications: *Traité élémentaire de statique* (1788: 8th ed. 1846); *Géométrie descriptive* (1795; 7th ed. 1847; new German ed. 1900): *Application de l'analyse à la géométrie des surfaces du premier et deuxième degré* (1795; 5th ed. 1850). Consult: Dupin, *Essai historique sur les travaux scientifiques de Monge* (Paris, 1819); Brisson, *Notice historique sur Monge* (Paris, 1818); Obenrauch, *Monge, der Begründer der darstellenden Geometrie als Wissenschaft* (Brünn, 1893-94).

MONGHYR, mon-gēr', or **MUNGHIR.** The capital of a district in Bengal, British India, on the south bank of the Ganges, having steam ferry communication with its railway station on the north bank, 34 miles northwest of Bhagalpur (Map: India, E 3). The city, extending for six miles along the river bank, has a picturesque appearance, and is dominated by a fort containing the district offices and headquarters, on a rocky elevation. During the eighteenth and nineteenth centuries Monghyr was noted for its manufactures of firearms, swords, and ironware, which are still in local demand. Cotton, cloth, shoes, furniture, and soap are manufactured, and there is a large trade in agricultural produce, especially butter. Population, in 1891, 57,077; in 1901, 35,880.

MONGIBELLO, môn'jē-bĕl'lô. The Sicilian name for Etna (q.v.).

MÖNG NAI, mēng nī. An eastern State of the feudatory Southern Shan States, British Burma. Area, 2716 square miles. Population, estimated at 24,000. Capital, Möng Nai.

MONGOL DYNASTIES (Mongolian, probably from *mong*, brave). From the earliest times the tribes that became known as Mongols about the twelfth century dwelt in Eastern Asia, in and about the modern Mongolia. They were organized and made a great conquering power by Genghis Khan (1162-1227). The great Asiatic empire which was made his by conquest was divided among his sons, of whom Ogotai received Northern China and Mongolia and succeeded his father as Great Khan. Under Kublai Khan, the grandson of Genghis, who became Great Khan in 1259, the empire was practically divided into four parts. The first, actually ruled by the Great Khan, included China, Korea, Mongolia, Manchuria, and Tibet, with its capital at Peking. (See Kublai Khan and Chinese Empire.) The second, the Middle Tatar Empire, given by Genghis to his son Tchagatai, included Sungaria, Transoxiana, Afghanistan, and a part of Chinese Turkestan. Its history differs in no way from that of other Asiatic States until, under a weak descendant of Tchagatai, the real power fell into the hands of the ruthless Tamerlane or Timur (q.v.), who made Samarkand the capital of his empire. The third division of the empire of Genghis Khan, the Empire of Kiptchak (q.v.), or the Golden Horde, was assigned to Batu, a grandson of Genghis by his eldest son Jujy. In 1237 a vast Mongol horde entered Russia (q.v.), and after carrying destruction through that country with fire and sword and forcing the princes to do homage, pressed into Poland and Germany, and on the field known as the Wahlstatt, near Leignitz, in Silesia, defeated an army of Poles, Silesians, and Teutonic Knights in April, 1241, suffering such heavy losses, however, as to be compelled to retreat. In the same year another army under Batu Khan overwhelmed the Hungarians under their King, Béla IV. In 1242 Batu Khan was recalled to Asia by the news of the death of Ogotai. As long as the House of Batu continued the Kiptchak Mongols or Tatars held Russia in vassalage, and kept Eastern Europe in constant terror. They met their first defeat at the hands of the Russians in 1380; but their strength was most seriously undermined by the new Tatar invasion under Timur (q.v.) in 1389. The empire dissolved into the separate khanates of Kazan, Astrakhan, and the Crimea. In 1480 the Russians emancipated themselves from the overlordship of the Mongols. The khans of the Crimea became vassals of the Turkish sultans in 1475. Kazan was conquered by Ivan the Terrible of Russia in 1552, and Astrakhan in 1554.

The fourth division included Persia, Georgia, Armenia, Khorasan, and part of Asia Minor. In 1253 Mangu, the fourth Great Khan, a grandson of Genghis, sent his brother Hulaku to govern this part of the empire and to complete the conquest begun by Genghis. Hulaku crossed the Oxus, destroyed the sect of the Assassins (q.v.), took Bagdad, and put an end to the Abbasside caliphate (1258). He reduced Persia to complete subjection, and added Mosul, Mesopotamia, Syria, and a large part of Asia Minor to the Mongol conquests. He became the founder of a dynasty known as the Ilkhans, which ruled over Persia till 1335. His religion was the pure theism of his house, and he was broadly tolerant toward both Christian and Moslem. His wife was a Christian. He established his capital at Maraghah, in Azerbaijan, and there maintained a court where science and the arts were liberally cultivated. Hulaku assumed independent sovereignty upon the death of Mangu Khan. He died in 1265, and was succeeded by his son Abaka, whose ability and virtues excelled those of his father. He had the advantage of being able to treat the country as an organizer rather than as a conqueror. The son of a Christian mother, he married a daughter of the Greek Emperor, Michael Palæologus, and is thought to have been himself a Christian. He was a devoted patron of learning. His reign was for the most part peaceful; but he expelled from his realms a Tatar army, defeating the invaders near Herat. He died in 1282. Abaka Khan was succeeded by his brother, baptized under the Christian name of Nicholas (Mongol Nikudân), who became a Mohammedan and persecuted the Christians and Mongols until he was warned to desist by his powerful uncle, Kublai Khan. When he apostatized he took the name of Ahmed. He was put to death in 1284 by Argun, the son of Abaka, who then ascended the throne. He followed the liberal and pro-Christian traditions of his father and grandfather. He opened diplomatic relations with Europe, whither he sent a Genoese, Buscarelli, as his agent. He proposed to make an alliance with the Pope, England, and France against the Mohammedan power. Marco Polo, the famous Venetian traveler, conducted a Mongol bride from the Court of Kublai to Argun, but the latter died before their arrival, in 1291. His successor, Kai Katu, died in 1294, and the direct succession was restored by Ghazan Khan, the son of Argun. He waged a successful war with the Egyptian Sultan, and continued the friendly intercourse with Europe which his father had begun. In his later years he adopted Mohammedanism. He was a patron of literature, like his predecessors, and caused a history of the Mongols to be written by one of the scholars at his Court. He made many improvements, especially in the administration of justice, and built roads and established post routes. He died in 1303. His brother and successor, Mohammed Kudah Bundah, made Es-Sultaniyeh his capital, attached himself to the Moslem sect of Ali, and died in 1316. The son of the last prince, Abu Said, was a mere child, and the common experience of absolute monarchies, a struggle for power between leading chiefs, followed his accession, and introduced the seeds of weakness into the Mongol dominion. Juban, who was successful in this rivalry, married the young Khan's sister; but when Abu Said became of age he showed the spirit of his race, and defeated and killed his aspiring vassal in 1327. His death in 1335 was the practical end of the Mongol monarchy in Persia. His successors until 1344 were mere puppets in the hands of ambitious chiefs, and anarchy made easy the conquests of Timur. Timur was likewise of Mongol origin, and akin to the family of Genghis. The Mogul (or Mongol) dynasty in India (q.v.) was founded by one of his descendants, Baber, in 1526. Consult: Howarth, *History of the Mongols* (4 vols., London, 1876-88); Markham, *History of Persia* (London, 1874); Yule, *Cathay and the Way Thither* (London, 1866); Hammer-Purgstall, *Geschichte der goldenen Horde* (Pest, 1840); id., *Geschichte der Ilchane* (Darmstadt, 1842).

MONGO'LIA. The land of the Mongols; a Chinese colonial possession, which stretches through Central Asia from Eastern Turkestan, Sungaria, and the Altai Mountains on the west, to Manchuria on the east, and northward from China proper to the four Siberian provinces of Tomsk, Yeniseisk, Irkutsk, and Transbaikalia. The term is sometimes stretched to include Sungaria on the west, where many Mongols dwell, and Koko-nor, which lies north of Tibet, but is separated from Mongolia proper by the Chinese Province of Kansu. The area is estimated at about 1,300,000 square miles.

Physical Features. Three physically distinct regions are recognizable: (1) A central elevated plateau known as the Desert of Gobi, 2500 to 3000 feet above the level of the sea, 500 miles or more in breadth, and extending from southwest to northeast for 1000 miles. It may be described as an almost treeless stony or gravelly plain, diversified by ranges of low barren hills a few hundred feet above the general level of the country, and marked here and there with projecting crags and shattered peaks apparently of volcanic origin. Toward the west and southwest are parts over-blown with loose sands, which fill the bottoms of the smaller valleys, or form fantastic, ever-changing ridges and hillocks, presenting a weird and dreary aspect, and traversable only by camels. Elsewhere, however, especially toward the Hurku Hills in the west, and in the northeastern section, are found many wide grassy plains, with patches of scrub and furze, and clumps of parched flowers, merging in the north into the rich pasture land and fairly wooded hill country south and east of the Kentei continuations of the Yablonoi Mountains of Siberia. (2) A still more elevated plateau from 3000 to 5000 feet above the level of the sea, lying to the northwest of this so-called desert plateau, and bounded toward Sungaria and Siberia by the Altai and the Sayan Mountains. This is the region sometimes called Outer Mongolia. It is a mountainous country, clad with forests and intersected with numerous streams. The chief mountains are the Tannu, the Taiskhir, the Kara-Adsirga, the Arzy-Bodgo, the Khangai, and the Chamur, with a general northwest to southeast trend. (3) The fertile, undulating, and well-wooded region usually called Eastern or Inner Mongolia, lying to the south and southeast of the Gobi, and intersected by the greater Khingan Mountains and their southwestern continuations. It lies along the Manchurian provinces of Kirin and Shing-king, and stretches westward along the Great Wall as far as Kwei-hwa-ch'ing.

Hydrography. With the exception of the southwest parts of the Gobi Plateau, the country is fairly well watered, and even in those regions numerous rills are encountered, which, however, speedily lose themselves in the sand. Water, however, may be found almost everywhere by digging a few feet. Unfortunately, these regions are so frequently wind-swept that the water holes are soon covered over or hidden by the fine dust with which the winds are laden. The drainage of the country is partly to the north, into Lake Baikal by the Eder, the Orkhon, and other tributaries of the Selengha, and partly to the northeast and east by the Onon, through the Shilka, and by the Kerulen, through the Dalai-nor and the Argun into the Amur. The extreme eastern part of Mongolia drains partly into the Amur through the Nonni and the Sungari of Manchuria, and partly to the sea by the Shira-muren, which finds its way into the Gulf of Pe-chi-li by the Liao. There are several lakes in Kobdo and Uliassutai, some of them brackish, from which some thousands of tons of salt are obtained. The largest is Kosogol (5200 feet above sea-level), near the Russian frontier. On the extreme east, partly in Manchuria, is the Dalai-nor, and there are many lakes of less extent in Southeast Mongolia.

Geology and Minerals. The country seems to be built up of granites, gneisses, and crystalline schists of Archæan age, and there are indications of its being rich in minerals. In the Sayan Mountains immense beds and boulders of nephrite have been found, and in the Kitoi Alps, near Lake Baikal, are great deposits of serpentine and graphite. Silver ores and graphite have also been found on the Mongolian side, and coal, apparently of Jurassic age, has been found in the Tannu Mountains and the Yenisei basin, as well as near Kukuhoto (Kwei-hwa-ch'ing), near the great bend of the Yellow River. In the lower or central plateau red and brown conglomerates, sandstones, and clays are common, and both crystalline and mountain limestone abound in the Khingan range.

Soil, Climate, and Vegetation. Except in the vicinity of the lakes and rivers, along the rich alluvial borderlands of the Khingan range, and the loess deposits north of Shansi and Chihli, the soil is poor and little agriculture is possible. In Southeast Mongolia, where the average summer temperature is 77° F., indigo, cotton, opium, and rice are produced, as well as the usual cereals, while in Central Mongolia only small quantities of wheat, oats, buckwheat, and millet are grown. In the northwest agriculture is attempted only in the vicinity of the lakes and along the lower courses of the rivers. Winter lasts for from six to eight months, and in December the mercury falls in some places to 30° F. below zero. The air is dry; cold northwest winds prevail; northeast winds bring moisture, south and southeast winds dry heat. At Urga, the capital, in latitude 48° 20′ N., longitude 107° 30′ E., 600 miles north-northwest of Kalgan, the annual rainfall is only 9½ inches, and the mean summer temperature 64° F., and at Uliassutai, in the northwest, 5400 feet above sea-level, the July temperature is 66° F. The snowfall is never great.

Fauna. The fauna resembles that of Siberia, and is not extensive. It is richest in fur-bearing animals, as hares, foxes, sables, and squirrels, and there are deer, marmots, black bears, Kyang or mountain goats, ounces, and wolves. The wolves never run in packs, seldom attack men, and are far from brave. Droves of wild camels, ponies, asses, and mules are found, and their young are sometimes captured. Among game birds is the partridge. Except in the settled regions near China, cats and chickens are seldom seen. No encampment is complete, however, without a pack of barking, currish dogs. The camel is two-humped, but does not possess the water cells of the camels of the Arabian desert.

Industries. Mongolia has no manufactures. The chief industry is the rearing of flocks and herds, and the breeding of horses. In the northwest, and to a less extent elsewhere, hunting is engaged in, and furs, skins, deers' horns, etc., form important articles of trade. Felt and certain kinds of woolen goods are produced, and two kinds of silk are woven in the rich agricultural districts occupied by the Chinese and the sedentary Mongols (i.e. the region between the desert and the Great Wall), whose trade is with North China. Trade centres chiefly in Urga, Kobdo, Uliassutai, and Maimaichin, opposite the Russian town of Kiakhta (840 miles north-northwest of Kalgan (q.v.), also an important trade centre), and Kuku-koto, or Kwei-hwa-ch'ing, a walled Chinese town near the great bend of the Yellow River, and an important point of departure for the trade with East Turkestan and Ili. Other cities are Jehol (q.v.); Lama-miao, 150 miles northeast of Peking; Pa-K'ow, 60 miles east by south of Jehol; Chi-fung-hien, 150 miles northeast of Jehol; and Hada, situated in latitude 42° 10′ N. and longitude 119° E. Trade is carried on mostly by barter, furs, woolen stuffs, skins, sheep, camels, horses, etc., being exchanged for salt, timber, tea, silk, cottons, sugar candy, etc. Brick tea is the chief medium of exchange.

A very extensive and important transit trade passes through Mongolia from Peking, through Kalgan and Urga to Kiakhta in Siberia, tea being the chief commodity from China. This gives considerable employment to several of the tribes as conductors of the caravans, particularly the Sunids, who occupy the central portion of the Gobi, and thousands of camels are employed. Roads—i.e. well-beaten tracks—abound, and run in all directions, except in the sandy parts, and there are usually two or more to every important place, camels going one way and ox-carts another, depending on the pasturage and the water. There are few cities or towns, the Mongols being for the most part tent-dwellers who usually camp on one spot all winter, but move occasionally during summer to some suitable pasturage within their own tribal limits.

Population and Government. The country is ruled as a military colony by the Li Fan Yuen, or 'Colonial Department,' at Peking. The population has been estimated at from 2,000,000 to 5,000,000. The latter number seems excessive, but probably includes the inhabitants of Sungaria and Koko-nor, as well as the very large number of Chinese who have taken up their abode here as merchants and farmers. The Mongols are divided into aimaks or tribes, each governed by its own chieftain, and subdivided for military purposes into Koshun, or 'banners.' The northern half of the country is occupied (1) by four khanates (eighty-three banners)—Dzassaktu, Sain-noin, Tsushetu, and Tsetsen—each governed by a prince claiming descent from Genghis Khan, controlled by two Manchu residents, whose seat is at Urga, the capital. The four khanates are composed entirely of Khalkhas, the most powerful of all the tribes. (2) By Kobdo and Ulianghai, dependencies of Uliassutai, ruled by their own chieftains, and a Chinese Amban or Minister Resident at Uliassutai. The rest of the country—known as Inner Mongolia—is occupied by twenty-four aimaks or tribes, each with its own hereditary chieftain, the whole divided into forty-nine banners, forming six corps. The most important of these are the Kortchin, on the Manchurian border, who joined the Manchus in the conquest of China, and the Ordos within the great bend of the Yellow River. The Chakhars and Bargou are not included in the jurisdiction of Mongolia; their pasture lands are now included within the Province of Chih-li. They are governed by a Tu-tung, or lieutenant-general, who resides at Kalgan. Similarly the Tumets north of Shan-si are included in that province, and are (with the Ordos) controlled by a general residing at Kwei-hwa-ch'ing. The people pay no taxes to China; only a cattle tax to the princes, who pay a certain nominal tribute to the Emperor of China, whom they acknowledge as paramount, agreeing to have no relations with any foreign power. The princes furnish certain military contingents when needed, and are required to visit Peking at stated periods. Their military forces consist entirely of cavalry.

Religion. Buddhism was introduced by Kublai Khan, and the Mongols are now strongly devoted to Lamaism (q.v.). Several males of each family become lamas or priests, and in this they are encouraged by the Chinese Government. There are numerous great lamaseries in Mongolia—e.g. in the vicinity of Jehol (q.v.)—and temples are found well scattered over the country. The spiritual head of Mongolian Buddhism is the *Kutuktu*, or Living Buddha—next in importance to the Grand Lama of Tibet—who resides at Urga.

Social Life. The Mongols are a cheerful, good-natured, and hospitable people. They live in tents (*yurts*) of a very close-grained dark fabric, lined with felt, with a hole in the roof for escaping smoke, its occupants squatting on the felt-covered floor, supporting their backs against the boxes and chests which line the 'wall.' There is no furniture beyond small tables. Though Buddhists, they are not averse to flesh-eating; but few except princes and nobles, or specially wealthy persons, can afford such a luxury. Their ordinary food consists of preparations of milk and millet, buckwheat flour, oatmeal, and the like. Mutton, however, is kept in the houses of the well-to-do for festive occasions, for the entertainment of guests, or to be used when prescribed medically. Except among princes and the agricultural Mongols bordering on China, chopsticks are not used—the fingers or a spoon suffice. Women are not secluded as in China, and in their marriage customs a semblance of the primitive fashion of wiving by 'capture' is retained.

Language. Mongolian is an agglutinative language, belonging to the Ural-Altaic family. It is closely allied to the Manchu, and in its grammatical procedures it greatly resembles Korean. Throughout Mongolia proper it is free from dialectal differences, but slight differences exist in Kalmuck (as in Sungaria) and among the Buriatic Mongols of Siberia. It was reduced to writing in the time of Genghis Khan, the alphabet then introduced being borrowed from that of the Uighur Turks of Kashgar, who had at an earlier period borrowed theirs from the old Syriac which had been introduced by the Nestorian missionaries. It consists of seventeen consonants, seven vowels, and five diphthongs. These are grouped on the left of a vertical stem forming syllables which are arranged in columns read downward and from left to right. As in Korean, case is indicated by appended particles; the plural is formed by separable affixes; there is no grammatical gender; there are no relatives, and very few true conjunctions; the verb is very elaborate, the adjective uninflected; prepositions become post-positions, the governed word precedes that which governs it; and, as in China, the book language differs somewhat from the spoken. The literature is not extensive. It comprises Buddhist scriptures and some translations from the Chinese; some folk-lore and fairy tales, and the great history of the Eastern Mongols, written in the seventeenth century by Sanang Setsen. Both the Old and New Testaments were done into Mongolian by Stallybrass and Swan in 1836-46.

History. Little is known of the origin and early history of the Mongols. They are referred to in the history of the T'ang dynasty (seventh century), but they begin to find a place in world history only in the appearance of Temu-jin, later known as Genghis Khan (q.v.), the leader of a great wave of bloodshed and conquest which overspread Asia and struck terror into Europe.

Mongolia proper during this period has no history; its people were making history for themselves, but outside their own country. Driven out of China in 1368 by the founder of the Ming dynasty, the contemporary of Timur, the Khalkhas, who had established their rule there under Kublai, retired to their former home north of the Gobi, still hoping for an opportunity to reconquer their lost territory, but a great leader did not arise. In 1643 a new dynasty came to the throne of China—the Manchus—with the help of certain of the Mongol tribes whose seats lay near the Manchurian frontier. In 1688 war broke out between the Eleuths of Sungaria and the Khalkhas, and the latter. being defeated in 1690, sought the aid and protection of China. Both were cheerfully given; but it was not till seven years later that warlike operations, led by the Emperor K'ang-hi in person, resulted in the utter defeat of the Eleuths, and the death of their leader, Galdan. Sungaria became a Chinese possession, and all the tribes of Mongolia became vassals of the Emperor. Valuable presents from time to time, the softening influence of Buddhism, the spread of Monachism, and the personal influence of the Dalai Lama of Tibet have preserved peace ever since.

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MONGOLIAN RACE. That division of mankind which is characteristically Asiatic and had its primitive home on the continent of Asia, whence it has sent out branches into Europe, Africa, the islands of the Pacific, and, in the opinion of some authorities, even to the continent of America. Brinton, who termed this the Asian race, included in it the Sinitic peoples (Chinese, Tibetans, Indo-Chinese) and the Sibiric peoples (Tungusic, Mongolic, Tataric, Finnic, Arctic, and Japanese-Korean groups), while he regarded the Malayo-Polynesian peoples as a branch descended from some ancestral tribe in Asia. Keane modifies this view and regards the Malay type as distinctly Mongolic, and also has an Oceanic Mongol group (including all the peoples of Malaysia and Polynesia who are not of Indonesian, Negritic, Australasian, Papuan, or Melanesian stocks), one of the divisions of his *Homo Mongolicus*. Both these scholars reject the theory which would derive the American aborigines from a Mongolian stock. Some of the earlier ethnologists saw a large Mongolian ('Turanian') element in Western Asia and Europe, of which fragments were to be seen in Sumerians and Hittites, Pelasgians and Etruscans, Iberians and Basques, Picts, and other isolated peoples. Abundant evidence, however, is now forthcoming that Europe and Western Asia have from prehistoric times been in the possession of peoples belonging to the Mediterranean branch of the white race and their more northern and southern congeners. The view of other authorities that the Celts are largely Mongolian lacks proof, as do also the views of those archæologists who explain certain industrial and social phenomena of later prehistoric Europe by invasions of Mongolian or Mongolized peoples from Asia. Outside of the Finno-Ugrian or Ural-Altaic peoples of Northeastern Europe and the later Mongol and Turko-Tataric peoples of Southeastern Russia, the Magyars of Hungary, the Turks of the Balkan Peninsula, and the Huns, Avars, and Bulgars, who came in the wake of the great migration of Germanic peoples (the last-named still surviving to some extent in the Slavicized Bulgarians), the Mongolian population of Europe has probably never amounted to much at any epoch, the greatest invasions having taken place in historical times during the Middle Ages. Western Asia, Europe, and Northern Africa have been as characteristically the environment of the white as the great mass of the Asiatic continent has been that of the yellow race.

The members of the Mongolian race possess, as a rule, straight, coarse hair (abundant on the head, less on the face, very scanty on the body), yellowish skin, a brachycephalous (or mesocephalous) head-form, prominent cheek-bones, a roundish face, a small nose, and small black eyes, with slight elevation of outer angle and vertical fold of skin over the inner canthus. Their stature is medium or below the average. The 'Mongolian spots' (q.v.) are also considered by some ethnologists a differentiating characteristic of this race. Certain bodily characteristics, as the relative proportion of trunk, limbs, and head of the typical Mongolian, have led many authorities to consider this the most child-like of all the human races. Color of skin, stature, and other peculiarities of a somatic nature account for the opinion of some that the Mongolian race is nearest to the original human stock, while the white, black, brown, and red races are held to represent greater divergences from the primitive type. That the Mongolian type should be the nearest to the original race and at the same time the closest to the child, who best represents the general human type, is very probable. Physically, then, the Mongolian race is of peculiar interest. Intellectually it runs a gamut equal to that of the white race, from the lowest tribes of Siberia, through the half-civilized peoples of Central Asia and the borders of China, to the great, ancient, and almost stagnant civilization of China, and beyond that to the rapidly advancing and progressive Japanese.

Consult: Müller, *Der ugrische Volksstamm* (Leipzig, 1837); Rittich, *Die Ethnographie Russlands* (Gotha, 1878); Latham, *Russian and Turk* (London, 1878); Helle von Samo, *Die Völker des osmanischen Reiches* (Vienna, 1877); Vámbéry, *Primitive Cultur des turko-tatarischen Volkes* (Leipzig, 1879); id., *Ursprung der Magyaren* (Vienna, 1883); id., *Das Türkenvolk* (Leipzig, 1885); Winkler, *Uralaltäische Völker und Sprachen* (Berlin, 1884); Ujfalvy de Mezö-Kövesd, *Expédition scientifique française en Russie, en Sibérie, etc.* (Paris, 1878-80); Ten Kate, *Zur Craniologie der Mongoloiden* (Berlin, 1882);

Müller, *Unter Tungusen und Jakuten* (Leipzig, 1882); Radloff, *Aus Sibirien* (Leipzig, 1884-93); Martin, *Sibirica* (Stockholm, 1897); Munzinger, *Die Japaner* (Berlin, 1898); Jacob, *Oestliche Kulturelemente im Abendlande* (ib., 1902); René-Sifert, *Jaunes et blancs en Chine* (Paris, 1902); Haberer, *Schädel und Skeletteile aus Peking: Ein Beitrag zur somatischen Ethnologie der Mongolen* (Jena, 1902).

MONGOLIAN SPOTS. A term applied by anatomical anthropologists to certain temporary pigment-spots, bluish, gray, or blackish in color, found particularly in the sacro-lumbar region and on the buttocks of new-born children, so frequently as to be regarded as a characteristic of the Mongolian races. These spots usually disappear between the ages of two and five, although they not infrequently last until the seventh year, and are occasionally found even in adults. Some anthropologists regard these spots as the most important distinctive race-characteristic of the Mongolians. They have been reported from Chinese, Japanese, Koreans, Indo-Chinese, Malays and Polynesians, Malagasy, Ainu, Tungus, Kalmucks, Mongols, as well as among Eskimos, Mexican Indians, and even in full-blooded Europeans. It has been suggested that they may be rather a mark of the Indonesian than of the Mongolian race, but at all events, in view of the fact that they are by no means confined to the Mongolian race, and may possibly turn out to be quite common even in the white race, for the present their value as a real race-characteristic is very doubtful. Consult Wardle, "Evanescent Congenital Pigmentation in the Sacro-Lumbar Region," in the *American Anthropologist*, vol. iv. (New York, 1901).

MONGOLIAN SUBREGION. In zoögeography, a subdivision of the Palearctic Region, which includes the tablelands of Central Asia, from the Caspian Sea to Japan. Its separation from other Asiatic faunal regions is mainly on ornithological grounds, and is neither distinct nor important.

MONGOOSE. One of the various spellings of Mungoos (q.v.).

MÖNG PAI, mĕng pä′ē. The southwesternmost of the feudatory Shan States of British Burma. Estimated area, 1000 square miles. Population, about 17,000. See Burma.

MÖNG PAN, mĕng păn. An eastern State of the feudatory Southern Shan States, British Burma (Map: Burma C 2). It is named after its village capital. Area, 2299 square miles. Population, estimated at 9000. See Burma.

MONIER DE LA SIZERANNE, mō̇′nyȧ′ de lȧ sēz′rȧṅ′, Maurice (1837—). A French philanthropist, born at Tain. He became blind at an early age, and was educated at the Jeunes Aveugles, an institution in which he was made a professor in 1873. He compiled a bibliography of books especially printed for the blind, and devoted all his energies to the alleviation of their lot. His own works include: *Les aveugles utiles* (1881); *Jean Guadet et les aveugles* (1885); *Les aveugles par un aveugle* (1888); and *Dix ans d'études et de propagande en faveur des aveugles* (1890).

MONIER-WILLIAMS, mō′nĭ-ẽr wĭl′yŭmz, Sir Monier (1819-99). An English Orientalist, born at Bombay, the son of Monier Williams, Surveyor-General. He studied at Balliol College, Oxford, and at the East India College in Haileybury, and graduated at University College, Oxford, in 1844. He taught at Haileybury and at Cheltenham, and in 1860 became Boden professor of Sanskrit at Oxford. His main work in this post was the foundation of the Indian Institute, in the interests of which he traveled in India (in 1875-76 and 1883), and to which he presented a valuable collection of manuscripts. He retired from active work in 1887. He edited Kālidāsa's *Vikramorvaś* (1894) and *Śakuntalā* (1853; 2d ed. 1876; trans. by him in 1853; 6th ed. 1894); and the *Episode of Nala* from the *Mahābhārata* (2d ed. 1879); and wrote *Indian Wisdom* (1875; 4th ed. 1893); a *Sanskrit Grammar* (1846; 4th ed. 1876); a valuable *Sanskrit English Dictionary* (1872; 2d ed. 1899); and a *Sanskrit Manual for Composition* (1862). He also wrote a *Practical Hindūstānī Grammar* (1862), and several essays on the religions of India.

MONISM (Gk. *μόνος*, *monos*, single). A philosophical term, in its broadest sense designating all systems of philosophy which define the sum total of reality as unitary, either in organization or in substance. It is thus opposed to dualism and pluralism.

In this broad sense, as indicating merely the final unity of all reality, monism represents the ideal of nearly every system of philosophy, and indeed by some thinkers it is considered to be the only legitimate philosophical ideal. In the history of philosophy the first conscious effort to attain a monistic system appears in the teachings of the Eleatics. Among the Ionians there had been philosophers who derived all phenomena from a single primal element, but the Eleatics were the earliest to assert the immutable unity of all that is real. They did not, however, definitely fix the nature of the unitary being. That nature might be of two sorts—material or spiritual. The ancient Atomists advanced the doctrine of a material being, while Anaxagoras and Plato, although in neither case attaining a pure monism, clearly pointed the way of modern idealism.

The first thoroughgoing monism, in a more exact and restricted sense, appears in the philosophy of Spinoza, after scholastic controversies had crystallized the conception of substance and attribute. Spinoza taught that both material and ideal phenomena are attributes of one underlying substance which forms the monistic reality. His doctrine is thus analogous to the 'mind-stuff' theory (q.v.), which teaches that matter and mind are diverse aspects of one reality, and is generally identified as the modern 'scientific monism.' But materialism, if it asserts that mind may be identified with matter, is also monistic; while idealism, denying the reality of matter, represents the opposing, complementary form of the doctrine. Idealistic monism is itself of two types, however. On the one hand, there is that type which identifies the monistic reality with some one psychical element—as in Schopenhauer, who finds the essence of all things in blind will; and on the other there is that type which unifies in a world-consciousness all the diversities of phenomena. Similar to this latter is the Hegelian monism which expresses the unification in logical terminology, as the reconciliation of opposites in a higher synthesis.

The term monism is relatively recent, having been first used by Christian Wolf (1679-1754) to designate types of thought which endeavored to do away with the dualism of body and mind. For a considerable period, it was used with explicit reference to relations involved in the epistemological problem (see KNOWLEDGE, THEORY OF), but in contemporary thought it has been extended to the senses indicated.

MO'NITA SECRE'TA SOCI'ETA'TIS JE'SU (Lat., secret instructions of the Society of Jesus). The title of a book purporting to contain private instructions for the members of the Society of Jesus, first published at Cracow in 1614 without any author's name. It was attributed by the enemies of the Jesuits to Claudio Acquaviva, the general of the Order; and, though it was condemned by the Congregation of the Index in 1616 as "falsely ascribed to the society, calumnious, and full of defamatory matter," it was for a long time received as authentic by these same enemies. Its genuineness has long ceased to be defended by scholars, whatever their point of view. Recent investigations of the Cracow Academy have made it practically certain that it was written by the man whom the Bishop of Cracow names as its suspected author in the year following its publication—Jerome Zahorowski, a former Jesuit, who had been dismissed from the Order for ill conduct, and took this means of revenging himself. Consult: Duhr, *Jesuiten-Fabeln* (Freiburg, 1891); Huber, *Der Jesuitenorden* (Berlin, 1873).

MONITEUR, mō'nā'tẽr', LE (Fr., the Monitor). A French journal founded May 5, 1789, by C. J. Panckoucke under the title *Gazette Nationale, ou le Moniteur Universel*. Its great importance as a register of events begins with the crisis of August 10, 1792. Its issues for the years 1789-99 were reprinted in 32 volumes by Gallois, *L'Ancien Moniteur* (Paris, 1840-45). In Nivôse of the year VIII. (1800) the *Moniteur* began to publish officially the *Actes du Gouvernement*. In 1811 it took as its sole title *Moniteur Universel*. From July, 1814, to February, 1815, the official part of the journal was suspended, the Government issuing irregularly a *Journal Officiel*. After this the *Moniteur* was again recognized as the Government organ and so continued until 1868, when the official part was separated from the *Moniteur* and took the title *Journal Officiel*.

MONITOR (Lat. *monitor*, one who warns, from *monere*, to warn; so called because the lizard was supposed to give warning of the presence of the crocodile). A large, semi-aquatic pleurodont lizard of the Old World, of the family Varanidæ, characterized by a long, deeply cleft, smooth tongue. The neck is relatively long and the skin is almost smooth; the tail is very long, often laterally compressed, forming a powerful swimming organ, and the teeth are large and pointed. There are nearly 30 species, all in the single genus Varanus, inhabiting Africa, Southern Asia, and thence to Australia, but absent from Madagascar. Some species reach a length of six or seven feet, and all are rapacious, seizing whatever animals they can master. Although most of them live in or around the water, others occur in dry inland regions or in the woods. The most familiar is the Nile monitor (*Varanus Niloticus*), which inhabits all of Africa except the northwestern part. It is greenish-gray, more or less mottled. This species spends most of its time in the water and is of service in keeping down the crocodiles, for whose eggs it searches, and whose young it captures in the water. A well-known species of the East, found from Northern India to the Philippines, is *Varanus salvator*, called in Ceylon 'Kabara-goya.' It is amphibious, but wanders widely in the forests and climbs trees with great agility. Consult: Gadow, *Amphibia and Reptiles* (London, 1901); Mason and Theobald, *Burma, Its People and Productions* (London, 1882); Tennent, *Natural History of Ceylon* (London, 1861). See Plate of LIZARDS OF THE OLD WORLD.

MONITOR, THE. One of the most famous vessels and the first successful ironclad in the history of the United States Navy. It was built at Greenpoint, L. I., under the direction of John Ericsson (q.v.); was launched on January 30, 1862, and on March 6, 1862, under the command of Lieutenant John L. Worden, started for Hampton Roads, Va., where she arrived on the night of March 8th. During this day the Confederate ironclad vessel, the *Virginia* (commonly known as the *Merrimac*, its name prior to its capture at Norfolk by the Confederates), had destroyed or disabled a large part of the Federal fleet in the harbor. On Sunday, the 9th, the *Monitor* engaged the *Virginia* in an indecisive battle lasting several hours, the *Virginia* finally withdrawing up the Elizabeth River. Neither vessel was very seriously injured, and only a few men were wounded on either side, Lieutenant Worden, however, being seriously injured on the *Monitor*. On May 15, 1862, in company with the *Galena*, the *Naugatuck*, *Port Royal*, and *Aroostook*, the *Monitor* participated in an unsuccessful attempt to capture Richmond, and on December 31, 1862, while en route to Beaufort, N. C., the *Monitor* sank in a windstorm, four officers and seventeen men being drowned. The engagement between the *Monitor* and the *Virginia* (or *Merrimac*) was one of the most important and significant in the naval history of the world, demonstrating as it did the value of armored vessels and the relative uselessness of the old-style wooden warships. Consult Bennett, *The Monitor and the Navy Under Steam* (Boston, 1900); Johnson and Buel (eds.), *Battles and Leaders of the Civil War*, vol. i. (New York, 1887); and Hill, *Twenty-Six Historic Ships* (New York, 1903). For a description of the *Monitor*, see the article SHIPS, ARMORED.

MONITOR BUG. A local name in California for the blood-sucking cone-nose (*Conorhinus sanguisuga*). See CONE-NOSE.

MONITORIAL SYSTEM OF MUTUAL INSTRUCTION. A term applied to a system of school organization and instruction popular during the first half of the nineteenth century in Great Britain, and to a less degree in some Continental countries and in America. It was employed in 1795 by Dr. Andrew Bell, superintendent of the Orphan Asylum at Madras, who made use of the more advanced boys in the school to instruct the younger pupils. In 1797 the idea was introduced into England, and in the following year it was taken up by Joseph Lancaster (q.v.), who improved and popularized the method. Hence the system is often called the Bell or the Lancastrian system of instruction.

The monitorial system was at once effectual and economical. By the employment of clever boys under the direction of the master, both for the purpose of keeping order and for giving instruction, the school might be made self-operative, and several hundred boys taught with the employment of only one adult superintendent. The pedagogical idea upon which the system was based was that the school life of the child is divided into two periods: in the first the child should receive all the aid that the teacher can give him consistent with the development of self-helpfulness; in the second he should be taught to apply what he has acquired to the study of other branches, and to the teaching of others, when he should be thrown as much as possible upon his own resources. The original organization of such schools was: (1) the master, who was the ultimate and absolute authority; (2) the usher, who was a sort of superintendent of management and discipline; (3) the subushers, who had charge of school-room materials; (4) the teachers, who had general oversight of two or three classes or groups; (5) the assistants, who had charge of each group or class; (6) the tutors, who assisted each child in the preparation of his lesson. In general, all these officials under the master were pupils, the pupils of one class becoming in turn the tutors of the one below. Lancaster's improvement upon the general scheme was the division of classes into small groups, and the formulation of detailed methods of instruction in the elementary branches.

Consult: Gill, *Systems of Education* (Boston, 1889); Sharpless, *English Education* (New York, 1892); Meiklejohn, *An Old Educational Reformer* (London, 1881); Lancaster, *Improvements in Education* (London, 1805); Bell, *Elements of Tuition* (London, 1805). See LANCASTER; NATIONAL EDUCATION, SYSTEMS OF.

MONIUSZKO, mô'nyush'kô, STANISLAW (1820-72). A Polish composer, born in Ubiel, Government of Minsk, Russia. He perfected his musical education under Rungenhagen of Berlin, in which city he also taught for a livelihood, but subsequently settled in Vilna. He was a prolific composer. He became director of the Warsaw Opera, and held a faculty position at the Warsaw Conservatory. His works include numerous songs, church music, chamber music, orchestral and instrumental pieces, and fifteen national Polish operas.

MONK. See MONASTICISM.

MONK, or **MONCK**, GEORGE, first Duke of Albemarle (1608-70). An English general, to whom the Stuart Restoration was due. He was born at Potheridge, Devonshire, December 6, 1608. Coming under the ban of the law for thrashing a civil officer who illegally attempted to arrest his father, he volunteered for service in Spain, where he distinguished himself on secret service. In 1629 he entered the Dutch Army, and acquitted himself gallantly at Breda. In 1639, at the outbreak of the Scottish troubles, he was appointed lieutenant-colonel and won additional renown by saving the English guns in the rout at Newburn. In 1642-43 he commanded a regiment against the Irish rebels, gained several victories, and was appointed Governor of Dublin. In the early part of the Civil War he fought as a volunteer for the King, and in the Royalist defeat at Nantwich was taken prisoner by Fairfax. Charged with high treason, he was committed to the Tower, where he remained for two years. He regained his freedom by consenting to serve in Ireland. His conduct commended itself to Cromwell, who made him lieutenant-general and chief of artillery. Parliament appointed him Governor of Carrickfergus and gave him a gratuity of £500. In 1650 Cromwell took him to Scotland, and, on account of his brilliant conduct at Dunbar, left him as commander-in-chief to complete the subjection of that country. In 1653 he became conspicuous in a new capacity as a sea fighter and, associated with Blake and Deane, won two great naval battles over the Dutch Admiral Tromp. He took part in the commission to arrange the union of Scotland and England, and went to the former country as Governor in 1654, with much difficulty maintaining his rule against the Presbyterians. Charles II. tried to secure his support, but Monk sent the letter to Cromwell. After the Protector's death Monk declared in favor of Richard Cromwell and assumed the defense of public order when Lambert's insurrection threatened a military despotism. On January 1, 1660, Monk crossed the border with 6000 men, joined Fairfax at York, and entered London, February 3d, without opposition. His intentions were not known until February 28th, when, owing to the unsettled condition of affairs and knowing of the national wish to bring back the Stuarts, he called together the Presbyterian members expelled from Parliament in 1648, and created a majority for the King. Charles II. was formally declared King on May 8th. He made Monk Duke of Albemarle, Privy Councilor, Chamberlain, and Lord Lieutenant of Devon and Middlesex. In 1665, as Governor of London during the plague, Monk remained at his post when every one else had fled who could. The King then employed him against the Dutch at sea. In June, 1666, De Ruyter with an overwhelming force defeated him in a three days' battle off Dunkirk. In the month following, Albemarle gained a complete and sanguinary victory over De Ruyter off the North Foreland. During the last years of his life Monk lived in a measure retired from political and social life. He died at Newhall, Essex, January 3, 1670.

Consult: *Calendar of Domestic State Papers, 1649-60* (London, 1875-86); *Thurloe State Papers* (London, 1742); Firth, *Scotland and the Commonwealth, 1751-53* (Edinburgh, 1895); id., *Scotland and the Protectorate, 1654-59* (ib., 1899); *Clarendon State Papers* (Oxford, 1786); Clarendon, *History of the Rebellion* (ib., 1888); id., *Life* (ib., 1827); Pepys, *Diary* (London, 1893-96); Gumble, *Life of General Monck* (ib., 1671), is of special importance since the author was chaplain to Monk in 1659-60, and had special opportunities for obtaining information; Guizot, *Monck, or the Fall of the Republic and the Restoration of the Monarchy*, trans. by Scoble (London, 1851); Gardiner, *History of England 1603-42* (New York, 1883-84); id., *History of the Great Civil War* (ib., 1897).

MONK, MARIA (c.1817-50). A Canadian impostor. In 1835 she claimed to have escaped from the nunnery of the Hôtel Dieu in Montreal, and told of many revolting practices alleged to have been carried on within the walls. She came to New York, and so impressed many people of standing that they continued to believe her after she was proved to be of bad character, and her story to be a clumsy invention. Her tale was printed in *Awful Disclosures by Maria Monk* (1836) and *Further Disclosures* (1836). More than 200,000 copies were sold, and a violent anti-Catholic agitation resulted. William L. Stone, of the New York *Commercial Advertiser*, visited Montreal and exposed her in *Maria Monk and the Nunnery of the Hotel Dieu* (1836). For this he was abused by the 'Know Nothings,' who made much capital of the story.

MONK BAT. A 'bulldog' or 'mastiff' bat (q.v.).

MONK-BIRD. The friar-bird (q.v.).

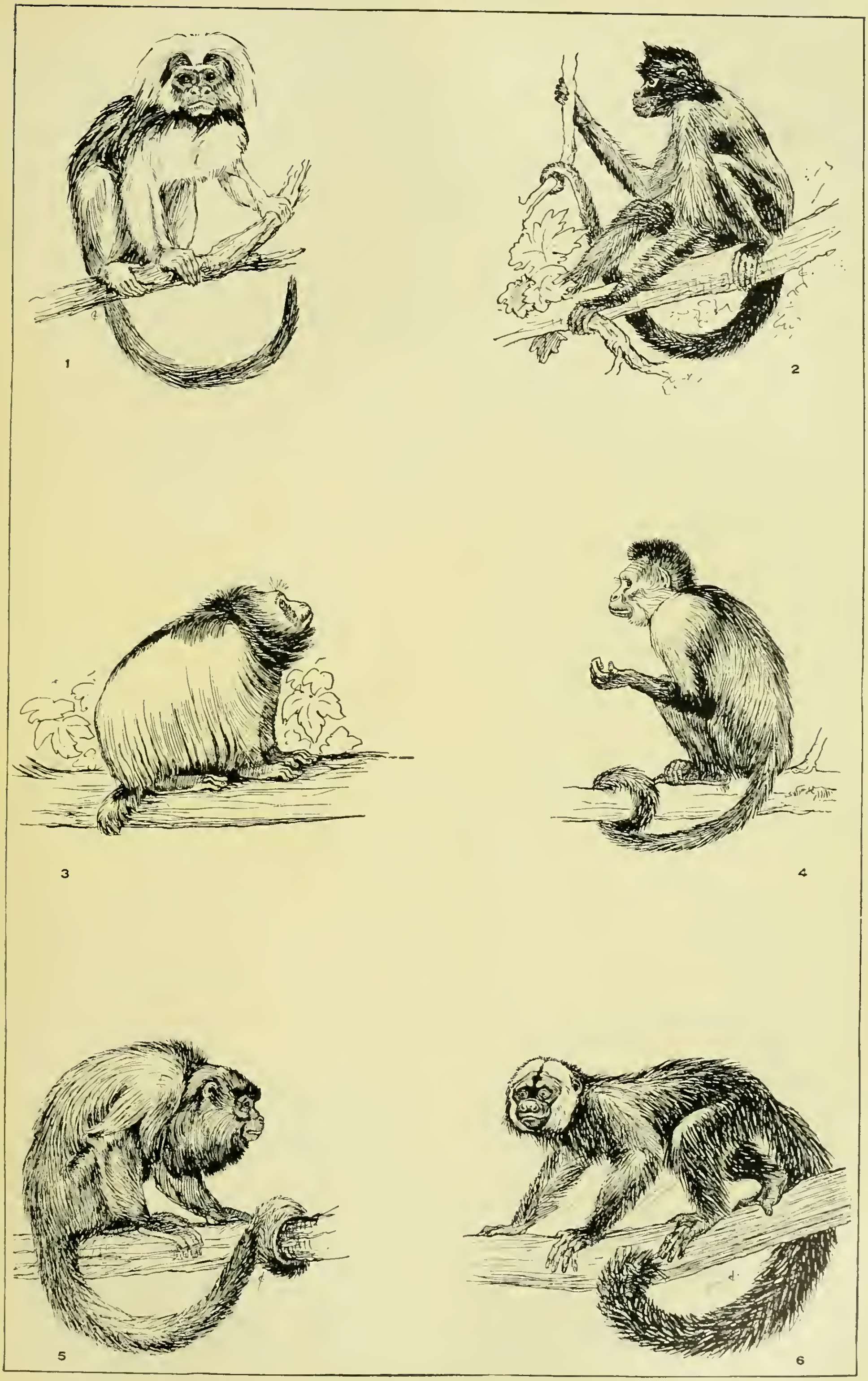
MONKEY (with double diminutive ending *k-ey*, from OF. *monne*, from It. *monna*, OIt. *mona*, she-monkey, old woman, contraction of *madonna*, lady, from *mia donna*, my lady, from *mia*, from Lat. *meus*, mine, and *donna*, from Lat. *domina*, lady; apparently so called from the resemblance of a monkey's face to that of an old crone). A popular name for a large number of mammals of the order Primates. In the broadest sense, a monkey is any primate except a man or a lemur. Many of these, however, are better known under more particular names, as the marmosets, apes, gibbons, etc., and it will be proper here to consider 'monkey' as including only the members of the two families Cebidæ and Cercopithecidæ, further excepting baboons and macaques (qq.v.), which have short tails, limbs nearly equal and not specially adapted to an arboreal life, and the muzzle projecting so that the face is more or less dog-like. We may, therefore, regard the monkeys in a strict sense as including all of the Cebidæ, and of the Cercopithecidæ all except Cynocephalus and Macacus, and their nearest allies.

New World Monkeys. The Cebidæ are exclusively American and include not less than 10 genera and about 50 species. They are readily distinguished from the monkeys of the Old World by the presence of 36 teeth, the absence of a bony external auditory meatus, the absence of ischiatic callosities, and the presence of a broad internarial septum. On account of the latter characteristic, they were at one time grouped as a suborder, the Platyrrhini, while the Old World monkeys, since they have a narrow septum, were called Catarrhini, but these terms have now largely passed out of use. The principal kinds of American monkeys are the howlers, sakis, uakaris, teetees, squirrel-monkeys, spider-monkeys, barrigudos, and sapajous. The howlers (genus Mycetes) are remarkable for the extraordinary cries which they are capable of emitting owing to the enormous enlargement of the hollow hyoid bone and vocal apparatus. The face is supplied with a long beard, the tail is long and very prehensile, and the color is very variable, though usually dark. In intelligence, the howlers are ranked among the lowest of the American monkeys, although in size among the largest. The sakis are long-tailed monkeys of the genus Pithecia, having a well-developed thumb and the lower incisors inclined forward; they also have the rami of the mandible expanded, though not so much so as in the howlers. A number of species are known, all South American, but varying greatly in the character of the hairy coat, the beard, and the bushiness of the tail; all are arboreal, have powerful voices, and make interesting pets, some species showing great attachment to their masters. The uakaris differ from all the other American monkeys in having a short baboon-like tail, in spite of which they are exclusively arboreal. They are limited in their range, and die soon after being sent away from their own home. There are three species, of the genus Uacaria. The teetees (Callithrix) are small Brazilian monkeys with vertical lower incisors and a long non-prehensile tail, distinguished from the squirrel-monkeys (Chrysothrix) by the small canine teeth and the bushy tail. Four species of squirrel-monkeys are known from Northern South America; they have very large eyes and disproportionately long hind limbs and tail. The spider-monkeys, comprising the genera Ateles and Eriodes, are the most celebrated of the Cebidæ. Ateles, of which a dozen or more species are known, lacks a thumb, the coat is not woolly, while Eriodes, with only three species, has a rudimentary thumb, and a woolly coat. All these monkeys have the form slender, the limbs very long, and the tail extremely prehensile and naked beneath at the tip. Although so perfectly adapted to an arboreal life, they are not specially active, and the power of grasping by the hand is very imperfect, owing to the lack of a thumb. They range from Southern Mexico and Central America southward to Southeastern Brazil. The barrigudos (Lagothrix) are similar to the spider-monkeys, but have a thumb and are much heavier. They rank with the howlers as the largest American monkeys. The sapajous are somewhat smaller and stouter than the spider-monkeys and are the favorite species in captivity, which they bear very well. They have a thumb, and the under surface of the tail is hairy; at least 20 species have been described, all of the genus Cebus.

These monkeys are all active animals, chiefly diurnal, though a few of the smaller forms are nocturnal. They live almost wholly in trees and feed upon fruits and insects chiefly, though eggs, young birds, and even some reptiles may vary the diet. They are themselves constantly hunted by the Indians, who use them for food, and also use or sell the skins. The flesh of monkeys is said to be good eating, and some travelers speak in the highest terms of the meat of some of the spider-monkeys. The Cebidæ are not only inferior to the Old World monkeys in size, but in intelligence do not compare with them. The sapajous are perhaps the most intelligent of the American species, and in captivity make very interesting pets. Most of the monkeys seen in the United States with organ-grinders are of this kind. The South American Indians shoot them with arrows, the tips of which are slightly poisoned with curare, and when the animal thus wounded has been captured, it is fed with salt, which is an antidote to the poison. The habits of monkeys are so well known that the verb 'to monkey' has passed into current use as an unmistakable expression for meddlesome activity.

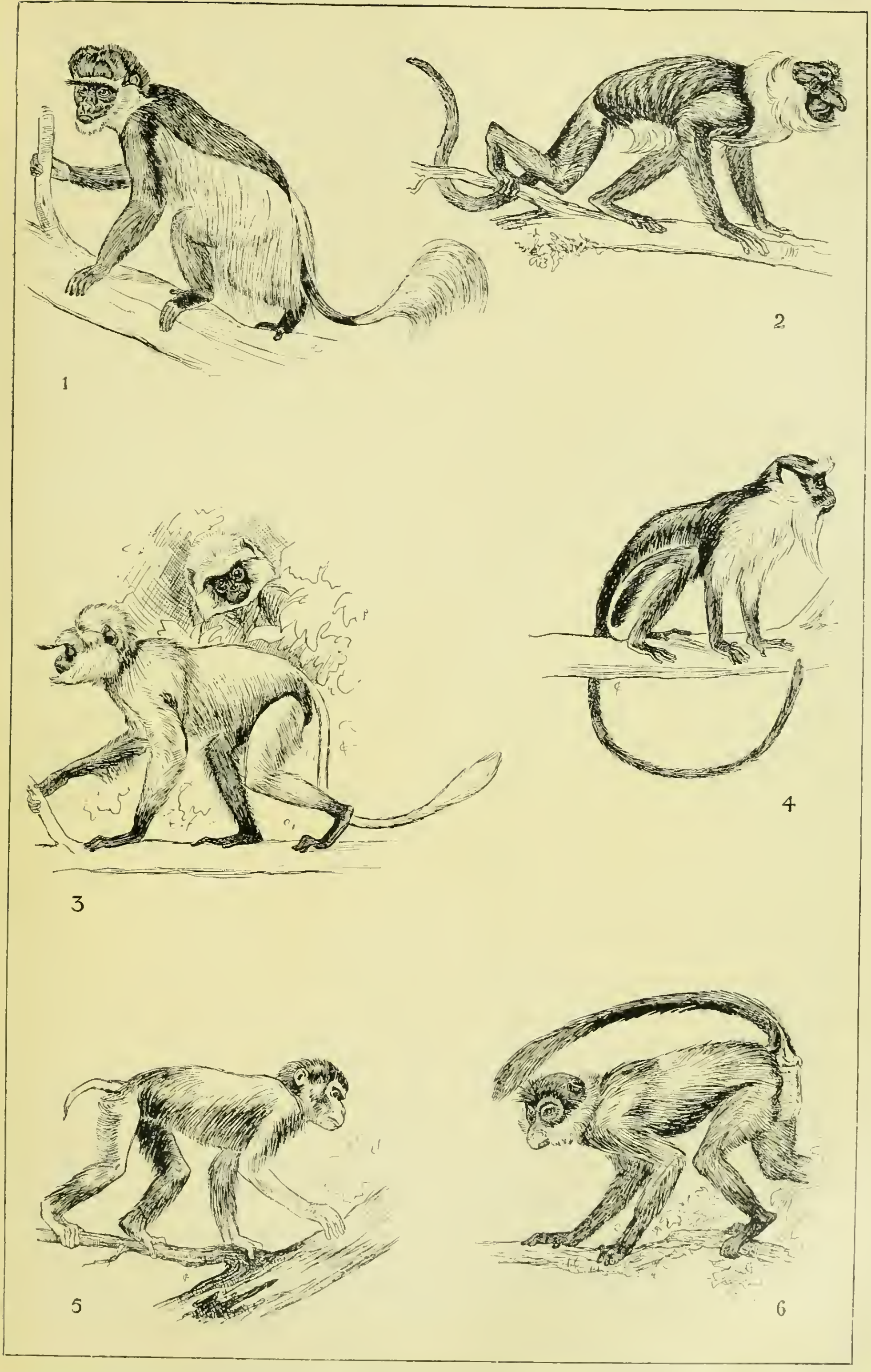
Old World Monkeys. Turning now to the Old World monkeys, which have 32 teeth, an external, bony auditory meatus, ischiatic callosities, and a narrow internarial septum, and leaving out of account the baboons and macaques, we face an assemblage of five genera and something like 45 species. Three of the genera are confined to Africa and two to Asia. Cercocebus is an African genus of four species, with teeth like a macaque, but with a long tail. Cercopithecus is a large African genus of rather slender, long-tailed

AMERICAN MONKEYS



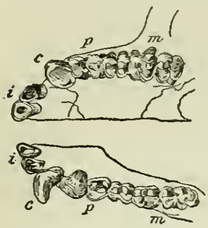
1. PINCHE MARMOSET (Midas Œdipus).
2. BLACK SPIDER MONKEY (Ateles paniscus).
3. BALD UAKARI (Uacaria calva).
4 WEEPER SAPAJOU (Cebus capucinus).
5. BLACK HOWLER (Mycetes caraya).
6. WHITE-HEADED SAKI (Pithecia leucocephala).

MONKEYS OF THE OLD WORLD



1. GUERZA (Colobus guerza).
2. PROBOSCIS MONKEY (Nasalis larvatus).
3. HANUMAN or SACRED MONKEY (Semnopithecus entellus).
4. DIANA MONKEY (Cercopithecus Diana).
5. PIG-TAILED MONKEY (Macacus nemestrinus).
6. SOOTY MANGABEY (Cercocebus fuliginosus).

monkeys, including some of the best known species. The thumb is of large size, both hands and feet are adapted for running as well as climbing, and the stomach is simple and not sacculated. They live in troops and make pillaging expeditions into cultivated grounds under the leadership of an old male. Of the various species of this genus which are in the market as pets, the mangabeys (q.v.) are favorites; they are usually blackish, with more or less white. The best known of African monkeys is the common green monkey (*Cercopithecus callitrichus*), which is of medium size and olive green in color. It is widely distributed in Africa, and over 200 years ago was introduced into Saint Kitts, Grenada, and some others of the Lesser Antilles, where it has been quite destructive to crops. In identifying the various less known species of Cercopithecus, one of the most important points is the color of the nose. Nasalis is a notable genus containing a single species, the proboscis monkey (q.v.) of Borneo, in which the nose is greatly prolonged into a real proboscis. This species bears captivity poorly and few living specimens have been seen in Europe or America. Semnopithecus includes a dozen or more Asiatic species, such as the well-known hanuman and the langurs (qq.v.). The last genus, Colobus (see Guereza; King Monkey), includes about a dozen African monkeys with the thumb rudimentary or wanting. Many of them are handsomely decorated with long, silky hair, and the pelts have considerable commercial value, being used for the manufacture of women's boas, muffs, etc. The Old World monkeys do not differ essentially from the Cebidæ, but they are not so exclusively arboreal and the tail is not prehensile. In many species cheek pouches are present, in which food may be stored, and such forms have the stomach simple, but in those forms where there are no cheek pouches the stomach is sacculated in an extraordinary manner. The latter monkeys are exclusively herbivorous and live largely on shoots and leaves. Monkeys breed usually but once a year and produce only one or two young ones at a birth.



DENTITION OF A MONKEY.
Upper and lower series of teeth, left side, of the green monkey: *i*, incisors; *c*, canines; *p*, premolars; *m*, molars. (Cf. Langur.)

The fossil remains of monkeys have been found in the Pleistocene deposits of Brazil, and as far back as the Middle Miocene of Europe.

Bibliography. Consult standard natural histories, especially the books of Jerdon, Blanford, Blyth, and Wallace on India and the East; and of Azara, Humboldt, Bates, Wallace, Tschudi, Waterton, Belt, Gosse, and Alston, on South and Central America. The latest general popular account is Forbes, "A Handbook to the Primates," in Allen's *Natural History* (London, 1897).

MONKEY BREAD. A tropical tree and its edible fruit. See Adansonia.

MONKEY-POT TREE. See Brazil Nut.

MONKFISH. (1) The angel-fish (*Squatina vulgaris*), a cartilaginous fish of nearly cosmopolitan distribution, which has characteristics of both the sharks and the rays. It grows to a length of five feet. Fossil monkfish are found from Upper Jurassic through Cretaceous and Tertiary rocks. (2) The angler (q.v.).

MONK'HOUSE, William Cosmo (1840-1901). An English art critic and poet, born in London, March 18, 1840. He was educated at Saint Paul's School. In 1857 he became a clerk in the Board of Trade, and in 1893 Assistant Secretary of Finance. His verse comprises: *A Dream of Idleness and Other Poems* (1865); *Corn and Poppies* (1890), containing many beautiful lyrics; and *The Christ Upon the Hill* (1895). Among his publications on art are: *The Italian Pre-Raphaelites* (1887); *The Earlier English Water-Colour Painters* (1890); *In the National Gallery* (1895); *British Contemporary Artists* (1899). He also wrote *Lives* of Turner (1879) and Leigh Hunt (1893), and contributed many articles to the *Dictionary of National Biography.*

MONK SEAL. The West Indian seal (Monachus). See Seal.

MONKSHOOD. See Aconite.

MONK'S TALE, The. One of Chaucer's *Canterbury Tales,* a miniature reproduction of Boccaccio's *Falls of Illustrious Men.*

MONLUC, or **MONTLUC,** mōɴ'lụk', Blaise de (1502-77). A French warrior and historian and autobiographer, born in Armagnac, near Condon, now in the Department of Gers. Fifty years he was abroad, always doing something, and he remembered what he had done. He shared in the campaigns of Francis I., and got leave from him for the Duke d'Enghien to start the fight at Cérisoles (1544). Under Henry II., in 1555, he held off the Emperor's troops at Siena. He fought the Huguenots in Guienne. A slash in the face caused him to withdraw for two years (1570-72), and in this forced repose he wrote his *Commentaires.* He detested letters, but the example of Cæsar set him to writing of what he had done and seen. Monluc wrote admirably, with the fire of a glory-loving Gascon. He was not in the least a philosopher, though he meant his *Commentaires* to be useful to posterity. Without understanding the movements of his time, he saw distinctly what went on about him. Monluc gives an extraordinarily vivid series of pictures of his adventures in France and Italy. His *Commentaires* are highly valuable to the historians, and their style makes them delightful reading to those who are simply looking for a man. Monluc died in Estilla, near Agen. Consult the *Commentaires et Lettres de Blaise de Monluc,* ed. by Ruble (Paris, 1864-72); also Normand, *Les mémorialistes, Monluc* (ib., 1892).

MONMOUTH, mŏn'mŭth. A municipal borough and market-town, the capital of Monmouthshire, England, situated amid beautiful scenery, at the confluence of the Monnow and the Wye, 17 miles south of Hereford (Map: England, D 5). Its church, dating from the fourteenth century, is surmounted by a lofty spire. Of its castle, the favorite residence of John of Gaunt, and the birthplace of Henry V., the ruins only remain. A building said to be the study of Geoffrey of Monmouth is all that exists of the Benedictine monastery. Population, in 1901, 5100.

MONMOUTH. A city and the county-seat of Warren County, Ill., 28 miles east by north of Burlington, Iowa; on the Iowa Central and the

Chicago, Burlington and Quincy railroads (Map: Illinois, B 3). It is the seat of Monmouth College (United Presbyterian), founded in 1856; and the Warren County Library is here. The city has farming, coal-mining, horse-breeding, and commercial interests, controlling a large trade in grain, produce, live stock, and in the principal manufactured products, which include agricultural implements, sewer pipe, pottery, stoneware, soap, stump-pullers, boxes, and cigars. Settled in 1836, Monmouth was incorporated first in 1852. The government, under a charter of 1874, is vested in a mayor, elected biennially, and a unicameral council. The city owns and operates the water-works. Population, in 1890, 5936; in 1900, 7450.

MONMOUTH, Battle of. A battle fought June 28, 1778, during the American Revolution, near Monmouth Court House, in the town of Freehold, Monmouth County, N. J., between an American army under General Washington and an English army under Sir Henry Clinton. The latter, evacuating Philadelphia on June 18th, retreated across New Jersey, and on the 26th reached Freehold, whence on the 27th he started for Sandy Hook. Washington, following closely, resolved to attack Clinton's left wing, 8000 strong, marching in the rear, and detailed Gen. Charles Lee with 6000 troops to assail its flank until he could come up with the main division. Lee advanced accordingly, but instead of attacking, intentionally wasted time in feinting and executing futile manœuvres, and after a little skirmishing, ordered a general retreat. Washington rapidly pushed forward, rebuked Lee with great severity, and rallying the demoralized troops, checked the advance of the British, who made determined but unsuccessful attacks on the American left under Stirling and the American right under Wayne and Greene. The English then fell back and took up a strong position, but, during the night, withdrew to the heights of Middletown. Though usually claimed as a victory for the Americans, the battle was strategically drawn, neither side gaining any decisive advantage. The Americans lost 362 in killed, wounded, and missing, the British 416, many on each side being prostrated by the intense heat (96° in the shade). Lee was shortly afterwards tried by court-martial for his conduct, was found guilty of disobeying orders and of making a shameful retreat, and was suspended from command for a year. Consult: Dawson, *Battles of the United States* (New York, 1856) : and Carrington, *Battles of the American Revolution* (New York, 1876).

MONMOUTH, James, Duke of (1649-85). A natural son of Charles II. of England by Lucy Walters or Walter. Charles committed the boy to the care of Lord Crofts, who gave him his own name. On the Restoration, Monmouth, then Mr. James Crofts, came to England with the Queen Dowager and was lodged at the royal palaces of Hampton Court and Whitehall. He was married in 1663 to Anne, daughter of the Earl of Buccleuch, and was created Duke of Monmouth, assuming as family name his wife's name of Scott. At the period of Titus Oates's plot (1678), rumors that the 'Protestant Duke' was the King's legitimate son spread far and wide: but the King declared solemnly before the Privy Council that he had never married Lucy Walters. Monmouth was sent into Scotland in 1679, to quell the rebellion of the radical Presbyterians. (See Covenants, The.) He defeated the Covenanters at Bothwell Bridge; but his humanity to the fleeing and wounded was so conspicuous and his recommendations to pardon the prisoners were so urgent as to bring upon him the violent censure of the King and Lauderdale. He thus became the idol of the English Nonconformists. The return of the Duke of York and the exile of Monmouth soon followed. In Holland he allied himself to the leaders of the Nonconformist party, exiled like himself, and when he returned to London he was received with such demonstrations of joy as to convince him that he was the people's choice as successor to his father. In 1680 he made a quasi-royal progress through the west of England with the design probably of courting the Nonconformists, and two years afterwards he traversed some of the northern counties. The King and his brother were alarmed, and Monmouth was placed for a short time under arrest. In 1684 Monmouth went to the Netherlands and remained abroad until the death of Charles, whereupon he returned to England. Landing in 1685, he assumed the title of James II. and headed a rebellion against the Government. News of the defeat of Argyle, who at the head of the Scottish exiles had attempted an insurrection in Scotland, made Monmouth despondent. Nevertheless on July 6th he attacked a superior royal force which, under the command of the Earl of Feversham, was encamped at Sedgemoor, near Bridgewater. When his ammunition failed the Duke fled and his troops were massacred. Monmouth was found concealed in a ditch, and was brought to London. Gaining an interview with the King, he made the most humiliating submission, but in vain, even the shortest respite being refused. On July 15, 1685, he was beheaded on Tower Hill. In the 'Bloody Assize,' under Judge Jeffreys (q.v.), Monmouth's adherents paid a fearful penalty for their participation in his rash rebellion. Consult: Roberts, *Life, Progress, and Rebellion of James, Duke of Monmouth* (London, 1844) ; Collins, *Peerage of England*, vol. iii. (5th ed., ib., 1779) : Fergusson, *Robert Fergusson, the Plotter, or the Secret of the Rye-House Conspiracy and the Story of a Strange Career* (Edinburgh, 1887) ; Grey, *Secret History of the Rye-House Plot, and of Monmouth's Rebellion in 1685* (London, 1754) : Hyde, *Correspondence of Henry of Clarendon and James, Earl of Abingdon, Chiefly Relating to the Monmouth Insurrection, 1683-85* (Oxford, 1896) ; Macaulay, *History of England* (New York, 1858) ; and various other histories of England. See Charles II.; James II.

MONMOUTH COLLEGE. A coeducational institution, opened in 1856 at Monmouth, Ill., under the control of the United Presbyterian Church. The college courses are arranged in nine groups, all leading to the degree of B.A. There are preparatory and graduate departments and schools of music and art, with a total registration, in 1902, of 359. The library contained about 6000 volumes. The faculty numbered 18. The campus occupies ten acres, and with the buildings is valued at about $100,000, the whole value of the college property being $120,000. The endowment is $200,000 and the income $25,273.

MONMOUTHSHIRE. A maritime county in the west of England, bounded south by the estuary of the Severn, northeast by Herefordshire, and east by Gloucestershire (Map: England, D 5). It has a coast line of 22 miles. Area, 535 square miles. The surface is elevated in the north and northwest, in the Sugarloaf attaining a maximum altitude of 1856 feet. The coast districts are low and fertile, and in the valleys of the Usk and Wye wheat, barley, and oats are grown. The county is celebrated for its mineral wealth, and abounds in collieries and iron-works. The scenery is unusually varied and beautiful, and its picturesqueness is enhanced by numerous Roman antiquities, and the feudal remains of Raglan, Caldecot and Chepstow castles, and Llanthony and Tintern abbeys. Until the reign of Henry VIII., Monmouth was part of South Wales, and the Welsh language is still spoken in some districts. Chief towns, Newport, Abertillery, Blaenavon, Pontypool. Capital, Monmouth. Population, in 1891, 252,400; in 1901, 292,300.

MONNIER, mô'nyâ', Henri Bonaventure (1805-77). A French caricaturist and author, born June 6, 1805, in Paris. He first won attention by pen-sketches and lithographic illustrations of Béranger (1828), which revealed his power of catching typical traits. Thus he was led to write and illustrate such comic yet faithful records of Paris street life as *Scènes populaires* (1830), or the *Mémoires de M. Joseph Prudhomme* (1857). In 1831 he became an actor, excelling in plays of his own writing, but he soon abandoned the stage. Many of his later pictured stories have been adapted for dramatic presentation, e.g. *Un voyage en Hollande*, *Les bourgeois de Paris*, and *Le bonheur de vivre aux champs*. He died in Paris, January 3, 1877. Consult: Champfleury, *Henri Monnier, sa vie, son œuvre* (Paris, 1889); and Beraldi, *Les graveurs du XIXème siècle*, vol. x. (ib., 1890).

MONNIER, Jean Marie Albert Marcel (1853—). A French explorer and author, born in Paris, and educated at the Condorcet Lyceum. In 1886-87 he explored the Andes and the Amazon. In 1891-92 he went with Captain Binger's African expedition to the Ivory Coast, and in 1894, as correspondent of the *Temps*, he began a journey across the least traveled parts of Asia, which lasted three years. Among his writings are: *Un printemps sur le Pacifique* (1885); *Des Andes au Pará* (1890); *La France noire* (1894); and *Tour d'Asie* (1899).

MONNIER, Marc (1827-85). A French writer, known mostly for his studies of Italy. He was born in Florence and passed the greater part of his life in Geneva, where he was professor at the university. His works include an *Etude historique de la conquête de la Sicile par les Sarrasins* (1847); *Histoire du brigandage dans l'Italie méridionale* (1862); *La Camorra, mystères de Naples* (1863); *Pompéi et les Pompéiens* (1864); *Contes populaires en Italie* (1880); *Un aventurier du siècle dernier, Le Comte Joseph Gorani* (1884); *Histoire de la littérature moderne: La renaissance de Dante à Luther* (1884), followed by *La réforme de Luther à Shakespeare* (1885); also *Les amours permises* (1861); *Lucioles*, in verse (1853); *La vie de Jésus*, in verse (1873); and *Le charmeur* (1882).

MONNOYER, mô'nwä'yâ', Jean Baptiste (1634-99). A French still-life painter, born at Lille. After study in Antwerp, he worked at Lille, and later went to London, where he was employed by Lord Montagu, Queen Mary, and Queen Anne to decorate their palaces. There are eight pieces by him in the Louvre. He belongs to the Flemish school, and although he does not equal the masters of still-life painting, he was an agreeable colorist, and his arrangements are interesting.

MONOC'ACY, Battle of. A battle fought at Monocacy Junction, Md., about five miles from Frederick, on July 9, 1864, during the Civil War, between about 6000 Federals under General Lew Wallace and about 20,000 Confederates under General Early. The Federal force was defeated, but succeeded in delaying Early's march upon Washington, and thus rendered a valuable service. General Grant, in his *Memoirs*, says: "General Wallace contributed on this occasion, by the defeat of the troops under him, a greater benefit to the cause than often falls to the lot of a commander of an equal force to render by means of a victory."

MONOCHORD (Lat. *monochordos*, *monochordon*, from Gk. *μονόχορδον*, monochord, neu. sg. of *μονόχορδος*, *monochordos*, having a single chord, from *μόνος*, *monos*, single + *χορδή*, *chordē*, string). A very ancient musical instrument used to determine the mathematical proportions of intervals. It consists of a single string stretched over a sounding-board. Any division of this string is obtained by means of a movable bridge sliding on a graduated scale. In this manner every interval can be produced with absolute acoustic purity. During the Middle Ages the monochord was used to illustrate intervals sounding simultaneously, and for this purpose several strings, each with a separate bridge, were added. In this form it became the precursor of the *clavichord* (q.v.). See Harmonics and Plate of Musical Instruments.

MONOCHROME (ML. *monochroma*, from Gk. *μονόχρωμος*, *monochrōmos*, having a single color, from *μόνος*, *monos*, single + *χρῶμα*, *chrōma*, color). A painting done in the various shades of a single color.

MONOCLINE (from Gk. *μόνος*, *monos*, single + *κλίνειν*, *klinein*, to incline). A geological term applied to an abrupt inclination of strata connecting the same beds lying at different levels. A monocline may be regarded as a modified form of the anticline (q.v.). Folds of this character are developed on a grand scale in the Rocky Mountain region.

MON'OCOT'YLE'DONS (from Gk. *μόνος*, *monos*, single + *κοτυληδών*, *kotylēdōn*, cup-shaped cavity, from *κοτύλη*, *kotylē*, socket). One of the two great divisions of angiosperms (q.v.). The name means 'one cotyledon,' and suggests one of the distinguishing features of the group, namely that the embryo developed within the seed has but one cotyledon or seed-leaf; while in the other group (dicotyledons) it has two. The fact that the embryo has only a single cotyledon is not so significant as its position. At one end of the axis of the embryo the root tip is organized, while at the other end the cotyledon is developed, the stem tip coming out on the side of the axis. In dicotyledons the tips of the roots and those of the stems occupy the ends of the axis, and the cotyledons come out on the side. The most easily recognized characters of the monocotyledons, however, are as follows: Woody strands scattered in the stem, as in a corn stalk, and not forming a definite cylinder, parallel-veined leaves (not reticulately veined), and parts of the flowers in threes (never in fives or fours). None of these characters is without exception, but their combination usually indicates a monocotyledon, the final test being the character of the embryo. Formerly the members of the group were called 'endogens,' but the name has been abandoned in this connection and is applied in a totally different way. The whole assemblage of monocotyledons numbers about 20.000 living species. and among them are some of the most conspicuous and useful of plants. As illustrations the following prominent groups may be mentioned: Pond weeds, grasses, palms, lilies, and orchids.

MONOD, mō'nō', ADOLPHE (1802-56). A French Protestant minister. He was born at Copenhagen, his father having been a Reformed clergyman from Geneva. He studied in Paris and Geneva. and was pastor of a small Protestant congregation at Naples (1825-27). In 1828 he became pastor at Lyons, where he remained till 1831 and founded the Free Evangelical Church. In 1836 he was appointed professor of theology at Montauban, and held this position for eleven years. During this time he traveled in Southern France, preaching and instructing the people who were attracted by the power of his discourses. In 1847 he became pastor at Paris, where he drew large crowds by his eloquent preaching. His literary works were chiefly sermons (4th ed., Paris, 1866), and *A. Monod's Farewell to His Friends and to the Church* (Eng. trans., London, 1857). Consult S. M. (a daughter), *Life and Letters of A. Monod* (London, 1885).

MONOD, FRÉDÉRIC (1794-1863). A French Protestant, brother of Adolphe Monod. He was born in Monnaz. Canton of Vaud, Switzerland; educated at Geneva; entered the ministry in 1820, and the same year succeeded his father as pastor of the National Protestant Church of France in Paris. He established in 1824 the *Archives du Christianisme*, the chief organ of the Evangelical French Protestants, and continued its editor until his death. After officiating twelve years as pastor of the oratoire, he united with Count Gasparin and others in an attempt to restore a rule of faith in the Reformed Church which would exclude rationalists, by making an acknowledgment of the divinity of Christ essential to membership. Failing in this, they left the National Protestant Church in 1849 and organized independent congregations which resulted in the formation of the Free Evangelical Church of France. During the Civil War in America Monod warmly espoused the cause of the National Government.

MONOD, GABRIEL (1844—). A French historian, born at Havre. He studied at the Ecole Normale, and in Italy and Germany, and in 1869 began to teach at the Ecole des Hautes Etudes, of which he became director. Monod was editor of the *Revue Critique* and founded with Fagniez the *Revue Historique* (1876). His published works include: *Allemands et Français* (1871); *Etudes critiques sur les sources de l'histoire mérovingienne* (1872-85); a like volume on the Carolingian period (1895); *Jules Michelet* (1875); *Bibliographie de l'histoire de France* (1888); and *Les maîtres de l'histoire, Renan, Taine, Michelet* (1894).

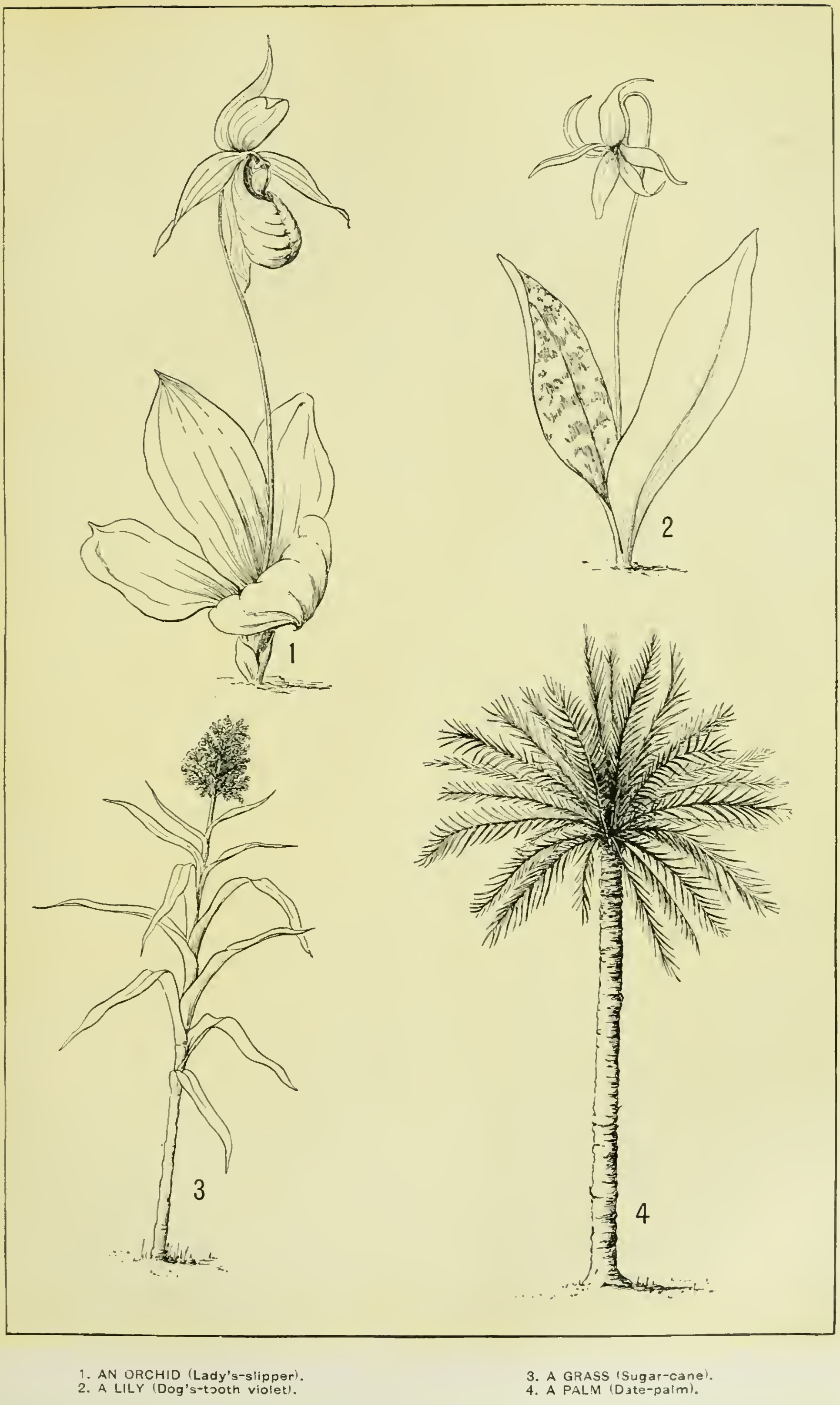
MON'ODEL'PHIA (Neo-Lat., from Gk. *μόνος*, *monos*, single + *δελφύς*, *delphys*, womb). The largest and highest of the subclasses of mammals, equivalent to Eutheria (q.v.). This term, now passing into disuse, refers to the fact that the vagina and uterus in the female are always single. Compare ORNITHODELPHIA; DIDELPHIA.

MONODY (Lat. *monodia*, from Gk. *μονῳδία*, solo, lament, from *μόνος*, *monos*, single + *ᾠδή*, *ōdē*, song, ode, from *ἄδειν*, *adein*, to sing). An elegy in which the mourner is supposed to lament alone. Among the finest English examples of the monody are Milton's *Lycidas*, Tennyson's *In Memoriam*, and Matthew Arnold's *Scholar-Gipsy* and *Thyrsis*.

MONODY. A style of music which first was cultivated in Italy about 1600. Up to that time serious composers had always used polyphony (q.v.). The Renaissance awakened a deep interest in the works of the ancient Greek dramatists, and in Florence a number of learned musicians and literary men attempted to reconstruct the music of those plays. It was felt that the polyphonic style, employing a number of voices, was not suited to accompany the words of a drama, where distinct enunciation of every word was the prime consideration. Attempts were made to write for a solo voice with instrumental accompaniment. For this purpose famous madrigals (see MADRIGAL) were arranged so that one part was assigned to the voice, while the others were played on some instrument. The inadequacy of this soon made itself felt, and composers began to write original compositions for a solo voice. This new style, employing only one voice, was called *monody*, as against polyphony, a style with many voices. The instrumental part of the earliest of these compositions is exceedingly primitive, consisting of scarcely more than a figured bass (q.v.). But with the establishment of the opera the progress of monody was very rapid. Monody must not be confounded with *homophony* (q.v.), which is a later development, and which does not exclude elaborate contrapuntal work in the accompanying parts.

MONŒ'CISM (from Gk. *μόνος*, *monos*, single + *οἶκος*, *oikos*, house). The word means primarily the condition of a 'single household' in plants, which means that the male and the female organs occur upon the same individual. In its original application, however, it referred to the fact that in many seed plants the stamens and pistils occur upon the same individual, but this application arose from the mistaken idea that stamens and pistils are sex organs. The contrasting term is diœcism, referring to the condition in plants in which the male and female organs occur upon different individuals. The application of the term to a non-sexual condition in the flowering plants is unfortunate, for it means that monœcism in mosses and ferns refers to one fact and in flowering plants to quite a different one. Among the mosses the monœcious habit is very usual, the same sexual plant (gametophyte) bearing both sex organs (antheridium and archegonium). Among the true ferns monœcism is almost universal, the characteristic

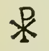
TYPES OF MONOCOTYLEDONS



1. AN ORCHID (Lady's-slipper).
2. A LILY (Dog's-tooth violet).
3. A GRASS (Sugar-cane).
4. A PALM (Date-palm).

small gametophyte (prothallium) bearing both antheridium and archegonium. With the introduction of heterospory (q.v.), however, the sexual plants are absolutely differentiated, one individual being male and another female. Since all the flowering plants are heterosporous, it follows that they are essentially not monœcious in the sense of the term as used among mosses and ferns. In the application of the term to stamens and pistils, however, rather than to sex organs, the majority of flowering plants are found to be 'monœcious'; that is, with the stamens and pistils not only upon the same plant, but in the same flower.

MONOGRAM (Lat. *monogramma*, from Gk. μονογράμματος, *monogrammatos*, consisting of a single letter, from Gk. μόνος, *monos*, single + γραμμα, *gramma*, letter, from γραφειν, *graphein*, to write). A character composed of two or more letters of the alphabet, often interlaced with other lines, and used as a cipher or abbreviation of a name. A perfect monogram is one in which all the letters of the word are to be traced. The use of monograms began at a very early date. They are found on Greek coins, medals, and seals, and are particularly numerous on the coins of Macedonia and Sicily. Both on coins and in MSS. it was the practice to present the names of States and cities by monograms, of which above 500 are known, but some have not been deciphered. Monograms occur on the family coins of Rome, but not on the coins of the earlier Roman emperors. Constantine placed on his coins one of the earliest of Christian monograms which is to be traced in the recesses of the catacombs, composed of the first and second letters of XPιστος (Christus), a monogram which also appeared on the Labarum (q.v.), and was continued on the coins of the succeeding emperors of the East down to Alexander Comnenus and Theodorus Lascaris. We often find it combined with the first and last letters of the Greek alphabet (Rev. i. 8). Another well-known monogram is that of the name of Jesus, IHS, from the first three letters of IHΣοῦς, though sometimes explained as standing for the three Latin words *Iesus Hominum Salvator* (Jesus, Saviour of Men).



Popes, emperors, and kings of France during the Middle Ages were in the practice of using a monogram instead of signing their names. Almost all the coins of the French kings of the Carlovingian race bear their respective monograms, as also do those of Alfred and some of the other Saxon kings of England.

Painters and engravers in Germany and Italy have used monograms to a large extent as a means of distinguishing their works. In these, the initial letters of their names were often interwoven with figures of a symbolical character, so as to form a rebus on the artist's name. The first typographers distinguished their publications by wood-cut vignettes, whose invention is ascribed to the elder Aldus; but besides these, each made use of a monogram or cipher, a series of which, well known to the bibliographer, fixes the identity of the ancient editions, German, Italian, and English, from the invention of printing down to the middle or end of the sixteenth century. For a detailed account of the monograms of early printers and others, consult: Brulliot, *Dictionnaire des monogrammes* (Munich, 1832-34); Horne, *Introduction to Bibliography*, vol. ii. (London, 1814); Herbert and Ames, *Typographical Antiquities* (ib., 1749); Leutsch, *Universal Monogram-Work* (Gera, 1893); Schiller, *Monogramme* (Ravensburg, 1897 et seq.).

MON'OGRAP'TUS (Neo-Lat., from Gk. μόνος, *monos*, single + γραπτός, *graptos*, marked with letters, from γράφειν, *graphein*, to write). A genus of extinct graptolites found in and characteristic of rocks of Silurian age. See GRAPTOLITE.

MO'NO LAKE. A lake in Mono County, East Central California. It lies in the Sierra Nevada at an altitude of 6730 feet, and is surrounded by mountains rising 6000 to 7000 feet above its surface (Map: California, D 2). Its area is now about 85 square miles, but ancient beaches show that it was formerly nearly four times as large. It has no outlet, and its waters are so salty that fish cannot live in them. Sodium carbonate and bicarbonate constitute nearly one-half of the salts held in solution, and these are therefore of considerable commercial value.

MONOLITH (Lat. *monolithus*, from Gk. μονόλιθος, consisting of a single stone, from μόνος, *monos*, single + λίθος, *lithos*, stone). A monument, statue, obelisk, column, shaft, or other achitectural member formed of a single stone or cut out of the solid rock. Monolithic columnar shafts of large size and highly colored marbles did not become popular with the Romans until the Imperial period. (See COLUMN.) In Egypt, and especially in India, there are examples of monolithic temples, as at Abu-Simbel, and in the cave-temples and monasteries at Ajanta, Ellora, Karli, etc., and the open-air monuments at Ellora, Dhumnar, and many other places. Of monolithic blocks in ancient architecture some of the largest are at Baalbek in Syria, one measuring about 70 × 21 × 14 feet. A remarkably high shaft was one quarried at Vinal Haven, Me., 115 feet high and weighing 150 tons.

MON'OMA'NIA (Neo-Lat., from Gk. μόνος, *monos*, single + μανία, *mania*, madness). A form of insanity in which there is one systematized delusion which dominates, while it does not impair, the intellect of the lunatic. The central delusion may be replaced in part by minor related delusions, and it may be concealed upon occasions, or for a long period of time. Ability is not incompatible with this form of insanity. See PARANOIA.

MONOMETALLISM. See BIMETALLISM; MONEY.

MONONGAHELA, mō-nŏn'gȧ-hē'lȧ. One of the headstreams of the Ohio River. It rises in the Alleghany Mountains in Randolph County, West Virginia, and flows northward with many windings through a fertile and populous valley abounding in coal and timber (Map: Pennsylvania, B 4). At Pittsburg, Pa., it joins the Alleghany River to form the Ohio. Its total length is about 300 miles, and by a system of nine locks it has been made navigable for steamboats to Morgantown, W. Va., 106 miles above Pittsburg. Four more locks are now in construction above Morgantown, and the Government plans to make the river navigable to Fairmount in Marion County, at the junction of its two main headstreams. The principal tributary is the navigable Youghiogheny. On the banks of the Monongahela, a few miles from Fort Duquesne (now Pittsburg), the Anglo-American army of Braddock was defeated by the French and Indians on July 9, 1755.

MONONGAHELA. A city in Washington County. Pa.. 30 miles south of Pittsburg: on the Monongahela River, and on the Pennsylvania Railroad (Map: Pennsylvania, A 3). It is in a productive coal region, and is engaged principally in coal-mining and in manufacturing, the industrial works comprising glass factories, machine shops, foundries, planing mills, paper mills, flour mills, etc. Settled as early as 1792, Monongahela was not incorporated until 1873, the charter of that year being still in operation and providing for a mayor. annually elected, and a bicameral council. Population, in 1890, 4096; in 1900, 5173.

MONONGAHELA, BATTLE OF THE. See BRADDOCK, EDWARD, and FRENCH AND INDIAN WAR.

MONOPH'YSITES (Gk. μονοφυσίτης, *monophysitēs,* one who affirms the single nature of God, from μόνος, *monos,* single + φύσις, *physis,* nature). The name applied to a large number of Christians in the fifth and sixth centuries who maintained that Christ had only one nature, as against the orthodox doctrine that in Him humanity and divinity were perfectly united without detriment to either. The Monophysites called the orthodox, by analogy, Dyophysites, i.e. believers in two natures (Gk. δύο, two, and φύσις). The controversy sprang out of the fourth century discussions respecting the Trinity (q.v.), and the connecting link may be found in the speculations of Apollinaris of Laodicea (d. 390), who raised the question how the divine and the human could exist together in Christ.

The Monophysite controversy passed through several preliminary stages. One of these is marked by the name of Nestorius, Patriarch of Constantinople, whose Christology was suspected to be unsound, and who was condemned by the Council of Ephesus (431), under the leadership of Cyril of Alexandria. (See NESTORIUS; EPHESUS, COUNCIL OF.) Another stage is connected with the monk Eutyches (q.v.), who held a peculiar view of the natures in Christ, different from that of Nestorius, yet open to suspicion. He, too, was adjudged heretical (448), and although he was received back into fellowship by the 'Robber Synod' of Ephesus (449), his vindication did not stand. Meanwhile, Pope Leo I. (440-461) had written to the Bishop of Constantinople his celebrated 'Tome,' or letter, in which he defined the Catholic doctrine of the two natures. This document was brought into requisition at the Council of Chalcedon (451), and upon it was based the official decree which set forth the orthodox Christology. According to this definition, Christ is "perfect in deity and perfect in humanity, truly God, and truly man, . . . one and the same Christ, in two natures without confusion, change, division, or separation." The adoption of the Chalcedonian decree may be regarded as terminating the theological and introducing the political period of the Monophysite controversy.

The problem at that time confronting the Empire was that of harmonizing the theologically discordant elements of the population. Christianity being the State religion, it was necessary for all to accept whatever doctrinal decisions might be reached by the proper authorities. But a large part of the Eastern Church was strongly Monophysite, and would not surrender its convictions, in spite of the Council. The Emperors themselves did not all think alike, although they all sought, if possible, to unify the opinions of their subjects. A usurper in the East, Basiliscus by name, issued a decree condemning the definition of Chalcedon (476), and while many of the Eastern clergy accepted his decree, a storm of opposition was aroused. A later Emperor, Zeno, endeavored to reach a compromise by his *Henoticon,* or instrument of union (482), which practically ignored what had been accomplished at Chalcedon, and reverted to the Nicæno-Constantinopolitan creed as the sole standard of orthodoxy. Pope Felix condemned the *Henoticon,* and the result was a schism between East and West, lasting for about thirty-five years (484-519). Before the close of the fifth century several national churches had been formed in the East, independent of Constantinople, yet patriarchal in their organization, and all professing the Monophysite faith, e.g. the Jacobites, Maronites, Armenians, Copts, Abyssinians, etc. In Egypt some of the most extreme Monophysites separated from the Patriarch of Alexandria and formed a sect of their own. They were called *Acephali,* i.e. 'without a head.' Justinian (527-565), a champion of orthodoxy, attempted to induce his subjects to unite on the basis of the Chalcedonian decree, and partially succeeded, chiefly by forcing his will upon the Fifth Ecumenical Council (553). But his most important utterances on the subject pleased neither party, and by a sort of irony of fate at the close of his life he was said himself to have fallen into a heresy akin to Monophysitism (cf. Evagrius, *Hist. Eccles.,* iv. 39). Only after the separation of the schismatic churches of the East, and, still more, after the rise of Mohammedanism, which forced Oriental Christians, in self-defense, to seek closer relations with Rome, can the long Monophysite struggle be said to have come to an end. The two-nature doctrine, as defined at Chalcedon, triumphed, in spite of its inherent difficulties, and remained the orthodox faith of Christendom. Consult: Gibbon, *Roman Empire,* chap. 47 (ed. by J. B. Bury, London, 1896-1900); Harnack, *History of Dogma,* vol. iv. (London, 1898); Fisher, *History of Christian Doctrine* (New York, 1896); Smith and Wace, *Dictionary of Christian Biography,* article "Person of Christ, Controversies Respecting" (London, 1887); Hutton, *The Church of the Sixth Century* (London, 1897); Hefele, *History of the Councils,* vols. iii. and iv. (Edinburgh, 1883-95).

MON'OPNEU'MONA (Neo-Lat. nom. pl., from Gk. μόνος, *monos,* single + πνεύμων, *pneumōn,* lung). An order of fishes, so called from the simple, unified condition of the lung-sac. It comprises a single family, Ceratodidæ, and genus, Ceratodus, in which the lateral jointed rays of the archipterygium are well developed. It represents a very ancient stock, of which only the barramunda (q.v.) of Australia now exists. Compare DIPNOI.

MONOPODIAL BRANCHING (from Gk. μονόπους, *monopous,* single-footed, from μόνος, *monos,* single + πούς, *pous,* foot). The method in which the axis of a plant develops continuously from an apical and the branches arise from lateral ends. See Branching.

MONOPOLI, mō-nōp'ō-lē. A town in the Province of Bari, Italy, situated on the Adriatic, 25 miles southeast of Bari (Map: Italy, M 7). It is surrounded by walls, and has a fortress constructed in 1552 by Charles V. There is a cathedral. Along the coast near by are curious tombs hewn out of the rock, and the ruins of an ancient city. Weaving and dyeing are the principal industries. The trade is in olive oil and wine. Population (commune), in 1881, 20,918; in 1901, 22,545.

MONOPOLY (Lat. *monopolium*, from Gk. *μονοπώλιον*, right of exclusive sale, *μονοπωλία*, *monopōlia*, exclusive sale, from *μόνος*, *monos*, single + *πωλεῖν*, *pōlein*, to sell). In its strictest sense, a grant of the Crown or State to a private individual or corporation of an exclusive right to carry on a certain class of business or traffic. In a general and more modern sense it signifies such control of a given class of articles or of the traffic in them as will make it possible to raise their price higher than the level of prices fixed by free competition. A typical example of a monopoly of the first class is the grant of a patent right, which in effect gives the grantee an exclusive control over the production of and traffic in the patented article; a common example of monopolies of the second class is the exclusive control of mineral or other special products of the land by virtue of ownership of land. Monopolies may be classified as public or private according as they are managed by the Government or by private individuals, associations, or corporations.

Private monopolies may be classified as (1) legal monopolies, resting upon a grant from the Government of exclusive privileges for manufacture or sale; (2) natural monopolies, which are based upon the control of a limited natural product through the ownership of land or other natural resources, or of exclusive natural facilities for transportation; and (3) capitalistic monopolies, which hold their power over prices by virtue of the fact that an enormous capital is required in certain industries so that an established plant always has a great advantage over a new competitor. This last form of monopoly will be discussed at length in the article Trust (q.v.).

Legal monopolies have generally been granted to private persons for some real or ostensible service to the commonwealth. Sometimes such a grant was made primarily for fiscal purposes. Thus the monopoly of the issue of bank notes in England, granted in the early part of the eighteenth century to the Bank of England, was a reward for the considerable services of that corporation to the national exchequer. In early times the exclusive right of sale or production of a commodity was frequently granted to individuals in return for a fixed sum paid into the public treasury. The danger, however, of such monopolies lay in the fact that the probable profits were as a rule underestimated through the influence of favoritism, with the result that the sums secured by the treasury were not commensurate with the vexation to the public. Too frequently these exclusive privileges were granted to Court favorites whose actual services to the commonwealth merited no such reward. Monopolies by grant first acquired prominence in the reign of Elizabeth, when her frequent grants of monopolies in articles of common use were regarded as a great abuse and brought forth the protests of Parliament. Such articles as salt, leather, coal, soap, cards, beer, and wine were thus monopolized, and indeed there was hardly any article of common necessity of which the sale was not thus restricted for the benefit of the great. The practice was continued until the statute 21, James I., c. 3, known as the Statute of Monopolies, was enacted by Parliament in 1623. This statute abolished all existing monopolies with certain exceptions, as patents and manufactures of war supplies and materials, and forbade the creation of monopolies, except by grant made by authority of act of Parliament.

Somewhat similar in character were the special prerogatives granted about this time to the East India and other trading companies. The monopoly of trade which was a characteristic of these companies was held by many to be a feature essential to their success. It may be remarked that monopoly privileges did not prevent failure on the part of the many companies which from time to time were established by France, though they may have been a valuable adjunct to the more vigorous administration of the English and Dutch companies.

The limited monopoly for a term of years which at the present time is granted to the holders of patents and copyrights is somewhat akin in principle to those just discussed, but is justified by other considerations of public policy. It differs from them in that the objects to which such rights pertain are essentially new creations, and the exclusive privileges which they convey act as a stimulus to productions which are of public benefit. While copyright aims to secure to writers a reward for their labors, there are, in general, few restrictions upon the use of these privileges. On the other hand, the aim of patent legislation is in some countries not only to stimulate invention, but to secure the widest utilization of improved processes. The monopoly which the patent right confers cannot be used, therefore, for the exclusive benefit of its possessor. Persons who fail to provide for the commercial utilization of their patents forfeit their rights. German law, for instance, provides for an annual fee for the issuing of patents which grows larger as time progresses, and under this law ineffective patents or those which are not commercially profitable lapse and cease to be a bar to further applications of the principle upon which they are based. The power of granting monopolies is subject to restrictions of both the United States and the various State constitutions. The question as to how far a State may grant exclusive privileges to conduct a business depends primarily upon the Constitution of the State, and hence is a question of constitutional law outside the scope of this article. The Fourteenth Amendment of the United States Constitution, which provides that "No State shall make or enforce any law which shall abridge the privileges or immunities of citizens of the United States, nor shall any State deprive any person of life, liberty, or property without due process of law," is a direct limitation upon the powers of a State to grant monopolies indiscriminately. It does not, however, prevent a State from giving exclusive privileges to conduct public callings upon the theory that power to regulate and control public callings was an essential right of the State, recognized at common law and not intended to be destroyed by the Fourteenth Amendment. Thus the State may grant the exclusive right to operate public ferries, turnpikes, railroads, grain elevators, etc.

Nor does the Fourteenth Amendment preclude a State from granting exclusive privileges in the proper exercise of its police power.

The State may thus grant monopolies for the sale of liquor, or the sale of lottery tickets, or the erection of a slaughter-house, or the conduct of a slaughtering business within a city. See Public Calling; Constitutional Law; Police Power.

The United States Constitution expressly confers upon Congress the power of granting copyrights and patents to authors and to the originators of useful inventions. No other power to create monopoly is expressly vested in Congress, and it is probable that it is without such power, except when incidental to the exercise of powers expressly granted by the Constitution, as, for example, the power to regulate commerce, borrow money, or collect duties and imports.

Natural monopolies exist where the conditions of the enterprise are such as to preclude competition. In a general way, economists sometimes speak of the possession of land as constituting a natural monopoly. As monopoly implies a lack of competition as well as special privilege, the term strictly applies only to cases in which the ownership of the privileges is centred in one person, or at least a very few persons capable of acting in harmony. Land and other natural resources, such as water power and mineral wealth, are so widely diffused that monopoly in a strict sense rarely arises from their ownership. The most important instances of the so-called natural monopolies arise in connection with certain public services, particularly in cities, and are usually connected with the right of way through public highways. Such services are the furnishing of gas, water, transportation, and communication in cities. As the right to make use of the city streets to lay gas and water pipes, electric conduits, or to build tramways cannot be granted to all, competition in furnishing such services is practically excluded. In some respects, particularly as concerns the right of way through municipalities, steam railroads belong in the same class. Competition among them is possible on a larger scale than among street railways, but they undoubtedly possess some elements of natural monopoly.

As the policy of the law has eliminated from our economic life legal monopolies which do not conform to the principle of public interest, so there is a growing demand that these natural monopolies shall be administered in the public interest. In its extreme form it calls for the municipalization of such enterprises, while many who are unwilling to accept this solution demand far greater caution in the granting of franchises and a much stricter supervision of the manner in which such franchises are used than has heretofore been common in American municipalities.

Monopoly Price. It can hardly be said that the price of the commodities or services controlled by a public monopoly is subject to any general law. The Government may fix prices below cost of service, or it may purposely make them so high as to discourage consumption. Private monopolies, on the other hand, naturally aim to secure the greatest net profit; and the price which will yield the greatest surplus above cost may be termed monopoly price. The determination of such a price is a difficult matter in practice, since a large number of factors have to be taken into account. If the monopolized commodity is a necessity of life, as, for example, salt, the price may be fixed very high, since high prices would not greatly diminish consumption. If, on the other hand, the commodity is an article of luxury, or one out of a group of commodities which satisfy the same want, a material rise in price will greatly limit consumption, so that while a large profit may be made on each unit sold, small sales will reduce total profits. Again, it may be that an increase in the quantity of service performed or goods produced will by no means demand a proportional outlay. In that case the monopoly may best subserve its own interests by keeping prices low. Thus a street railway company can generally double the number of passengers carried without doubling the cost of service; and may therefore find it profitable to lower fares. See Trust; Patent; Copyright.

Bibliography. The most satisfactory recent general discussion of monopoly is Ely's *Monopolies and Trusts* (New York, 1900). For a concise discussion of monopoly price, consult Marshall, *Principles of Economics* (London, 1895), pp. 532-547. A scholarly discussion of the theory of monopoly is Schäffle's *Theorie der ausschliessenden Absatzverhältnisse* (Tübingen, 1867). An interesting discussion of a fiscal monopoly is Wicksett, *Studien über das österreichische Tabaksmonopol* (Stuttgart, 1897). Consult, also, King, "Alcohol Monopoly in Switzerland," *Economic Review* (1893), and Raffalovich, "State Monopoly of Spirits in Russia," *Journal of the Statistical Society of London* (1901). See bibliography under article Trust.

MONOPTERAL (from Lat. *monopteros*, from Gk. μονόπτερος, having a single row of columns, from μόνος, *monos*, single + πτερόν, *pteron*, wing, row of columns). A circular building in Græco-Roman architecture, in which a single row of columns surrounds the central space or cella and carries the roof. Such are the temple of Vesta at Rome and that at Tivoli.

MON'OTHEISM (from Gk. μόνος, *monos*, single + θεός, *theos*, god). The belief that there is but one God, in distinction from polytheism, belief in many gods. It has been held that monotheism was a primitive belief, and there are many references to the pure primitive belief in one God. Not only was this assumed in the case of the Hebrews, who with the Mohammedans and Christians are the best type of monotheists, but even in the case of India the Hindus in the works of early Sanskrit scholars are credited with having had and lost a primitive monotheism. The opposite view has been strongly enforced in the last decades by the work of historians, anthropologists, and philologists. Thus the Hebrews became monotheists only after rejecting, in the course of a long struggle, an earlier belief in gods of stone, divine animals, and gods of other peoples; traces of this belief being still discoverable in the Bible itself, as well as historically proved by what we now know of earlier religious affinities of the Hebrews. So, too, Mohammedanism was first of all a protest against theriolatry, litholatry, and other forms of polytheism. In India, monotheism was an evolution from pantheism, when it was not directly borrowed from Mohammedanism or Christianity, as is the case with most of the reforming sects of the sixteenth and seventeenth centuries. Zoroastrianism was also essentially a monotheistic religion, based upon an earlier polytheism: though its dualistic nature, expressed by the conflict between good and evil, and its retention of the older gods as great spirits, cause it to be popularly regarded as polytheistic. Thus also the Egyptians worked out from a chaos of heterogeneous gods the idea of one only real God; and in the highest expression of their religion they may be said to be monotheistic, though this monotheism is rather a pantheistic expression of monotheism. It is claimed by some that Christianity is not monotheism; that no trinitarianism can be a pure monotheism, but must be a tritheism—that is, a belief in three gods. Two objections to this view may be pointed out. In the first place, the corresponding trinitarianism of India in no wise invalidates the belief in the unitarian pantheistic God, of which the three-in-one are merely different expressions. Secondly, the earliest creed of Christianity, as given in I. Cor. viii. 4 f., is clearly monotheistic. Finally, it must be observed that neither in the literal meaning of the word nor in its accepted significance is there any objection to the view that monotheism may be a form of pantheism. The nature of God, whether monistic or part of a dualistic system, is not deducible from the definition, though, doubtless, in the ordinary use of the word, it is understood that the God of monotheism is a creative intelligent spirit governing the universe and not one identical with it.

MONOTH′ELITISM, more correctly **MONOTHELETISM** (from Lat. *monothelitæ*, from Gk. μονοθελῆται, *monothēlētai*, from μόνος, *monos*, single + θελητής, *thelētēs*, one who wills, from θέλειν, *thelein*, to will). The name of a seventh-century heresy which asserted the existence of one will in Christ instead of two. It was a direct outgrowth of the Monophysite heresy (see Monophysites), for if Christ had only one nature, of course He had also only one will. Orthodoxy, however, drew the logical conclusion from its two-nature doctrine, which had been formulated at Chalcedon (451), and maintained that there were two wills in Christ, corresponding to His divine and human natures respectively. The controversy over this question involved most of the Eastern Church, and its influence was felt in Rome. The Emperor Heraclius (610-641), threatened by the advances of Mohammedanism and by danger from the Persians, strove to reunite his Christian subjects, who had been sadly divided over the Monophysite question and had formed schismatic churches, e.g. Armenians, Jacobites, etc. Sergius, Patriarch of Constantinople, and Cyrus, Patriarch of Alexandria, were working along the same line, with some measure of success, by interpreting the decree of Chalcedon in such a way as to persuade the Monophysites to accept it. But a monk named Sophronius, who visited Alexandria and learned what was going on, denounced the movement as a relapse into the heresy of Apollinaris, whose views had long since been condemned. (See Apollinaris.) Pope Honorius tried to allay this strife by seeking to quiet Sophronius, thus taking a dangerously temporizing stand. But Sophronius was soon elevated to the Patriarchate of Jerusalem (634), and his continued opposition to the measures of Sergius and Heraclius was now more serious. The Western Church, as a whole, was logical enough to share the views of Sophronius. This appeared in the action of a Roman synod in 649, which asserted the doctrine of the two wills. After some thirty years the Eastern Church was brought to the same position, and the Sixth Ecumenical Council (Constantinople, 680) adopted dyothelitism as a Catholic dogma. The same Council condemned the monothelite leaders, Sergius and Cyrus, and along with them Pope Honorius, for not promptly suppressing the incipient heresy. This properly ends the Christological controversies which for three hundred years had agitated the Church. Monothelitism found a home among the Maronites of Mount Lebanon, and their name was long synonymous in the East with Monothelites. In the twelfth century the Maronites entered the Roman communion.

Consult: Hefele, *History of the Councils*, vol. v. (Edinburgh, 1896); Harnack, *History of Dogma*, vol. iv. (London, 1898); Fisher, *History of Christian Doctrine* (New York, 1896); Gibbon, *Roman Empire*, chap. 47 (ed. by J. B. Bury, London, 1896-1900); Smith and Wace, *Dictionary of Christian Biography*, article "Person of Christ."

MON′OTREME (Neo-Lat. nom. pl., from Gk. μόνος, *monos*, single + τρῆμα, *trēma*, perforation). A mammal of the order Monotremata, which is coextensive with the sub-class Prototheria, and embraces the low egg-laying mammals (Ornithodelphia) duckbill and echidna (qq.v.). The term connotes the fact that in the reproductive organs of this group the orifices of the urinary canal, the intestinal canal, and the generative canal, open, as in birds, into a common cloaca. See Prototheria. For fossil forms, see Mammalia; Fossil.

MONÓVAR, mō-nō′vär. A town of Southeastern Spain, in the Province of Alicante, situated among the mountains, 18 miles northwest of Alicante (Map: Spain, E 3). It has a number of good buildings, a large and handsome church, and a casino with a beautiful park. Great quantities of wine are produced in the vicinity, and the town manufactures woolen and cotton textiles, leather, soap, and spirits. In the neighborhood are quarries of marble, gypsum, and building stone. Population, in 1900, 10,573.

MONRAD, mŏn′råt, Ditlev Gothard (1811-87). A Danish statesman and ecclesiastic, born in Copenhagen. He studied theology and Oriental philology at the University of Copenhagen, spent a year in Paris, and after the death of Frederick VI. entered political journalism as author of *Flyvende politiske Breve* (1840-42). In 1846 he had settled as pastor of a parish in Laaland, but he was active in the rising of 1848, and was Minister of Education in the March Ministry of that year. With political success came advancement in the Church; but in 1854, because of his continued opposition to Oersted's ministry, he was removed from his see of Laaland. In Hall's Cabinet Monrad held various posts in the Department of Education, and became Minister once more in May, 1859. Hall resigned at the end of 1863. Monrad formed a new Cabinet, in which he took the portfolio of finance. But the war with Prussia forced him from power (1864), and with his family he went to New Zealand in the following year, not to return until 1869, when his property had been destroyed in the Maori campaigns. He received his old bishopric in 1871, and from 1882 to 1886 was member of the Danish Parliament. Consult the biography by Graae (Copenhagen, 1887).

MONREALE, mȯn′rȧ-ä′lȧ. A city in the Province of Palermo, Sicily, five miles southwest of Palermo, with which it has electric railway connection (Map: Italy, H 9). It is the seat of an archbishop. Its cathedral, dating from the twelfth century, is a fine example of the Norman-Sicilian style. The bronze doors are beautifully ornamented, and the walls are almost completely covered with mosaics representing biblical scenes. The Benedictine monastery, with its beautiful cloisters, is now used as a school building, and has a library of 17,000 volumes. There is a trade in oil, corn, fruit, and almonds. Population (commune), in 1881, 19,543; in 1901, 23,778.

MONRO, mŭn-rō′, Alexander (Primus) (1697-1767). An eminent Scotch anatomist, born in London. He graduated at the University of Edinburgh, and then studied under Cheselden and Boerhaave. In 1720 he was appointed professor of anatomy at the University of Edinburgh, which had up to that time offered no courses in the subject. A collected edition of his works appeared in 1781. Consult the memoir by his son, Dr. Donald Monro, prefixed to his *Works* (Edinburgh, 1781).

MONRO, Alexander (Secundus) (1733-1817). A Scotch anatomist; younger son of Alexander Monro (Primus) (q.v.), whom, in 1764, he succeeded as professor of anatomy in the University of Edinburgh. His most important work is his *Observations on the Structure and Functions of the Nervous System* (1783), in which he describes the 'foramen of Monro.'

MONROE′. A city and the parish seat of Ouachita Parish, La., 72 miles west by north of Vicksburg, Miss.; on the Washita River, here navigable for large steamboats during a considerable part of the year, and on the Queen and Crescent Route and the Missouri Pacific Railroad (Map: Louisiana, D 1). The Federal Government building is one of the most prominent structures of the city. A considerable cotton trade is carried on, and there are large cotton compresses, cottonseed-oil mills, and extensive manufactures of various lumber products, bricks, etc. Population, in 1890, 3256; in 1900, 5428.

MONROE. A city and the county-seat of Monroe County, Mich., 35 miles south-southwest of Detroit; on the Raisin River, and on the Pere Marquette, the Lake Shore and Michigan Southern, and the Michigan Central railroads (Map: Michigan, K 7). It has an orphan asylum and a home for the aged, a public library with 6000 volumes, Saint Mary's Academy, a fine court-house, and an armory and opera house that cost $30,000. In Monroe is the mother house of the Sisters of the Immaculate Heart of Mary, who own valuable property here. The city is in a fertile region and is an important depot for shipment of grain and fruit. It has extensive nurseries, fisheries, and, among the industrial plants, stove and furnace works, flour, lumber, and paper mills, canning factories, agricultural implement works, furniture factories, brick and tile works, paint works, etc. The government is administered under a charter of 1895, which provides for a mayor, annually elected, and a unicameral council. The city owns and operates the electric light plant. Population, in 1890, 5258; in 1900, 5043.

Monroe was settled as 'Frenchtown' by a company of Canadians in 1784, and received its present name, in honor of James Monroe, in 1815. It was the scene of the battle of the River Raisin, January 22-23, 1813, in which 397 of the American force were killed and 537 captured, only 33 escaping, while of the British, 24 were killed and 158 wounded. A number of the prisoners wounded and unable to march were left here under inadequate protection, and were subsequently massacred by the Indians. This gave rise to the battle-cry, "Remember the River Raisin." Monroe was chartered as a city in 1836.

MONROE. A city and the county-seat of Union County, N. C., 152 miles southwest of Raleigh; on the Seaboard Air Line Railroad (Map: North Carolina, B 3). It has gold mines of some value, and the principal manufactories include large cotton mills and iron works. Population, in 1890, 1866; in 1900, 2427.

MONROE. A city and the county-seat of Green County, Wis., 37 miles south by west of Madison; on the Illinois Central and the Chicago, Milwaukee and Saint Paul railroads (Map: Wisconsin, D 6). It has manufactures of condensed milk, lumber, carriages, foundry and machine-shop products, boilers, etc., and enjoys considerable trade in the products of the adjacent region, which is interested chiefly in farming, stock-raising, and dairying. The city maintains a public library with about 4500 volumes. Monroe was incorporated as a village in 1859, and in 1882 was chartered as a city. Population, in 1890, 3768; in 1900, 3927.

MONROE, Fort. See Fort Monroe.

MONROE, James (1758-1831). The fifth President of the United States. He was born in Westmoreland County, Va., April 28, 1758; and was sent to William and Mary College to be educated, but his studies were soon interrupted by the outbreak of the Revolutionary War, when he left college and enlisted in the American army. He joined a Virginia regiment near New York in 1776 with the rank of lieutenant, and took part in the battles of Harlem Heights, White Plains, and Trenton, in the last of which he was wounded. During the campaigns of 1777-78 he served on the staff of the Earl of Stirling (William Alexander), taking part in the battles of Brandywine, Germantown, and Monmouth. Although his services were highly commended by the Commander-in-Chief, Monroe was disappointed in the way in which they were rewarded, and his career in the army after 1778 was unimportant. It was at this time that he formed an acquaintance with Jefferson, who was then Governor of Virginia, and the event marks the beginning of an intimacy that lasted during the remainder of their lives and was destined to have a decisive influence upon the career of Monroe. In 1782, at the age of twenty-four, he was elected to a seat in the Legislature of Virginia, and became a member of the Virginia Executive Council. His next legislative service was in the Congress of the Confederation, of which he was an influential member for three successive terms from 1783 to 1786. He took a prominent part in the deliberations upon the vital questions of the period: the trade relations of the States, the navigation of the Mississippi, and the government of the western territory. To inform himself of conditions in the West, he twice crossed the Alleghanies, and the information which he acquired had a marked influence upon his course in Congress. Upon his retirement from Congress in 1786 he was again chosen to a seat in the Legislature, and in 1788 became a member of the State convention called to ratify the Federal Constitution. In this body he supported Patrick Henry in his futile opposition to the Constitution, making several lengthy arguments against ratification. In 1790 he was elected to a seat in the United States Senate, where he served until 1794. In the Senate he acted with the Anti-Federalists, opposing vigorously the Administration of Washington. He was nevertheless, in 1794, appointed Minister to France as the successor of Gouverneur Morris, the probable explanation of the appointment being his friendly attitude toward France and the desire of the President to offset the appointment of Jay, a stanch Federalist, as Minister to England. He arrived in France just after the fall of Robespierre, and was received by the Convention, August 15, 1794. In an address to the Convention he used expressions which, in view of the strained relations between the United States and France, did not meet with the approval of the Administration, and in other respects his course did not entirely commend itself to the Government. He was accordingly recalled in 1796, and Charles C. Pinckney was appointed as his successor. Upon his return the reasons and propriety of his recall became the subject of a spirited controversy and caused party feeling to run high. For a time Monroe retired to private life, from which he was called to assume the Governorship of Virginia in 1799, a position which he held until 1802. The accession of Jefferson to the Presidency in 1801 insured Monroe's return to national politics, and in the following year he was again sent to France as an additional plenipotentiary to aid Robert R. Livingston in the negotiations already begun for the purchase of New Orleans and a district at the mouth of the Mississippi, and at the same time was instructed to negotiate with Spain for the purchase of the Floridas. After the conclusion of the treaty by which France sold Louisiana to the United States (1803) Monroe was sent as Minister to England and subsequently to Spain. A treaty was finally concluded with England, but, not being satisfactory to the President on the question of impressment and indemnity, it was never laid before the Senate. The negotiations with Spain for the cession of the Floridas were likewise unsuccessful. In 1807 Monroe returned to the United States, and his course was again the subject of controversy. Again he served in the Virginia Assembly, and in 1811 was chosen a second time Governor of Virginia, but held the office only a short time, being called to the Cabinet of President Madison as Secretary of State in the same year. He held this office until his elevation to the Presidency in 1817, and for a time in 1814 and 1815 also acted as Secretary of War. As head of the War Department he took precautions for the defense of Washington against an attack from the British forces, and won popularity by the vigorous measures which he adopted in the prosecution of military operations. In the year 1816, while in his fifty-ninth year, he was elected President of the United States, having received 183 electoral votes, against 34 cast for the Federalist candidate, Rufus King. Four years later he was reëlected, receiving every vote in the electoral college except one. This was due to the passing of the Federalist Party, or, more correctly, to the breaking down of party lines, so that there were no longer Federalists or Republicans. The principal subjects which occupied the attention of the Government during the eight years of Monroe's Administration were the defense of the Atlantic seaboard, the encouragement of internal improvements, the Seminole War, the acquisition of Florida, the Missouri Compromise, and the relations with Europe in regard to South American affairs, which resulted in the annunciation of the permanent policy of the Government known as the 'Monroe Doctrine' (q.v.). Noteworthy events of a spectacular character during his term were the tour of the President through the East and the West, and the visit of Lafayette. The period of his administration was known as the 'era of good feeling,' on account of the general prosperity of the country and the absence of party strife. Vast internal improvements were undertaken, and the westward movement of the population was marked. Five new States—Mississippi, Illinois, Alabama, Missouri, and Maine—were admitted to the Union.

At the close of his second term Monroe retired to private life, residing in Virginia and in New York, where he died July 4, 1831. During the year preceding his death he served as a member of the Virginia Constitutional Convention, this being his last public service.

Monroe's *Writings* (New York, 1898—) have been edited by S. M. Hamilton, librarian of the Department of State in Washington. A calendar of his *Correspondence* was published in *Bulletin No. 2*, 1893, of the Bureau of Rolls and Library, State Department. A biography of James Monroe was written for the "American Statesman Series," by D. C. Gilman (Boston, 1883; 2d ed. 1898), in the appendix to which is a bibliography of Monroe and of the Monroe Doctrine.

MONROE DOCTRINE. The term applied to the policy of the United States regarding foreign interference in American affairs. It takes its name from President Monroe, who in his message to Congress in 1823 first gave it formal announcement. It is sometimes stated as the corollary of Washington's policy of neutrality toward all European affairs. In modern conception it is the policy of the United States to regard any attempt on the part of a European power to gain a foothold in this hemisphere by conquest, or to acquire any new establishment in North or South America as an act hostile to the United States. Yet it does not contravene the right of any nation to enforce indemnity for injuries to its subjects, physical or financial, but applies only to territorial aggression by foreign powers, whether temporary or permanent. The conception of the policy is one of gradual growth, and as far as it has authority in international law it rests upon the principle of the right of a sovereign State to protect its own interests from dangerous aggression. With the wide and complex development of modern American interests, appeal to this argument is strengthened, yet the assertion of the doctrine in its extreme form is always attended with the danger of grave international complications.

The 'doctrine' is based upon two passages in Monroe's message, and has a twofold relation—a non-colonization and a non-intervention feature. The first passage referred to the boundary dispute in the Northwest, then in issue between Russia, Great Britain, and the United States, Russia having assumed to exclude foreigners from disputed territory extending to the fifty-first parallel of latitude. President Monroe said: "The occasion has been judged proper for asserting as a principle in which the rights and interests of the United States are involved, that the American continents, by the free and independent conditions which they have assumed and maintained, are henceforth not to be considered as subjects for future colonization by any European powers." Both the conditions which inspired the passage and its language prove that it related to an acquisition of territory by original occupation or settlement; that it did not include acquisition by gift, purchase, or like voluntary transfer, or by conquest. Further, while it did not strictly commit the United States to the application of the principle to territory other than that immediately in dispute in the Northwest, in prospective consideration it involved the vast tracts of unclaimed land on the continent still unexplored and unoccupied, upon which the establishment of a European colony with the exclusive trade policies then professed by all Continental governments could not fail to prejudice the trade relations of the United States. The controversy in question was settled by the treaty of 1825 with Russia, but the doctrine formulated was again asserted in 1826 by President J. Q. Adams in the proposed instructions of the United States delegates to the Panama Congress (q.v.), its application, however, being limited to its adoption by each separate State as a protection of the territory claimed by that State, and not committing the powers concerned as a body to "a joint resistance against any future attempt to plant a colony." The question, however, was not considered by the Panama Congress, owing to the non-arrival of the United States delegates, and this phase of the doctrine remained in abeyance for twenty years.

The second part of the Monroe message related to the proposed action of the Holy Alliance as announced by the resolutions of the Congress of Verona (November, 1822), directed against the system of representative government in Europe, and aiming at the reimposition of the Spanish yoke upon the South American colonies, then in a state of revolt, the independence of which the United States had already recognized. This action of the Powers threatened English commercial interests already established with these States, and England promptly proposed to the United States a joint declaration by the two governments against their action; but without awaiting a reply from this Government, on October 9, 1823, she gave notice to the French Ambassador of her unfriendly attitude. This, followed by President Monroe's declaration, summarily checked the Powers. "We owe it, therefore," said Monroe, "to candor and the amicable relations existing between the United States and these Powers to declare that we should consider any attempt on their part to extend their system to any portion of this hemisphere as dangerous to our peace and safety. With the existing colonies and dependencies of any European Power we have not interfered nor shall we interfere. But with the governments who have declared their independence and manifested it, and whose independence we have on great consideration and just principles acknowledged, we could not view any interposition for the purpose of oppressing them, or in any other manner controlling their destiny, than as a manifestation of an unfriendly disposition toward the United States." While Monroe's declaration was intended to meet the exigencies of the time, the principle was no novel one, but rather the embodiment of an idea that had developed with the growth of nationality, and had been expressed in various forms in previous papers and correspondence of Monroe, Adams, and Jefferson. Two months before the publication of the message Jefferson had written: "Our first and fundamental maxim should be never to entangle ourselves in the broils of Europe. Our second, never to suffer Europe to intermeddle with Cis-Atlantic affairs." The declaration, having accomplished its purpose, practically disappeared in its application with respect to the Holy Alliance, and the development of the policy for the next generation was the outgrowth of the colonization feature.

In 1845 President Polk took the first step toward extension of the principle. The northwest boundary was again in issue, this time with Great Britain, and the Administration was committed to the annexation of Texas. "It should be distinctly announced to the world," said Polk, "as our settled policy, that no future European colony or dominion shall with our consent be planted or established in any part of the North American continent." The doctrine was thus made to include acquisition by voluntary transfer or conquest of occupied territory, and a virtual protectorate over other American States in its application was announced, though limited to North America. Again in 1848, when the question of the occupation of Yucatan arose, Polk issued a second manifesto against the acquisition of such territory by voluntary transfer or cession. In 1853, when the Cuban annexation discussion was at its height, a resolution was introduced into the Senate combining the doctrines of Monroe and Polk; but it failed of passage, and the doctrine has never received express legislative sanction either by resolution or statute. It is therefore not a part of the law of the land, though with the predominance of the interests of the United States the policy in relation to both North and South America has been generally accepted by both political parties and the people, and its principles have been given repeated recognition during the past half century in our foreign policy. The interference of the United States in Mexico, resulting in the withdrawal of the French in 1866, and President Cleveland's declaration to Great Britain in connection with the Venezuelan boundary dispute in 1895, are the notable examples of such recognition. Notwithstanding the protests of the United States Government, during the progress of the Civil War, the French had secured a foothold in Mexico and attempted to install Maximilian, an Austrian prince, on the Mexican throne. With the conclusion of peace a formal demand for withdrawal was made, and General Sherman was sent to the Mexican frontier with a large force. After some delay in negotiations the French Emperor withdrew his troops, and Maximilian was left to his fate. In the Venezuelan affair, representations having been made by our Government that the action of Great Britain was a violation of the Monroe Doctrine, the latter yielded to the suggestion of the United States and consented to an arbitration, thus effecting an amicable settlement.

The Monroe Doctrine is sometimes held to commit the United States to a protectorate over other American States, requiring this country to espouse their quarrels though unable to control their actions. It has never been within its intent to forbid European nations to employ force in the settlement of their just demands upon this continent. In 1842 Great Britain blockaded San Juan de Nicaragua, and in 1851 laid an embargo on the entire western coast of Salvador, and in 1903 the combined German and English fleets maintained a blockade of the Venezuelan coast to secure the collection of their claims for indemnity. The requirements of the Monroe Doctrine as a national policy were fully met with the assurance to the United States of good faith on the part of the Powers concerned and that no Venezuelan territory would be taken in settlement of the indemnity. While the building of an interoceanic canal and the position which the United States has had as a world power since the close of the war with Spain have rendered the problem attending the application of the doctrine more complex, the increased respect which it has insured our demands has greatly decreased the difficulties of its enforcement.

For modern aspects of the Monroe Doctrine, consult: J. B. Moore, *Political Science Quarterly*, vol. ii., p. 1; T. S. Woolsey, *Forum*, vol. xx., p. 705; H. C. Lodge, *North American Review*, vol. clx., p. 651; John W. Burgess, *Political Science Quarterly*, vol. ii., p. 44. Consult also: Reddaway, *The Monroe Doctrine* (Cambridge, 1898); and authorities cited under INTERNATIONAL LAW.

MONRO′VIA. The capital of the Negro Republic of Liberia, West Africa, situated at the mouth of the Saint Paul River, on the coast (Map: Africa, C 4). It has an unhealthful climate. Its exports are palm oil and kernels, dyewoods, and rubber. Population, about 5000.

MONS, môɴs. The capital of the Province of Hainault, Belgium, situated on the Trouille, about 35 miles southwest of Brussels (Map: Belgium, B 4). It was formerly encircled by a line of fortifications. Their site is now occupied by promenades. The most interesting building in Mons is the late-Gothic Cathedral of Saint Waltrudis (1450-1589), having a well-proportioned interior decorated with reliefs and stained-glass windows. The Hôtel de Ville is a late-Gothic building of the fifteenth century, with a façade adorned with statuettes and a baroque tower. The educational institutions comprise a normal school, a seminary for teachers, a fine library, and an archæological museum and picture gallery. Mons lies in one of the most important coal-mining districts of Belgium, known as Borinage, and manufactures woolen and cotton goods and iron products. The trade, mostly in grain and coal, is facilitated by the Canal de Condé, which connects Mons with the Scheldt.

Mons is believed to occupy the site of a Roman castrum built by Julius Cæsar. It attained some importance in the Middle Ages, and owed not a little of its prosperity to Baldwin VI., Count of Flanders, later Emperor of Constantinople, from whom it received a charter in 1200. It was repeatedly taken by contending forces during the wars of Louis XIV. Population, in 1900, 25,483.

MONS, or TALAING. The inhabitants of the unhealthy delta regions of the rivers Irrawaddy, Sittong, and Salwen in Indo-China. They consider themselves the aborigines of the whole of Lower Burma. Their former habitat is now largely occupied by Burmese-Mon half-breeds. They are probably one of the eight groups of aborigines of Indo-China. Their language, which is of the monosyllabic type, seems to belong in the same class with the Khmer, and perhaps the Khasia.

MONSEIGNEUR, môɴ′så′nyẽr′ (Fr., my lord, plural *messeigneurs*). Originally a French title applicable to royal or Imperial princes, cardinals, archbishops, and bishops of France, and accorded in courtesy to the high officers of government and persons generally of high rank. The title was not applied to bishops until about the close of the seventeenth century, when they acquired it by concerted action in addressing each other in that way. Their title previously was simply *monsieur*. A law of the French Convention in 1801 interdicted the use of the title for bishops and archbishops, and required them to confine their signature titles and their addresses to each other to the words *citoyen* or *monsieur*. Among English-speaking Roman Catholics the title is applied in its Italian form, *monsignore*, not only to bishops, but to priests who are distinguished by the honorary appointment as domestic prelates to the Pope.

MON′SELL, JOHN SAMUEL BEWLEY (1811-75). A Church of England divine and hymnwriter. He was born in Londonderry, Ireland, March 2, 1811; graduated at Trinity College, Dublin, B.A., 1832. He was ordained priest 1835, and died as rector of Guildford, England, April 9, 1875. He was a popular hymn writer; Julian's *Dictionary of Hymnology* gives a list of seventy-three of his hymns which are in current use. One of his prose works, *Our New Vicar* (1867; 13th ed. 1890), has had a large sale.

MONSERRAT, mŏn′sĕr-rät′. A mountain in Spain. See MONTSERRAT.

MONSIEUR, me-syè′. A French title formerly addressed to persons of medium rank; now universally employed in French by all gentlemen in addressing each other. It is also used as a prefix to titles of rank, and as a form of respect in mentioning a third person. In the Middle Ages the title was given to saints, and as a prefix to the names of popes and of members of the royal family when alluded to in the third person. Later *Monsieur*, used without a proper name, was the special title of the oldest brother of the French King.

MONSIGNY, môɴ'sē̍'nyē̇', PIERRE ALEXANDRE DE (1729-1817). A French composer, born at Fauquembergue, Pas de Calais. He received some instruction in harmony from Gianotte, in Paris, and in 1759 produced his first opera, *Les aveux indiscrets.* Its success was immediate, and Monsigny followed it up with *Le Cadi dupé* (1761). From this time he had the poet Sedaine as collaborator. Together they wrote: *On ne s'avise jamais de tout* (1761); *Le roi et le fermier* (1762); *Rose et Colas* (1766); *Le déserteur* (1769); and *Le faucon* (1772). After *Félix, ou l'enfant trouvé* (1777; text by Sadaine), Monsigny ceased to write.

MONSOON' (from Fr. *monson, mouçon, mousson,* It. *monsone,* Sp. *monzón,* Port. *monção,* from Malay *mūsim,* season, year, monsoon, from Hind. *mausim,* from Ar. *mausim,* monsoon, from *masama,* to mark). In general, any wind or system of winds that changes regularly with the months or seasons. This term was brought to England from the East Indies by the Portuguese, Spanish, and Italian navigators. Its use in English first occurs in *Hakluyt's Voyages.* In India, Siam, and the East Indies there is a very regular change of the winds with the seasons. They blow from southwest or south from April to October, and from northeast or north from October to April. The existence of these winds in India was first made known to the Europeans by the expeditions of Alexander the Great. Modern knowledge of the corresponding winds in Siam and the Philippines dates from the middle of the sixteenth century; similar regular seasonal changes in the wind direction characterize many portions of the globe, so that Australia, Texas, Brazil, Africa, and Europe have prevailing winds at each season of the year; yet the contrast is nowhere so strongly marked as on the south and southeast coasts of Asia and the neighboring islands. During the winter season the cool air from the interior of the continent, flowing outward and keeping near the ground, becomes a north or northeast wind as it flows southward over the China Sea into the Bay of Bengal and into the Arabian Sea. This wind even passes beyond the equator to latitude 10° S., by which time it has been deflected into a west wind and flows eastward over the northwestern coast of Australia. South of this zone of north winds are the southeast trade winds of the Southern Hemisphere. By reason of the change from winter to summer the Asiatic continent becomes heated; consequently the northeast monsoon ceases and a strong indraught takes place, and eventually, in July and August, the greater part of the air over the south Indian Ocean responds to this indraught, so that from latitude 25° S. to latitude 5° S. a strong southeast trade wind prevails. Between latitudes 5° south and 5° north this southeast trade crosses the equator as a southerly wind, and turning toward the right becomes the southwest monsoon wind of India, Siam, and the adjacent seas. It was for a long time considered doubtful whether the winds of the Southern Hemisphere could thus cross the equator and enter the Northern Hemisphere, but the monsoon charts published daily for many years by the Government of India leave us no room to doubt this remarkable change. In the midst of the southeast trades of the southern Indian Ocean occur violent typhoons, which move from the neighborhood of Java and Northern Australia westward and away from the equator, turning in their course before they reach Madagascar and move southeastward until they are lost. These typhoons generally develop in the South Indian Ocean when the northeast monsoon is at its maximum in India.

The southwest monsoon is usually accompanied by rain in portions of India and in the adjacent East Indies. The northeast monsoon brings rain to the west coast of the Bay of Bengal. In general, the locations of the rain areas vary with the direction of the wind in accordance with the rule that a wind that is forced to ascend over a hilly coast brings rain to it. Through this interchange between the seasons of northeast and southwest monsoons, all of India has an opportunity of being well watered and of raising annual crops of grain. Nevertheless it occasionally happens that the southwest monsoon fails to bring much rain; this may indeed happen for several successive years (as in 1895 and 1896, and again in 1899), by reason of which distressing famines and great loss of life are caused. Since 1880 the Government meteorologists of India, H. F. Blanford and John Eliot, have devoted a great deal of attention to methods of predicting the probable character of the monsoon rains. These predictions are generally issued in the month of April and relate to the coming months of July and August. A remarkably large percentage of these predictions have been successful, but the failure of the forecasts for 1899 indicated that abnormal conditions prevailed in some distant region, and has greatly stimulated the study of the relation between the Indian monsoon and the condition of the atmosphere over the whole globe.

The general statement of the conditions that bring about monsoons is discussed at length by Prof. William Ferrel in *A Treatise on the Winds* (New York, 1889). He has emphasized the important rule that monsoons are stronger in proportion as the heated interior land surface is elevated above sea-level. On the coast of Jamaica, West Indies, the diurnal sea breeze is remarkably strong, owing to the steep gradient of the land as it ascends from sea-level to the tops of mountains. In India the southwest monsoon develops on a grand scale because of the average elevation of the Himalayas, which stretch east and west for 1300 miles at an average altitude of 18,000 feet, and also because of the mountains and plateaus behind the Himalayas in the interior of Asia. The monsoon, like the daily land and sea breeze, depends for its intensity ultimately on the heat produced by solar radiation. Any change in the radiation will produce corresponding effects on the monsoon. E. D. Archibald, in *Nature* (June 22, 1893, London), has maintained that there are systematic monsoon variations parallel to the variations of the spots on the sun. But these changes are barely appreciable, and further investigation may modify his results.

MONS SA'CER (Lat., Sacred Mount). A hill near Rome, made famous by the secession thither of the Plebs in B.C. 494. It is conjecturally identified with an eminence near the Ponte Nomentano, about three miles from the Porta Pia.

MONSTER. See MONSTROSITY.

MONSTRANCE (OF. *monstrance,* from ML. *monstrantia,* monstrance, from Lat. *monstrare,* to show, from *monstrum*, portent, monster, from *monere*, to warn, admonish), or Ostensory. The sacred utensil employed in the Roman Catholic Church for the purpose of presenting the consecrated host for the adoration of the people, as well while it is carried in procession as when it is exposed upon the altar on occasions of special solemnity and prayer. The use of the monstrance probably dates from the establishment of the festival of Corpus Christi in the thirteenth century. It consists of two parts, the foot or stand upon which it rests, and the repository or case in which the host is exhibited. The latter contains a small semi-circular holder called the *lunula*, or crescent, in which the host is fixed.

MONSTRELET, môn'stre-lâ', Enguerrand de (1390-1453). A French chronicler, probably born in Picardy. Of his life practically nothing is known. According to his own testimony, he was present at the interview between Jeanne d'Arc and the Duke of Bourgogne. In 1430 he had a civil and military office in Compiègne; later he was provost at Cambrai and bailiff at Walincourt. His *Chronique*, which covers the years 1400-1444, and continues the narratives of Froissart, is a clear and exact narrative of the time, written with little charm of style. The latest edition is that of Douët d'Arcq (1857-62). There is an English translation by Thomas Johnes (1810).

MONSTROSITY (Lat. *monstrositas*, from *monstrosus*, *monstruosus*, monstrous, from *monstrum*, monster, portent) (in Anatomy). All departures from the normal development of the human fœtus or of the young of the higher animals are now considered under the subject of Teratology. These deviations from the normal may vary from the comparatively slight and common anomalies (such as hare-lip and supernumerary digits) to forms which are so strange and hideous that they merit beyond question the name of monsters. Although the system of Saint Hilaire is by no means perfect, and is not based on embryonic laws, yet it has the advantage of a familiar nomenclature, and groups together forms which present similar external characteristics. Under his classification we have four general groups: *Hemiteratics*, *Heterotaxies*, *Hermaphroditics*, and *Monsters*.

Hemiteratics. In this group are included all forms of anomalies which show unusual development, but which are not exaggerated enough to be regarded as monsters nor specific enough to be considered members of the second or third class.

This group is subdivided into (1) *Anomalies of volume*, with general diminution or increase, as in dwarfs and giants. This abnormal development may affect only a part of the body, as the extremities, or the breasts, or the muscular system.

(2) *Anomalies of form*, resulting in deformities of the head, of the stomach, or of the pelvis.

(3) *Anomalies of color*, presenting the interesting condition of albinism or abnormal melanism.

(4) *Anomalies of structure*, as represented by the persistent cartilaginous condition of bones or the ossification of parts that normally should consist of cartilage.

(5) *Anomalies of disposition* include hernia, club-foot, extrophy of the bladder, and curvature of the spine.

(6) *Anomalies of connection* are especially varied. Bones have unusual articulations; muscles have abnormal attachments; and arteries and veins give off branches in violation of anatomical regularity.

(7) *Anomalies of continuity* show an imperforate condition of vagina, rectum, or œsophagus, or a union of the kidneys, of the digits, or of the teeth.

(8) *Anomalies of closure and disjunction* are illustrated by a vaginal septum and by cleft palate and hare-lip.

(9) *Anomalies of number* embrace many varieties represented by an increase or decrease in the number of digits, teeth, breasts, or other parts.

Heterotaxics include those forms which show transposition of the internal viscera, either of the thorax or of the abdomen. Rarely we find only a single organ transposed; often all are in an abnormal position, but this change is accompanied by no interference of nutrition nor of function. So at times the heart will be found on the right side or the liver on the left, and yet the individual is unconscious of any irregularity.

Hermaphroditics. Ahlfeld defines a true hermaphrodite as an individual possessing functionally active glands of both sexes, with excreting ducts and external genitals, so that the offices of both sexes can be fulfilled. Indisputable evidence of such a case has not been adduced, although there are numerous instances where glands presenting the histological characteristics of both sexes have been present in one person. False hermaphrodites present typical glands of one sex and others of a more or less mixed or modified type. They are usually masculine in sex. There are all degrees of abnormality in development, from a slight enlargement of the *vesicula prostatica* (the masculine uterus of Weber), without any alteration in the external genitals, to a fully developed uterus with tubes and vagina complete in a male subject. The penis in these cases is rudimentary, and a condition of hypospadias (a malformation of the penis, in which the orifice of the urethra is underneath or behind the glands) exists. The scrotum is ill developed, and the testicles remain in the abdomen. The absence of ovaries is not detected, so that the mistake in sex may naturally persist until a post-mortem examination reveals their absence and the true sexual nature of the individual is apparent. See Hermaphrodite.

Monstrosities. In this class we will first consider autositic single monsters which are capable of independent existence in the womb, and are the result of an arrest in development, of fusion, or of displacement of important parts. (1) *Ectromelus.*—This group includes aborted or imperfectly formed extremities which present various degrees of shortening or else are entirely absent. Some cases show rudimentary limbs, but perfectly formed hands and feet which appear to come immediately from the trunk. (2) *Symmelus.*—The pelvis and lower extremities in the individuals of this group are imperfectly developed, and the two lower limbs are more or less fused. Sometimes this fusion is complete and the feet are wholly lacking. (3) *Celostoma.*—The individuals in this class show a varying degree of cleft in the walls of the abdomen or of the thorax, and consequent eventration. Anomalies of the intestinal tracts and of the urinary and genital apparatus are frequent accompaniments. Malformations of the head are classified under the next three groups—(4) exencephalus, (5) pseudencephalus, and (6) anencephalus. In group (4) a malformed brain exists, situated in part at least within a cranial cavity of which the walls are imperfect. In group (5) the cranium is even more rudimentary and the brain tissue is but poorly represented, while in the anencephalus the true nerve elements are wholly lacking in the mass of tissue lying within the shallow and imperfect cranial cavity. These brainless monsters are almost always feminine. In (7) the cyclocephali the eyes approach the mid line and more or less closely unite. These organs are poorly developed or rudimentary, and the nose is atrophied, although in certain instances a hypertrophied proboscis may arise from above the fused sockets. The lower jaw is poorly developed or wanting in (8) the octocephalic, and the ears approach each other and frequently become fused below. The mouth is of course distorted to an exceptional degree.

Omphalositic single monsters are embryos dependent on other embryos within the womb for their own imperfect development. The primary fœtus is usually well formed, and supplies both itself and the parasite with blood by means of an extensive anastomosis of placental and umbilical vessels.

When the heart is present in omphalosites it is incomplete. The circulation is sluggish, and an overgrowth of connective tissue results with the formation of lacunæ and cysts and frequently marked œdema. The highest development of these monsters is reached in the paracephalus. In this anomaly the extremities are more or less definitely present, the head has an imperfect cranium and imperfect face, the cervical vertebræ are rudimentary, the diaphragm is defective, and the lungs are absent or else incomplete. There is of course no sign of life in these forms after birth.

Composite Monsters embrace all forms in which there is a reduplication of the principal parts of the body. There may be two distinct faces and heads closely fused together, or the duplicity may be only slightly suggested (Diprosopus). In other cases (Dicephalus) the heads may be quite distinct, and even the upper parts of the body are double, with three or four arms present. The internal organs are duplicated according to the amount of division. Although specimens of this group are seldom born alive, and still more rarely live, yet we have a well-marked instance of this class recorded in the case of the Tocci brothers (1877), who grew up and thrived for many years. In the third class (Ischiopagus) two separate distinct bodies are present which are joined by the coccygeal and sacral bones. Only one case is recorded which lived beyond the third year. The Pyopagi are very rare. In these two separate bodies are so joined together in the sacral region that the two individuals stand back to back. The Dipygi are cases which show a reduplication of the pelvis, of the genitals, and of the extremities. If four legs are present they are not all equally well developed, but the two inner legs are much smaller. This division of the body from below may be carried still further (Syncephalus); and if the union is simply confined to the heads, these specimens are included in the Craniopagus.

In some instances the reduplication is almost complete, and the union is comparatively slight, occurring at some point between the umbilicus and the lower thorax. The most famous case is that of the Siamese twins, who lived to be sixty-three years old. In February, 1902, the Hindu twins Rodica and Doodica, who had been joined in a fashion similar to the Siamese twins, were divided by operation in Paris, France. Rodica survived, but her sister died of tuberculosis.

Double Parasitic Monsters. In this class a more or less perfectly formed body is attached to a well-formed individual, but it has no separate existence, receiving its nourishment wholly from the other.

Triple Monsters are rare, and we know of but one case of a three-headed child—that recorded by Saint Hilaire, born in 1832 in Catania. Consult: Saint Hilaire, *Histoire des anomalies de l'organisation* (Paris, 1832-36); Hirse and Piersol, *Human Monstrosities* (Philadelphia, 1891); Fitch, "Hermaphroditism," in *New York Medical Journal* (November 22, 1890).

MONSTROSITY. A botanical term applied to a peculiar or unusual form of an organ or of the whole body; better designated by the term malformation (q.v.).

MONT, MENT, or **MENTU.** An Egyptian deity, originally the local god of Hermonthis (q.v.), where he had an ancient temple. His chief characteristics were strength and valor, and 'strong as Mont' and 'brave as Mont' were favorite epithets of the Egyptian kings. Under the New Empire, Mont became the national god of war, who fought for the armies of Egypt and gave might and victory to the King. In inscriptions of this period he is styled 'Lord of Thebes, dwelling in Hermonthis.' In the later theological system he was identified with the sun-god under the name of Mont-Rê. With the decline of Thebes and the rise of Hermonthis to supremacy over the surrounding district, Mont gained correspondingly in importance, and usurped in some measure the devotion formerly paid to Amon. Magnificent temples were dedicated to him at Karnak and at Medamut, near Thebes, by the Pharaohs of the eighteenth dynasty; and at Tud, the ancient Tuphium, are the remains of a small temple of the god built in Ptolemaic times. Mont is usually represented as a hawk-headed deity wearing upon his head the solar disk and two tall plumes. At his ancient seat of worship, Hermonthis, his sacred animal was the bull Bakh, called Bacis by the Greeks. Consult Wiedemann, *Religion of the Ancient Egyptians* (New York, 1897).

MONTAGNA, môn-tä′nyȧ, Bartolommeo (c.1450-1523). An Italian painter, born at Orzinuovi (near Brescia). He is thought to have been a pupil of Andrea Mantegna at Padua; perhaps studied also under Ballini and Carpoccio; was active about 1480 at Vicenza, and subsequently in Bassano, Verona, and Padua. His works are rather severe in design and sharply drawn, and ample in color after the manner of the earlier Venetians. They include such examples as the frescoes illustrating the life of Saint Blasius (in the Church of San Nazaro at Verona), "Madonna Enthroned with Three Saints and Bernardino da Feltre" (Berlin Museum), and "Ecce Homo" (Louvre, Paris). Others are in the Venice Academy, the National Gallery, London, and churches in Vicenza.

MONTAGNAIS, môɴ'tȧ'nyȧ' (Fr., mountaineers). A name applied to two American Indian tribal groups. (1) A group of closely cognate Algonquian tribes in Quebec Province and Labrador, Canada, extending along the northern shore of the Saint Lawrence River from near the entrance of the Saint Maurice nearly to the Gulf and inland to the main divide. They have greatly decreased in number from sickness and starvation resulting from the destruction of their former game supply. No separate census is kept, as they are officially grouped with the Nascapi, Têtes-de-Boule, and other tribes and bands. So far as can be learned from the reports, they appear to make their principal living by hunting, fishing, making bark canoes, showshoes, and moccasins, and acting as guides to tourists.

(2) A name somewhat loosely applied to certain Athapascan tribes, more particularly the Chippewyan, in the mountain region stretching from the Churchill River northward to the Great Slave Lake, including also the country about Caribou, Hatchet, and Athabasca lakes in British America. They have all been Christianized by Catholic missionaries.

MONTAGNANA, môn'tȧ-nyä'nȧ. A town in the Province of Padua, Italy, 22 miles southwest of Padua (Map: Italy, F 2). It is still surrounded by walls and towers, and has a Gothic cathedral and a palace with paintings. Its chief trade is in spun silk, wool, hemp, and coarse cotton textures. Population (commune), in 1881, 9941; in 1901, 10,364.

MONTAGNARDS, môɴ'tȧ'nyär' (Fr., mountaineers). The name first applied in France in 1790 to the Revolutionary members of the National Assembly, who occupied the high seats in the rear of the amphitheatre where the Assembly met. In the Convention (q.v.) it was applied to the entire Radical Left, composed of Jacobins (q.v.) and Cordeliers (q.v.), in distinction from the Girondists (q.v.), who occupied the lower seats in the hall. The history of the Convention till June, 1793, is almost entirely the history of the struggle between the Gironde and the Mountain. The former, comprising the philosophers, statesmen, orators, scientists, and men of letters in the Convention, were republicans at heart, but were not ready to go to extremes. The Mountain was made up of men of less renown, but men of action, earnest and uncompromising. Upon the question of Louis XVI.'s fate the issue between the two parties was practically fought out. Then, as in the crisis brought on by foreign invasion and internal disorder, the Girondists showed themselves irresolute. The Montagnards in condemning the King challenged all Europe, took the guidance of the Revolution into their own hands, and some time after (June 2, 1793) destroyed all opposition by arresting the leaders of the Gironde and sending them to the guillotine. The subsequent acts of the Convention were the acts of the Montagnards, under their leaders Danton, Marat, Robespierre, and Collot d'Herbois. In 1848 the Radicals under Louis Blanc and Ledru Rollin called themselves Montagnards. See French Revolution.

MONTAGU, mŭn'tȧ-gu̇ *or* mŏn'-, Basil (1770-1851). A British lawyer and author, natural son of John Montagu, fourth Earl of Sandwich. He was educated at the Charterhouse and at Christ's College, Cambridge. In 1795 he went to London, where he studied for the bar, to which he was admitted three years later, and soon afterwards he began to publish works dealing with legal subjects. He interested himself particularly in relieving the conditions of the debtor class, and succeeded in securing the abolition of the death penalty for certain crimes. Among his writings are: *An Enquiry Respecting the Mode of Issuing Commissions in Bankruptcy* (1810); *An Enquiry Respecting the Expediency of Limiting the Creditor's Power to Refuse a Bankrupt's Certificate* (1809); *The Opinions of Different Authors Upon the Punishment of Death* (1809); and *Enquiries Respecting the Insolvent Debtors' Bill, with the Opinions of Dr. Paley, Mr. Burke, and Dr. Johnson Upon Imprisonment for Debt* (1816). His edition of Bacon's works occasioned Macaulay's well-known essay in the *Edinburgh Review* (1837).

MONTAGU, Charles, first Earl of Halifax. An English poet and statesman. See Halifax, Charles Montagu, Earl of.

MONTAGU, Edward, first Earl of Sandwich. See Sandwich.

MONTAGU, Elizabeth (Robinson) (1720-1800). An English writer and society leader, born at York. In 1742 she married Edward Montagu, grandson of the first Earl of Sandwich, who on his death left her a large fortune. With abundance of wealth and possessing literary talent, she became a leader in London society, and numbered among her regular visitors Lord Lyttleton, Horace Walpole, Dr. Johnson, Burke, Garrick, and Sir Joshua Reynolds. The epithet of 'blue stocking' was first applied to her gatherings. According to one explanation, the ladies at Mrs. Montagu's parties wore 'blue stockings as a distinction,' in imitation of a fashionable French visitor, Madame de Polignac. In 1760 she wrote three *Dialogues of the Dead*, published in Lord Lyttleton's work by that name, and in 1769 an *Essay on the Writings and Genius of Shakespeare, Compared with the Greek and French Dramatic Poets*, that received high praise. Her correspondence, in great part, was published in 1809-13. Consult also Doran, *A Lady of the Last Century* (London, 1873).

MONTAGU, John, fourth Earl of Sandwich. See Sandwich.

MONTAGU, Lady Mary Wortley (1689-1762). An English poetess and letter-writer, eldest daughter of Evelyn Pierrepont (afterwards Duke of Kingston). She was baptized in London, May 26, 1689. From her brother's tutor or by herself she learned Latin, and read widely in English drama and romance. When a mere girl she was toasted by her father at the Kit-Cat Club, and on her appearing there was admitted a member by acclamation. Without the approval of her family she privately married (August 12, 1712) Edward Wortley Montagu, a Whig member of Parliament, with whom she lived for a time in retirement. On the accession of George I. she went to London with her husband. There her beauty and wit attracted unusual attention at Court, and she was much admired by the wits, especially by Pope. In 1716 appeared surreptitiously her *Court Poems*, afterwards called *Town Eclogues*. The same year she set out with her husband on his embassy to Constantinople. At Adrianople she became interested in inoculation for smallpox (1717); and on her return introduced the practice into England. During her travels in the East she wrote her well-known *Letters,* delightful in themselves and valuable for the light they throw upon the manners and customs of the time. Returning to England (1718), the Montagus soon settled near Pope at Twickenham, and Lady Mary became one of the best-known women in London society. Pope had addressed verses to her, and had kept up a correspondence during her absence. The friendship was now renewed on more intimate terms, but by 1722 they quarreled. Pope seems to have made a declaration of love, which was met with a burst of laughter. Pope afterwards satirized her as 'Sappho' in various poems. Swift lampooned her in *The Capon's Tale* (1726). In the *Epilogue to the Satires* (1738) she is accused by Pope of starving a sister and forswearing a debt, and in the *Imitations of Horace* (1733) a worse charge is brought against her (first satire, 2d book, i. 84). For unknown cause she left her husband in 1739, and lived abroad for many years, chiefly in Italy. Her husband died in 1761, and the next year she returned to England, at the request of her daughter, Lady Bute. She died August 21, 1762. Consult her *Works*, edited by her great-grandson, Lord Wharncliffe (London, 1837; new eds. 1887 and 1893). See Inoculation.

MONTAGUE, mŏn′tȧ-gû. A town, including several villages, Turner's Falls being industrially the most important, in Franklin County, Mass., separated from Greenfield by the Connecticut River, and on the Fitchburg and the Central Vermont railroads (Map: Massachusetts, B 2). It has two public libraries, and there are extensive manufactures of cotton goods, paper, pulp, cutlery, hardware, water-wheels and pumps, soap and toilet articles, bricks, and fishing rods. The government is administered by town meetings. Montague was settled about 1716, and was incorporated as a district in 1753. Population, in 1890, 6296; in 1900, 6150.

MONTAGUE HOUSE. (1) A former London mansion built for the first Duke of Montague. It was bought by the Government at the time of the purchase of the Sloane collection, which, with the Harleian manuscripts and the Cottonian library, were deposited in it, forming the nucleus of the British Museum. The expansion of the museum in the early part of the nineteenth century made the addition of a wing necessary, and the building was finally replaced by the present British Museum between 1823 and 1852. (2) A modern building in Whitehall, London, the residence of the Duke of Buccleuch, containing a large collection of pictures and miniatures.

MONTAIGLON, môɴ′tȧ′glôɴ′, Anatole de Courde de (1824-95). A French bibliographer and paleographer, born in Paris. A student at the Ecole des Chartes, he obtained his diploma as archivist in 1850, and held positions successively at the Museum of the Louvre, the Arsenal Library, and that of Sainte Geneviève, until he became professor of bibliography at the Ecole des Chartes. His numerous works, which deal chiefly with the origin of French art and literature, include: *Mémoires pour servir à l'histoire de l'académie royale de peinture* (1853); *Catalogue raisonné de l'œuvre de Claude Mellan d'Abbeville* (1858); *Notice historique et bibliographique sur Jean Pélerin, dit le Viateur* (1861); *Recueil général et complet des fabliaux des XIIIème et XIVème siècles* (9 vols., 1872-90); and *Un voyageur anglais à Lyon sous Henri IV.* (1881).

MONTAIGNE, mŏn-tān′, *Fr. pron.* môɴ′tȧ′-ny′, Michel Eyquem de (1533-92). A great French essayist and moralist. Montaigne got his name from the Château Montaigne, near the Dordogne, in Périgord, where he was born February 28, 1533. The family fortune was begun by Michel's great-grandfather, a merchant and citizen of Bordeaux. The essayist's father turned him over to a nurse, who reared him in a hamlet on his father's estate. As he tells us himself, he was awakened in the morning with music, and his father had him so well drilled in Latin that when he went to the Collège de Guyenne at Bordeaux he astounded every one by his Latinity, though he was but six years old. The boy's mother was Antoinette de Loupes (i.e. Lopez), of a Jewish family, which had come from Spain. To judge by Saint Aubin's engraving after the original portrait at the Château Montaigne, the essayist had an oval face, a good-sized nose, a wrinkled forehead, high cheek bones, and a smallish chin. He wore a short beard, with a moustache, and his mouth hardly suggests the sweetness of temper so apparent in his essays.

After eight years under the famous André de Govea, master of the Collège de Guyenne, then the best school in France, Montaigne seems to have studied law in Bordeaux and Toulouse till 1554. His essays, however, are scarcely the work of a lawyer, but rather of a genial, ever-inquisitive, and usually whimsical humorist. Sooner or later Montaigne skirted most of the hills of knowledge, rarely exerting himself to climb to their tops, but seeing very clearly from the level. At the Collège de Guyenne he had continued his studies in the language, literature, and history of Rome, and had taken part in the Latin plays written for him and his mates by Buchanan and Muret. This we know from Montaigne's own words; but we also learn from him that he was lazy and careless, and that in reading he followed his whims. At twenty-one, as a younger son, he was cared for by being made a member of the Cour des Aides at Périgueux, and three years later he was appointed counselor of Parliament at Bordeaux. Thus he met Etienne de la Boétie (q.v.), and there sprang up between them a friendship that lasted till La Boétie's death in 1563. At thirty-three Montaigne wedded Françoise de la Chassaigne, yielding to convention, for he declares he "would not have married Wisdom herself" for his own pleasure. He tells us that he lost "two or three" children in babyhood, but a daughter survived him. Montaigne had done his first literary work in 1568 by translating the *Theologia Naturalis* of Raimond Sebond, a Spaniard who had been a professor at Toulouse in the fifteenth century. This book was the text for Montaigne's most famous essay in skepticism, the *Apologie de Raimond Sebond.* In 1570 Montaigne edited the literary remains of La Boétie. After this he seldom left his estate, except for visits to Paris and an eighteen months' visit to Germany, Switzerland, and Italy in 1580. Of this voyage he left an interesting diary, partly in French and partly in Italian, first published in 1774, and edited by A. d'Ancona (Città di

Castello, 1889). He was elected (1581) and reëlected Mayor of Bordeaux. His last years were brightened by the Platonic affection of an adopted daughter, Mlle. de Gournay, a Parisian, who at nineteen had been attracted by his essays, of which she later prepared a valuable edition (1597). Montaigne suffered much toward the close of his life from gravel and stone. In 1592 he died of quinsy, receiving devoutly the last offices of the Church, though his mottoes *Que sais-je?* (What do I Know?) and *Qu'importe?* (What Matters It?) are those of an easy-going skeptic.

The essays, of which the first were written in 1572, beginning in self-analysis, finally came to take for their field the knowledge of man in general. Wholly unsystematic though they are, they show an insatiable curiosity, which seeks rather its own stimulation than the satisfaction of a definite conclusion. Montaigne drew the material for his reflections not so much from his own surroundings as from Seneca, Lucretius, and the historians, from Plutarch, Xenophon, and the anthology of Stobæus, and from the biographies of Diogenes Laërtius, as well as from Italian letter-writers and historians. Behind their thought he often sheltered his own, preferring rather to suggest that others had doubted than that he himself was other than a royalist and a Catholic. Suspended judgment, contented detachment, and a practical epicureanism are the teachings of Montaigne, who observes that "men are tormented by what they think about things, not by the things themselves." "However specious novelty may be," says he, "I change not easily, for I fear to lose by the change. . . . So I have, by God's grace, kept without worry and turmoil of conscience the old beliefs of our religion through all the sects and divisions that our century has brought forth." His attitude was not heroic, but it proved contagious; for the anti-Christian or simply non-Christian current which can be noted in the seventeenth century, passing through Molière or through Descartes and finally reaching Voltaire, seems to have its source in Montaigne. Rationalism, Epicurean or Cartesian, is already by implication in the essays. In his own day Montaigne stood almost alone among men who were hasty in thought and quick to act. Few French works have exercised so great and lasting an influence on the writing and thought of the world as the essays of Montaigne. He stands alone and secure among the world's writers. Through Florio (q.v.), who published his admirable translation in 1603, Montaigne was known to Shakespeare, and he very slightly influenced Francis Bacon, ten of whose essays appeared in 1597. He has fascinated great men in every civilized country and in every generation—never, perhaps, more than now.

Bibliography. Editions of the essays appeared in 1580, 1582, and 1588, each containing changes as well as new material. In 1595 his family, aided by Mlle. de Gournay and Pierre de Brach, published what they called "a new edition found after the author's death and augmented by him by a third more than was in preceding impressions." The text of 1595 forms the base of Courbet and Royer's edition (Paris, 1872-91), which has also Montaigne's letters. There is in the municipal library of Bordeaux a copy of the edition of 1588, with many autograph notes by Montaigne, differing, often considerably, from the changes in the editions of 1595. These notes were used in the not very accurate editions of Naigeon (Paris, 1802), of Desoer de l'Aulnaye (ib., 1818), and of Amaury-Duval (ib., 1820). Convenient for general use is the edition of Leclerc (ib., 1865). Montaigne's *Essays* were translated by Florio in time to be used by Shakespeare, and, as it seems, by Ben Jonson also. Florio's rendering was reëdited by C. Cotton and revised by Hazlitt (London, 1893). Consult: Grün, *La vie publique de Montaigne* (Paris, 1855); Malvezin, *M. de Montaigne, son origine, sa famille* (ib., 1875); Bonnefon, *Montaigne, l'homme et l'œuvre* (ib., 1893), reprinted in the same author's *Les amis de Montaigne* (ib., 1898); Stapfer, *Montaigne* (ib., 1894), and *La famille et les amis de Montaigne* (ib., 1896); also Payen, *Documents inédits* (ib., 1847-56); Nerlet, *Etudes littéraires* (ib., 1882); Champion, *Introduction aux essais de Montaigne* (ib., 1899). Works in English are the *Lives* of Montaigne by Saint John (London, 1858) and Lowndes (ib., 1898); Emerson, "Montaigne," in *Representative Men* (Boston, 1850); Church, in *Miscellaneous Essays* (London, 1888); and Pattison, in *Essays* (ib., 1889). A specially luminous treatment of the man and his attitude toward life is in Pater, *Gaston de Latour* (London, 1896). There is a good bibliography appended to Bonnefon, "Montaigne," in Petit de Julleville, *Histoire de la langue et de la littérature française*, vol. iii. (Paris, 1897).

MONTALEMBERT, môɴ'tȧ'läɴ'bâr', Charles Forbes de Tryon, Count (1810-70). A French historian and publicist. He was born in London, May 29, 1810, of an ancient noble family, his father, who had been driven out by the Revolution, having entered the English service. His mother was of the Scottish family of Forbes, to which circumstance may be ascribed Montalembert's knowledge of, and strong admiration for, English social and political institutions. He began his studies at Fulham, near London, and finally, after some time spent in Stockholm with his father, who was Ambassador to Sweden, completed them in Paris. At twenty, already an ardent champion of Catholicism and of popular freedom, he joined Lamennais (q.v.) on the staff of the *Avenir*, and coöperated with him in the establishment of free schools. He accompanied Lamennais on his unhappy journey to Rome, and then to Munich, and remained in close sympathy with his views, even after his master had gone further away from orthodoxy in *Paroles d'un croyant* (1834). At the end of that year, however, he broke with Lamennais and definitely submitted to the Papal decisions. He still maintained his ardent desire to demonstrate the close relations of his faith and popular liberty, and took great delight in the study of mediæval history, the first fruit of which was his *Histoire de Sainte Elisabeth d'Hongrie* (1836). Three years later appeared a collection of his studies in mediæval art, which he vigorously exalted over corrupt modern standards under the title *Du vandalisme et du catholicisme*. In 1835, having now attained the required age, he took his seat in the House of Peers, where, young as he was, he stood out at once as a champion of religion. After the Revolution of 1848 he was elected a member of the Constituent Assembly, and took his seat on the

Right, though acting occasionally with the Left. He had a decisive influence in bringing about French intervention in Italy and the restoration of Pius IX. to Rome. He was elected to the Legislative Assembly also, and for a time contrived, while he continued the same line of policy as regarded Church interests, to give a general support to the Government of Louis Napoleon. His first break with that Government was on the question of the proposed confiscation of the Orleans property, and after the coup d'état of December 2, 1851, the breach became irreconcilable. From that time he continued to be the implacable assailant of the arbitrary repression of public opinion which characterized the measures of Napoleon III. Failing of reëlection in 1857, he devoted himself thenceforth to literature, in which his eminence had been recognized by election to the Academy in 1851. Devoted son of the Church as he was, he clung to his early passion for freedom of thought, and took a pronounced position in favor of the view that the Papal syllabus of 1864 and the declaration of infallibility were both inopportune. He died March 13, 1870. Besides a large number of articles, he left many books of great interest, of which the following have been translated into English: *Catholic Interests in the Nineteenth Century* (1852); *The Political Future of England* (1856); *Constitutional Liberty* (1858); *Pius IX. and France in 1849 and 1859* (1861); *Pius IX. and Lord Palmerston* (1863); *Memoir of the Abbé Lacordaire* (1863). Of these and other works a collected edition in French appeared in eight volumes (Paris, 1860-68). But to English readers he is best known by his brilliant series of historical studies, *Les moines d'occident* (5th ed. 1874-77), translated as *The Monks of the West, from Saint Benedict to Saint Bernard* (new ed: by Gasquet, London, 1895). Consult his *Life* by Mrs. Oliphant (London, 1872), and by de Meaux (Paris, 1897); also Lecannet, *Montalembert d'après ses papiers et sa correspondance* (ib., 1895-1901).

MONTALEMBERT, Marc René, Marquis de (1714-1800). A French general. He was born at Angoulême, entered the army at eighteen, and served in Germany (1733) and in Italy and Bohemia (1742). He wrote much on fortification after his election to the Academy of Sciences, and, in spite of opposition to his novel theories, was intrusted with the fortification of the island of Aix in 1779. He recognized the defects of the bastion system of defense in fortifications, and advocated the employment of casemates for protected gun fire. His theories were first adopted by Prussia, and formed the basis of what afterwards became known as the polygonal system of defense. He is also famous for his works: *La fortification perpendiculaire* (1776), and *L'art défensif supérieur à l'offensif* (1796). See Fortification.

MONTALVÁN, mōn'tȧl-vän', Juan Perez de (1602-38). A Spanish dramatist. With the degree of doctor of theology, he joined the priestly Congregation of Saint Peter at Madrid. Already a successful dramatist at seventeen, he passed under the influence of Lope de Vega, who urged him to the composition of his *Orfeo* (1624), a work produced in competition with Jauregui's *Orfeo*. In the same year he produced some eight tales, which were translated into French and published at Paris as early as 1644. A prose work, the *Vida y purgatorio de San Patricio* (1627), deals with the familiar legend of Saint Patrick's Purgatory, and afforded the material whence Calderon was to derive his play on the subject. A collection containing tales and other compositions more or less dramatic in form is the *Paratodos* (1632). It is as a playwright that Montalván stands highest, ranking as one of the more important of the dramatists next in consequence to Lope and Calderon. He himself prepared two editions of his pieces, published in 1638 and 1639 and reprinted in 1652. The favorite among the dramas is the *Amantes de Teruel.* Selected plays of Montalván may be found in vol. xlv. of the *Biblioteca de autores españoles.*

MONTALVO, mōn-täl'vō, Garcia Ordoñez de. A Spanish author, who flourished in the latter part of the fifteenth century. To him is due the first Spanish version now extant of the famous romance of *Amadis.* Utilizing the material of previous writers, he prepared his version after 1492. The greater part of his work may have been mere translation from the Portuguese, but he also added matter of his own. In his own composition, the *Sergas de Esplandían,* he tells of Amadis's son. We know of Montalvo only that he was Governor of the city of Medina del Campo. Both the *Amadis* and the *Sergas de Esplandían* are published in vol. xl. of the *Biblioteca de autores españoles.* Consult: Baist on the Spanish *Amadis,* and K. M. de Vasconcellos on the Portuguese *Amadis* in their articles on Spanish and Portuguese literature in Groeber's *Grundriss der romanischen Philologie,* vol. ii. (Strassburg, 1900).

MONTANA, mōn-tä'nȧ (Lat., mountainous). A Northwestern State of the American Union, lying between 44° 6′ and 49° (the international boundary) north latitude, and between 104° and 116° west longitude. It is bounded on the north by the Canadian provinces of British Columbia, Alberta, and Assiniboia; on the east by the Dakotas; on the south by Wyoming and Idaho, and on the west by Idaho. Montana ranks third in size among the States of the Union. It measures 550 miles from east to west, with an average width from north to south of 275 miles. Its area is 146,080 square miles, of which 770 square miles are covered by water.

Topography. The eastern three-fifths of the State consist of rolling plains, lying at an elevation of from 2000 feet in the northeast to about 4000 feet among the foothills of the Rocky Mountains. These mountains take up the western portion. The Main Divide runs from Yellowstone Park for some distance along the southwestern boundary, after which it turns eastward, and then crosses the State obliquely in a northwest direction. The general elevation of its crest is about 6500 feet, and the peaks rise from 8000 to 11,300 feet. Mount Douglas represents the highest elevation of the State. Thus the range is considerably lower here and also less rugged than farther south in Wyoming and Colorado. A great longitudinal basin separates the Main Divide from the Bitter Root Mountains, which form the western boundary, and whose crest lies throughout between 7000 and 8000 feet above the sea. The mountain region is diversified by numerous spurs, valleys, and outlying ranges.

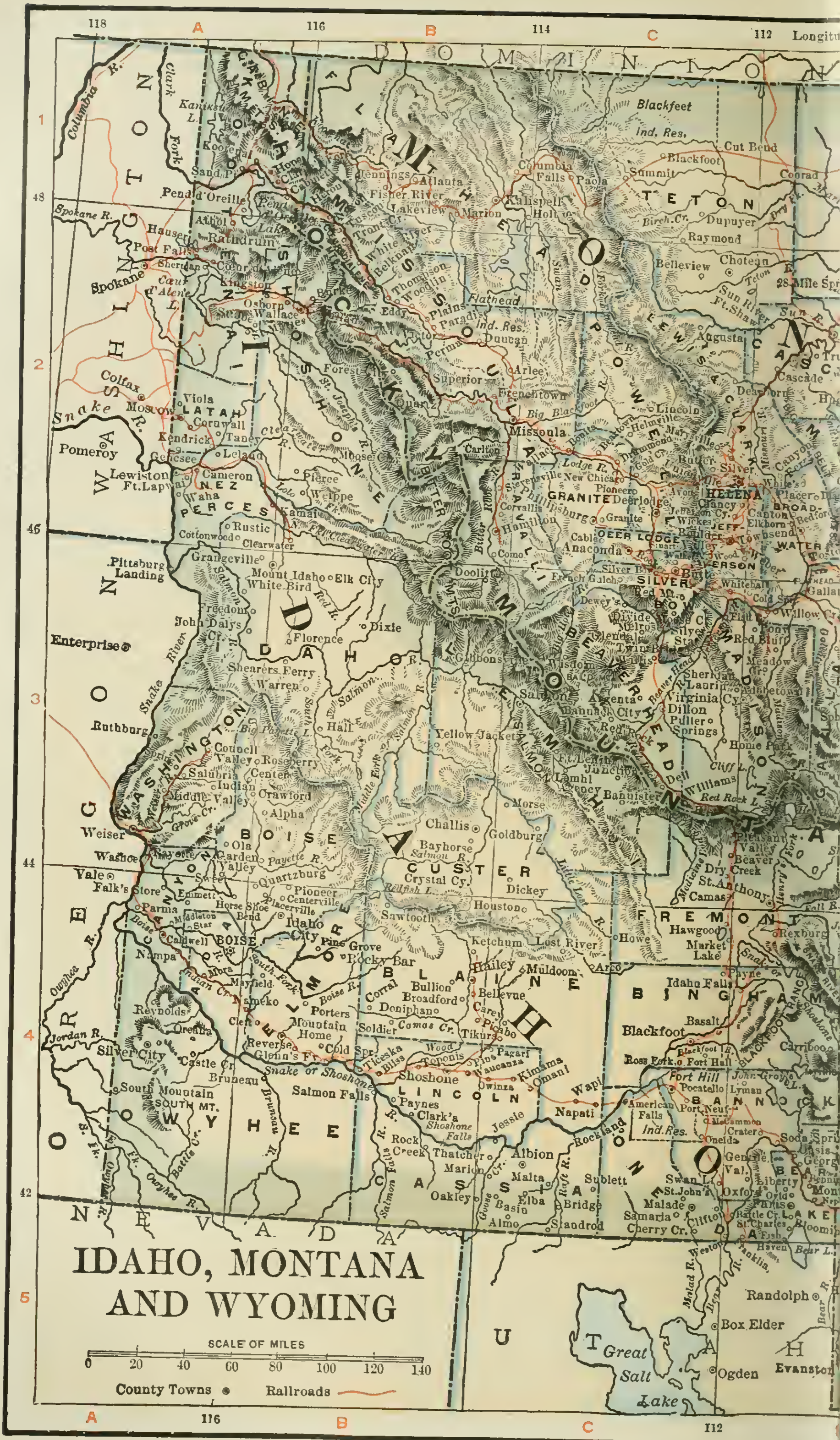
Hydrography. The Main Divide separates the

AREA AND POPULATION OF IDAHO BY COUNTIES.

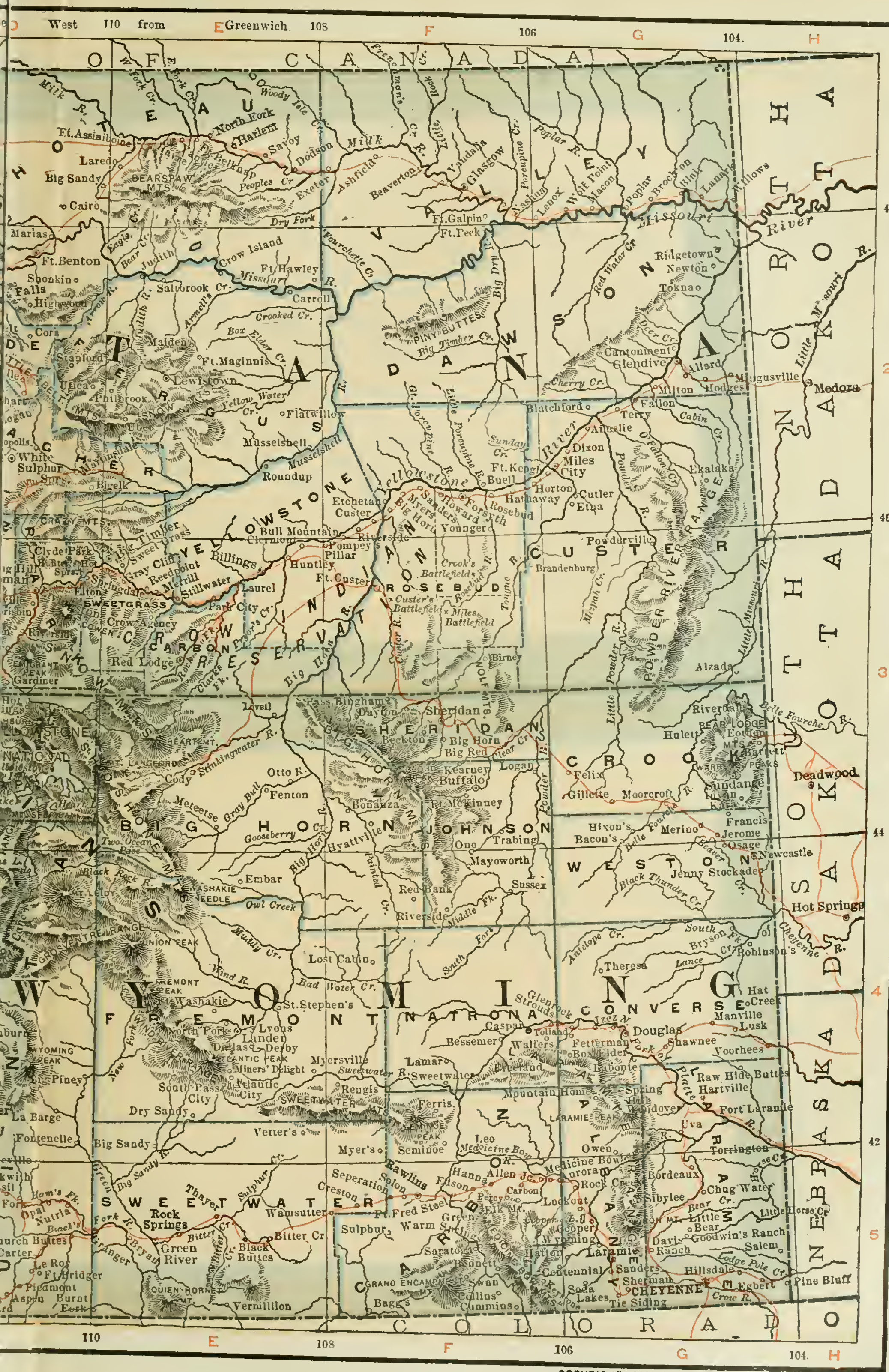
County.	Map Index.	County Seat.	Area in square miles.	Population.	
				1890.	1900.
Ada	A 1	Boise	1.177	8,368	11,559
Bannock	C 4	Pocatello	3.123	2.629	11,702
Bear Lake	C 4	Paris	964	6.057	7,051
Bingham	C 4	Blackfoot	4,314	13,575	10,447
Blaine	B 4	Hailey	6.309		4.900
Boise	A 3	Idaho City	4.203	3,342	4,174
Canyon	A 4	Caldwell	1,327		7,497
Cassia	B 4	Albion	4,511	3,143	3,951
Custer	B 3	Challis	4,670	2,176	2,049
Elmore	B 4	Mountainhome	2,431	1,870	2,286
Fremont	C 4	Saint Anthony	6,115		12,821
Idaho	A 3	Mount Idaho	11,074	2.955	9.121
Kooteni	A 1	Rathdrum	5,595	4,108	10,216
Latah	A 2	Moscow	1,114	9,173	13.451
Lemhi	C 3	Salmon	4,455	1,915	3,446
Lincoln	B 4	Shoshone	3,270	4,169	1,784
Nez Perces	A 2	Lewiston	1,421	2,847	13,748
Oneida	C 4	Malad City	2.695	6,819	8.933
Owyhee	A 4	Silver City	7,907	2,021	3,804
Shoshone	A 2	Wallace	4.677	5,382	11,950
Washington	A 3	Weiser	2,908	3,836	6,882

AREA AND POPULATION OF WYOMING BY COUNTIES.

County.	Map Index.	County Seat.	Area in square miles.	Population.	
				1890.	1900.
Albany	G 5	Laramie	4,300	8,865	13.084
Bighorn	E 3	Basin	12,216	.....	4.328
Carbon	F 5	Rawlins	8.018	6,857	9,589
Converse	G 4	Douglas	6.758	2.738	3.337
Crook	G 3	Sundance	5,435	2,338	3.137
Fremont	E 4	Lander	12,653	2.463	5.357
Johnson	F 3	Buffalo	4.168	2.357	2,361
Laramie	F 4	Cheyenne	6,986	16,777	20,181
Natrona	F 4	Casper	5.388	1.094	1.785
Sheridan	F 3	Sheridan	2,569	1,972	5,122
Sweetwater	E 5	Greenriver	10,510	1,911	8,455
Uinta	D 5	Evanston	15,980	7.881	12.223
Weston	G 4	Newcastle	4.594	2,422	3.203
Yellowstone Park	D 3		....	.....	369



IDAHO, MONTANA AND WYOMING



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has afforded the principal impetus to the growth of mixed agriculture, and has determined in part the region of its development. Hay is the principal crop. its acreage being more than twice that of all other crops. Native grasses constitute the greater part of the acreage, but alfalfa, clover, and other tame varieties are also grown. Oats, wheat, and barley yield abundant crops. Corn is but little grown. owing partly to the coolness of the nights. Potatoes are a favorite crop, and other vegetables are successfully raised. The apple and other temperate zone fruits flourish, and much interest is being developed in their culture. On the whole a greater variety of products can be raised than can be on the plains to the east.

Stock-Raising. Until recently stock-raising had largely monopolized the interest of the agriculturists. This industry is still advancing, though it is of less relative importance than formerly. The State greatly exceeds any other in the number of sheep and in the production of wool. Formerly. the males were shipped to Eastern States to be fed for the market, but with the increased production of alfalfa it is being found possible to fatten them within the State. The number of cattle has also shown a considerable increase, and the breed has greatly improved. The herds are not so large as formerly, but are more numerous. Much attention is also given to the raising of horses for the Eastern market. Although the State is far north, no great inconvenience is ordinarily experienced on account of the weather. In sheltered valleys cattle and horses roam the plains all winter, and the percentage of loss. except in unusual seasons, is small. The tendency of the snow to drift leaves large areas of grass exposed, enabling the stock to feed without assistance. Sheep often require hay and some protection from storms.

In the following comparative tables will be seen the relative importance of the principal farm products (in acres) and varieties of domestic animals, and the changes which occurred in the last census decade:

	1900	1890
Hay	875,712	300,033
Wheat	92,132	18,696
Oats	133,938	52,768
Barley	22,848	4,652
Corn	3,301	1,019
Potatoes	9,613	4,204

	1900	1890
Dairy cows	45,036	24,143
Other cattle	923,351	667,755
Horses	329,972	142,959
Mules and asses	2,857	959
Sheep	4,215,214	1,859,016
Swine	49,496	17,132

Manufactures. The State is too recently settled for manufacturing to have become normally developed, being as yet limited largely to purely domestic industries for local needs. In connection with its valuable mineral resources, however, it has a very important smelting and refining industry, the copper product in 1900 being estimated at $36,387,000, and the lead product at $5,264,000. Exceptional facilities are afforded for this industry by virtue of the enormous water power available from the Great Falls of the Missouri River within a convenient distance from the copper district. Coke is manufactured for use in the reducing works. The superior quality of the barley grown has stimulated the production of malt liquors. Slaughtering and the manufacturing of flour and grist mill products are also rapidly developing.

Transportation. Colorado alone of the Rocky Mountain States excels Montana in railroad facilities. Two lines, the Northern Pacific and the Great Northern, completely traverse the State from east to west. Each of these has a number of branch lines or feeders. There are also other lines, principally in the western part of the State. Butte is exceptionally well provided, being the centre for four different lines. The total mileage for the State (1899) is 3000, one-third of this having been constructed during the last decade. There are 2.06 miles of railroad for every 100 square miles of territory. and 191 miles for every 10.000 inhabitants. In many sections stages are the only means of conveyance, and in mountain regions saddle-horses and pack mules are largely used. At places on the Yellowstone, flat-bottomed ferry-boats are used, attached by ropes and pulleys to elevated cables stretched across the river.

Banks. Montana has a stringent banking law, which provides for the organization of State banks, trust companies, and savings banks, under the strict supervision of the State Auditor. The national bank system existed before Montana was admitted as a State. The first national bank was organized in 1867, and there were 23 in 1902. State (or rather Territorial) banks were first organized between 1880 and 1890.

The condition of the various banks is shown in the following table:

	National banks	State banks
Number of banks	23	21
Capital	$2,480,000	$1,335,000
Surplus	520,000	350,000
Cash, etc	1,444,000	1,256,000
Loans	11,705,000	8,722,000
Deposits	15,848,000	11,891,000

Government. The present Constitution is the only one the State has had, and was adopted in 1889. An amendment may be secured if approved by a two-thirds vote of the members elected to each House and by a majority vote of the people. By the same methods a constitutional convention may be called. and the new Constitution drawn up must be submitted to the people and be approved by a majority of those voting. Voters must be citizens of the United States who have resided in the State one year, and in the local districts as required by law. The suffrage is denied unpardoned felons and idiots or insane persons. Women vote at school district elections and are eligible to the office of school superintendent. Women who are taxpayers have the same suffrage privileges as men.

Legislative. Senators (16) are elected for a term of four years, Representatives (55) for a term of two years. The Legislature meets biennially. on the first Monday of January, and is limited to sixty days. Except by unanimous consent, bills cannot be introduced within ten days of the close of the session. Revenue bills originate with the Lower House.

Executive. A Governor, Lieutenant-Governor, Secretary of State, Attorney-General, Treasurer, Auditor, and Superintendent of Public Instruction are elected for a term of four years each. The Governor's veto is overridden by a two-thirds vote of each House. He grants pardons, etc., subject to the approval of a Board of Pardons. The Lieutenant-Governor, president of the Senate, and Speaker of the House are respectively in the line of succession to the Governorship, in case of the vacancy of that office.

Judiciary. There is a Supreme Court of three members, elected for a term of six years. There are district courts in districts created by the Legislature, in each district one judge being elected for a period of four years. Each township elects at least two justices of the peace, who serve two years. Each county elects a county attorney.

Local. In each county three commissioners are elected for four years. Other county officers are elected for two years, as follows: clerk, sheriff, treasurer, collector, school superintendent, surveyor, assessor, coroner, and public administrator.

The State has a local option law; the legal rate of interest is 10 per cent.; any rate is allowed by contract, and there is no penalty for usury. The capital is Helena. The State has one Representative in the National Congress.

Militia. The population of militia age in 1900 was 83,574. The number of the militia in 1901 was 340.

Finances. The budget of Montana before admission to Statehood was a very limited one, ranging from $30,000 to $50,000. At present Montana has no funded debt. The unpaid registered warrants are, however, interest-bearing and practically constitute a floating debt, which in 1902 amounted to $398,199. Several State institutions, mainly educational and charitable, issue bonds secured by the several land grants, but the State is not responsible for the interest or principal of these bonds, and they therefore do not constitute a State debt. The receipts have grown rapidly, and in 1902 amounted to $1,454,932, which was divided into more than thirty different funds, twelve of which are for schools and universities. The income is derived from a general property tax (50 per cent.), sale of lands (20 per cent.), licenses (10 per cent.), etc. The expenditures were $1,412,894. The balance on hand was $596,724, of which sum almost 75 per cent. belonged to various school funds.

Population. The following shows the population by decades: 1870, 20,595; 1880, 39,159; 1890, 132,159; 1900, 243,329. Most of the people live in the western or mining section of the State. Montana is predominantly a mining State, and there is a large excess of the male sex, the number in 1900 being 149,842. The total foreign-born numbered 67,067, no one nationality being particularly strong. In 1900 Butte had a population of 30,470; Great Falls, 14,930; Helena, 10,770; Anaconda, 9453.

Indians. The tribal Indians, chiefly Crows, Blackfeet, Yankton Sioux, Assiniboins, Gros Ventres, and Pend d'Oreilles, are located on five reservations, embracing an area of 45,000 square miles of fine agricultural and grazing land, of which only a small portion is cultivated. They are making some progress, but their first efforts have been attended with a great deal of waste and of misdirected energy. They are reckless in the use of farm machinery, and their attempts at irrigation are often unwisely executed. They own large herds of cattle and ponies.

Religion. The majority of the Church population belong to the Roman Catholic Church. The Methodists, Presbyterians, Episcopalians, and a number of other denominations also have a following.

Education. In 1900, 6.1 per cent. of the population above ten years of age was illiterate. The educational system of the State has the advantage of a liberal financial support. By act of Congress, two sections out of every township, besides certain other public lands and public land revenues, are set apart for educational purposes. The revenue from this source now exceeds an annual value of $200,000. The average length of 140 days for the school term is a creditable showing, but it is representative only of the towns and more thickly populated centres, there being large numbers of schools in the sparsely settled rural districts having a school term of less than half that length, and there are a number of inhabitants who are not within reach of public school advantages. A law passed in 1903 made education compulsory between the ages of eight and fourteen for the full schooling period. High schools are established when the electors of the county demand them, and six counties have thus provided themselves. In 1900 the census registered 57,210 children, 39,430 of whom were enrolled in the public schools and 1898 in private schools. The State maintains the following higher institutions of learning: State University, at Missoula; Agricultural College, at Bozeman; School of Mines, at Butte City; and a Normal College, at Dillon.

Charitable and Penal Institutions. There is a State Orphans' Home at Twin Bridges, a State Soldiers' Home at Columbia Falls, and a school for the deaf and the blind at Boulder (attendance of deaf and blind children is compulsory). The State as yet does not maintain an insane hospital, but cares for its insane by contract with a private company, allowing 65 cents per diem per capita. The number thus cared for increased from 195 in 1892 to 477 in 1900. There is a State reformatory at Miles City. The State penitentiary is situated at Billings, where the convicts are employed according to the public accounts system, the State paying 45 cents per diem per capita for their care.

History. In 1742 the Sieur de la Verendrye traversed the region now included within the State of Montana, and in January, 1743, reached the foot of the Rocky Mountains. In 1805 the expedition of Lewis and Clark on their return journey from the Pacific Coast descended the Missouri and the Yellowstone in two parties, meeting at the junction of the rivers just outside of the present eastern boundary of Montana. Trading posts were erected on the Yellowstone River by Manuel Lisa in 1809, William H. Ashley in 1822, and the American Fur Company in 1829. In 1840 Father Peter John de Smet of the Society of Jesus began mission work among the Flathead Indians, and this was followed by the establishment of a permanent mission among the Indians of Bitter Root Valley in September, 1841. Fort

Benton was founded by the American Fur Company in 1846. Gold was discovered as early as 1852 by François Finlay, a half-breed, near the Hellgate River, but the discovery aroused little attention till 1857, when John Silverthorn appeared at Fort Benton with a large quantity of gold dust which he had obtained in the mountains. In the winter of 1860 James and Granville Stuart settled on Gold Creek in the Deer Lodge Valley, attracted by the rumors of gold in that region, and in the following year they commenced mining on a small scale, having been joined in the meanwhile by three other pioneers. Rich placers were soon discovered at various points in the mountains and an active immigration set in, mining settlements springing up at Banack City on Grasshopper Creek, on the Bighole River, and on North Boulder Creek. In May, 1863, gold was discovered at Fairweather Gulch, near Alder Creek. The town of Virginia City sprang up near the spot, and within a year it had a population of 4000. The region, which constituted a part of Washington Territory, was organized in 1860-61 as Shoshone and Missoula counties. In 1863 the Territory of Idaho, including the present Montana, was set off from Washington, and on May 22, 1864, the Territory of Montana was erected from land taken from Idaho. During the early years of settlement the characteristic violence of the mining camp and the prevalence of outlawry led to the stern administration of justice by vigilance committees. The *Montana Post*, the first newspaper in the Territory, was published at Virginia City in 1865. In 1874 the seat of government was removed from Virginia City to Helena. On June 25, 1876, occurred the disastrous fight between General Custer and the Sioux Indians under Sitting Bull on the Little Big Horn River.

The prosperity of the Territory was increased by the completion of the Northern Pacific Railroad in 1883, surveys for the route having been made as early as 1853 by Isaac I. Stevens under authority of Congress. About 1880 began the development of silver and copper mining, which soon surpassed in importance the gold-mining industry, the value of the output of the two metals rising from $1,000,000 for both in 1880 to more than $18,000,000 for silver and nearly $37,000,000 for copper in 1901. In January and February, 1884, a constitutional convention framed a Constitution which was ratified by the people in November, and application was made to Congress for admission into the Union. No action was taken, however, until February, 1889, when an enabling act was passed by Congress. On November 8, 1889, Montana was admitted into the Union by proclamation of the President, after a State Constitution had been framed and State officers elected. From the first politics in Montana were marked by a spirit of bitter partisanship, which led to frequent delays in legislation. In January, 1891, the dispute between two rival legislatures was settled only by a conscienceless bargain between the Democrats and the Republicans. The influence of the great mining corporations has also proved a source of political evil. In national elections Montana was Republican in 1892 and Democratic in 1896. In 1900 it was carried by the Democrats and People's Party. The Governors of Montana have been as follows:

TERRITORIAL

Sidney Edgerton	1864-65
Thomas F. Meagher (acting)	1865-66
Green Clay Smith	1866-69
James M. Ashley	1869-70
Benjamin F. Potts	1870-83
John S. Crosby	1883-84
B. Platt Carpenter	1884-85
Samuel T. Hauser	1885-86
H. P. Leslie	1886-89
Benjamin F. White	1889

STATE

Joseph K. Toole	Democrat	1889-93
John E. Rickards	Republican	1893-97
Robert B. Smith	Democrat and Populist	1897-1901
Joseph K. Toole	" " "	1901 —

Bibliography. *United States Geographical and Geological Survey of the Territories* (Washington, 1872-74); *Mineral Resources of the United States* (Washington, 1892); *Montana Agriculture, Labor, and Industry Bureau Annual Report* (Helena, 1893 et seq.); *Montana Historical Society Contributions* (Helena, 1877 et seq.); Bancroft, *The Northwest Coast* (San Francisco, 1884); id., *Washington, Idaho, Montana* (San Francisco, 1890).

MONTANA, University of. A coeducational State institution at Missoula, Mont., founded in 1895. It maintains a preparatory department and a department of literature, science, and the arts, and offers graduate courses, leading respectively to the degrees of B.A., B.S., M.A., and M.S. There is also a summer school of science and a biological station. Tuition is free except in the law department. The university had in 1902 a student enrollment of 347 and 13 instructors. The library contained 10,000 volumes. The endowment consists of 72 sections of land given by Congress in 1892. The income fund arises from the rental of lands unsold, from licenses to cut trees, and from the interest on the proceeds of the sales of lands invested in the permanent university fund, which is applied to the payment of the bonds issued in 1897 for the construction and equipment of buildings. The income for maintenance amounted in 1902 to $37,000. The total value of the university property was $200,000, including a campus of 40 acres and buildings valued at $140,000.

MONTANELLI, mōn'tȧ-nĕl'lē. Giuseppe (1813-62). An Italian author and statesman, born at Fucecchio, January 21, 1813. He studied law at Pisa and began to practice there, composing meanwhile the verses which appeared in a small volume at Florence in 1837. He became professor of commercial law in the University of Pisa, identified himself with the Liberal Party there, and with two coöperators founded *L'Italia*, a periodical. After the rising of 1849 he became one of a triumvirate which also included Guerrazzi and Mazzini. When the dictatorship passed into the hands of Guerrazzi, Montanelli went on a mission to Paris, where he remained, practically in exile, for some ten years. During this period he wrote a number of his works: a poem, *La tentazione;* a tragedy, *Camma;* and a few political and historical treatises, the *Schiarimenti nel processo politico contro il ministero democratico* (1852); the *Appunti storici sulla rivoluzione italiana* (1859); and the most noteworthy of all his writings, the *Memorie sull' Italia e specialmente sulla Toscana dal 1814 al 1849* (1853). He returned to Italy in 1859 and advocated the formation of a central Italian kingdom. He was a deputy to the Tuscan Assembly, but there he accomplished little, for all parties looked upon him with distrust and he found himself with hardly any adherents. In *L'Impero, il papato e la democrazia in Italia* (1859) he defended his own standpoint. Having founded the short-lived *Nuova Europa*, he entered the Italian Parliament in 1861, and died June 17, 1862. Consult: Redi, *Ricordo biografico di Giuseppe Montanelli* (Florence, 1883); Provenzal, *Alla cara memoria di Giuseppe Montanelli* (Leghorn, 1862).

MONTAÑES, mōn-tä′nyȧs, MARTINEZ JUAN (?-1649). A Spanish sculptor in wood, born probably at Alcalá la Real. He was a pupil of Pablo de Rojas in Granada, and afterwards worked in Seville. His sculptures there include a "Conception," in the Cathedral, an altar with figures of saints and a life size "Christ on the Cross," in the University Church, and some statues in the gallery of the city. These are fine examples of his art, which is notable for purity of style and beauty of expression. In 1635 he went to Madrid, where he made a model for an equestrian statue of Philip IV., and where Velazquez painted his portrait, which is now in the Prado Museum.

MONTA′NUS (Lat., from Gk. Μοντανός). A Phrygian convert to Christianity about 156. He is said to have been formerly a priest of Cybele (q.v.). He undertook to restore the faith and practice of the primitive Church, but was finally excluded from fellowship as a heretic. Montanus taught that direct divine revelation still continued, and that he himself was the mouthpiece of the Paraclete, promised in John xiv. 16. Hence his movement is often called the 'new prophecy.' He revived the primitive conception of the speedy return of Christ to earth, to establish His kingdom, and the elect were summoned to gather at the Phrygian village of Pepuza, there to await their Lord. In view of the immediate end of the present age, asceticism was their rule of life, and martyrdom was courted as a blessing and even a duty. Montanus insisted upon strict ecclesiastical discipline, thus rebuking the alleged laxity and worldliness in the Church at large. He declared it wrong to grant forgiveness of mortal sin, and believed that the holiness of the Church could be preserved only by excluding all offenders from membership. He denied that the hierarchy possessed any right or power to restore holiness when it had been forfeited through sin, and thus he took his stand against the theory of sacramental grace. Closely associated with Montanus were two women, Prisca (or Priscilla) and Maximilla, supposed to be endowed like himself with the spirit of ecstatic prophecy. Like the 'spiritual gifts' of the Apostolic age (cf. I. Cor. xii.), the prophetic spirit might rest upon any one, and this divine equipment marked out the leaders of the Church. Revelation was imparted without any activity on the prophet's part; he was passive like the lyre when struck with the plectrum. Maximilla was held to be the last of the prophets. She died in 179. Montanus's death was earlier, but the exact year is unknown. The Montanists spread rapidly, and Asiatic synods were early held against them. They were known in Rome as early as the time of Soter (165-174), who pronounced an adverse judgment upon their claims, as did several of his successors. They were excluded from the Catholic Church, and organized as a separate body. Their most distinguished convert was Tertullian (q.v.), whose later writings are the chief literary monuments of the Montanist movement. Excluded from the Catholic Church, the Montanists did not long survive in the West, but in the East they are found as late as the sixth century, when Justinian finally suppressed them.

Consult the later writings of Tertullian, translated into English in *The Ante-Nicene Fathers*, edited by Roberts and Donaldson, American edition, vols. iii. and iv.; Bonwetsch, *Geschichte des Montanismus* (Erlangen, 1881); Harnack, *History of Dogma*, vol. ii. (London, 1896); Smith and Wace, *Dictionary of Christian Biography*, article "Montanus" (London, 1877-87); Raing, *The Ancient Catholic Church* (New York, 1902).

MONTARGIS, mōɴ′tär′zhē′. The capital of an arrondissement in the Department of Loiret, France, 75 miles south of Paris by rail, at the confluence of the Loing and the Vernisson, and at the junction of three canals connecting the Seine and the Loire (Map: France, J 3). Among its chief buildings are the thirteenth-century Church of La Madeleine, the town hall containing an art gallery, and the remains of the former imposing twelfth-century castle, which was capable of accommodating 6000 men. A bronze monumental group commemorates the 'Dog of Montargis,' who is said to have revealed his master's murderer by constantly following him; a fight between the suspect and the dog, suggested by Charles V., ended in the defeat of the criminal, who confessed and was executed. (See AUBRY DE MONTDIDIER.) There are considerable manufactures of paper, cotton goods, and cutlery, and a good trade in grain, wax, and honey. Anciently, Montargis was the capital of Gâtinais. During the English occupation it was attacked on several occasions, and successfully resisted a siege in 1427. Until the palace at Fontainebleau was built, the castle at Montargis was a favorite royal residence and became known as "the Cradle of the Children of France." Population, in 1901, 12,351.

MONTAUBAN, mōɴ′tō-bäɴ′. The capital of the Department of Tarn-et-Garonne, France, situated on an elevation above the river Tarn, in a rich and beautiful country, 31 miles north of Toulouse (Map: France, H 7). It is a handsome, well-built town, has a Renaissance cathedral finished in 1739, a Protestant theological college, a public library, and a splendid museum in the town hall, the ancient castle of the counts of Toulouse. Cloth, sugar, and metal ware are manufactured and there is a trade in horses, grain, oil, and wine. Montauban originated in the Abbey of Saint Théodard or Montauriol, built in the eighth century on the site of the Roman Mons Albanus. The town's growth dates from its opening up in 1144 by Count Alphonse of Toulouse as a refuge for serfs. It suffered severely during the Albigensian wars of the thirteenth century. It was an episcopal see from 1317 to 1560, when the inhabitants who had embraced the Protestant faith destroyed the cathedral. As one of the Huguenot strongholds, it was a frequent object of attack. In 1621 it was unsuccessfully besieged by the forces of Louis XIII. for eighty-six days. The fall of La Rochelle in 1629 entailed its submission and the destruction of its fortifications. Ingres, the artist, was born at Montauban. Population, in 1901, 30,506.

MONTAUK, mŏn-ta̤k'. An Algonquian tribe formerly inhabiting the eastern end of Long Island, and claiming sovereignty over most of the other tribes of the island. Their principal village was near Montauk Point. When first known they were a numerous people, but having been reduced by a pestilence in 1658 to about 500 souls, they were invaded by the Narragansett from the mainland and forced to seek shelter among the white settlers at Easthampton. A century later only 162 remained. Many of these joined a kindred band in New York about 1788, and in 1829 only about 30 were left on Long Island. By 1870 these had dwindled to about a half dozen.

MONTAUK POINT. A promontory at the eastern end of Long Island, in Suffolk County, N. Y. (Map: New York, J 5). On it are located a stone lighthouse, 170 feet high, with a flashing white light; a Daboll fog-trumpet; and a United States life-saving station. The Point was named after the Montauk Indians, who once inhabited the region.

MONTAUSIER, môɴ'tȯ'zyȧ', CHARLES DE SAINTE-MAURE, Marquis de (1610-90). A French soldier. He was educated at Sedan, rose rapidly in the army, and in 1645 became Governor of Saintonge and Angoumois. He was a patron of Boileau and Racine, and was famed for his brusque manners and his austere piety. It is supposed that he was the original of Molière's *Misanthrope*. He was the long-time suitor of Mlle. de Rambouillet, first dame d'honneur, whom he married and for whom he prepared the *Guirlande de Julie*, a book of unpublished autograph verse by various authors. Montausier was guardian of the Dauphin (1668-79).

MONTBÉLIARD, môɴ'bā'lyär'. The capital of an arrondissement in the Department of Doubs, France, 9 miles southwest of Belfort (Map: France, N 4). It lies in a valley between the Vosges and Jura mountains, at the confluence of the Allaine and the Lisaine, and on the Rhone-Rhine Canal. The strikingly situated castle, dating from the fifteenth century and largely rebuilt in the eighteenth century, was an important German post during the battle of Héricourt in 1871. There are various fortifications in addition to the castle. Among several public statues there is one to Cuvier, the naturalist, born here in 1769. The principal industries are watchmaking and the manufacture of hardware, silk and cotton goods, and agricultural instruments. Wine, leather, cheese, and the famous 'Montbéliard cows' are exported. Montbéliard belonged to Württemberg from the close of the fourteenth century (with intermissions) down to the time of the French Revolutionary wars. Population, in 1900, 10,034, chiefly Protestants.

MONT BLANC, môɴ bläɴ (Fr., White Mountain). The highest mountain in Europe outside of the Caucasus. It forms with the bordering heights an independent elongated ridge of the Western Alps, on the boundary between France (Savoy) and Italy (Piedmont) (Map: France, N 6). It is situated a short distance west of the Pennine Alps and north of the Graian Alps, about 40 miles south of Lake Geneva. It is composed of crystalline strata which exhibit the fan-shaped arrangement characteristic of Alpine peaks. The highest point (15,781 feet), generally known as Mont Blanc, is in France, 7 miles south of the Swiss boundary. It is covered by an immense cap of ice more than 75 feet thick, from which glaciers extend downward in all directions, feeding the tributaries of the Rhone on the north and of the Po on the south. The largest glaciers run northward into the Valley of Chamonix —the chief being the Glacier du Géant, which extends almost to the bottom of the valley, and is known in its lower course as the Mer de Glace. The line of perpetual snow is at an altitude of 8600 feet. The summit is surrounded by a series of lower, steep and needle-like crags (*aiguilles*), and the ascent is dangerous and fatiguing, many persons having perished in the attempt. The first ascent was made in 1786 by the guide Balmat, induced by a prize offered by the scientist Saussure, who himself accomplished the ascent the following year and made some of the earliest scientific observations in high altitudes. The summit is now ascended by large numbers of tourists every year. Two meteorological and astronomical observatories are located on Mont Blanc, one built in 1890 at an altitude of 14,324 feet, the other built in 1893 on the summit. Consult: Doblhoff, *Der Montblanc* (Vienna, 1880); Güssfeldt, *Der Montblanc* (Berlin, 1894); Duparc, *Le Montblanc, au point de vue géologique et petrographique* (Geneva, 1896); Durier, *Le Montblanc* (4th ed., Paris, 1897); Mathews, *The Annals of Mont Blanc* (London, 1898); Whymper, *Chamonix and the Range of Montblanc* (7th ed., London, 1902); and the authorities referred to under MOUNTAIN CLIMBING.

MONTCALM DE SAINT-VÉRAN, môɴ-kȧlm' de săɴ vȧ'räɴ', LOUIS JOSEPH, Marquis de (1712-59). A distinguished French general in America. He was born at Candiac, near Nîmes, February 29, 1712, and entered the army at the age of fourteen. At eighteen he was a captain. He served in Italy and Germany for many years. and was wounded at the battle of Piacenza in 1746. In May, 1756, he was sent to Canada to command the French forces. He captured Fort Ontario at Oswego in August of the same year. The next year he forced the capitulation of Fort William Henry at the head of Lake George, with an English garrison of 2500 men, capturing 42 guns and a large amount of stores. In 1758 he defended Fort Ticonderoga with 3600 Canadians against General Abercromby at the head of 15,000 English, repulsing the latter after a determined attack (July 8th). Lack of troops, ammunition, and provisions, and the large reënforcements of the English, obliged Montcalm to retire all his forces the following year to Quebec, which was menaced by a powerful army under General Wolfe. Ill supported by the French Government and forced to cope with disaffection among the authorities in Canada, Montcalm foresaw the ultimate downfall of the French power in America, but prepared to meet it with a heroic determination which has lent so much romantic interest to his last days. The struggle around Quebec began July 31, 1759, and the siege continued for six weeks until Wolfe's scaling of the Heights of Abraham above the city tempted the French to a battle in the field, in which the English were victorious, September 13, 1759. Wolfe fell dead in the moment of victory, and Montcalm was borne from the field mortally wounded and died the following day. The city was surrendered a few days after his death, and its fall signalized the end of the French power in Canada. In 1827 Governor Dalhousie, of Canada, caused a monument to be erected in Quebec to the joint honor of the two brave generals. The best work on Montcalm is by Parkman, *Montcalm and Wolfe* (Boston, 1885). Consult also: Bonnechose, *Montcalm et le Canada français* (Paris, 1877); Falgairolle, *Montcalm devant la postérité* (ib., 1886).

MONTCEAU-LES-MINES, môɴ'sō'lȧ'mēn'. A town of Eastern France, in the Department of Saône-et-Loire, situated on the Canal du Centre, 31 miles northwest of Mâcon. It is the centre of a coal-mining region and has iron foundries, machine shops, spinning and weaving factories. Population, in 1901, 9327; of commune, 28,779.

MONT CENIS, môɴ se-nē'. See CENIS, MONT.

MONTCHRESTIEN, môɴ'krȧ'tyăɴ', ANTOINE DE (c.1576-1621). A French playwright and economist. His father was an apothecary. Having left his birthplace, Falaise, the lad went to the College of Caen. In 1596 he published the tragedy of *Sophonisbe*, which was followed by *L'Ecossaise, ou Marie Stuart*, *Les Lacènes*, *David*, *Aman*, a revision of *Sophonisbe* called *La Carthaginoise*, and *Hector* (1604). Meanwhile Montchrestien was working on a history of Normandy, which was never printed and is now lost. A duel caused him to flee to England, whence he returned with a headful of economic theories. He started a steel mill at Aussonne-sur-Loire with a store in Paris. His *Traité d'économie politique* appeared in 1615. Our expression 'political economy' is merely a translation of the phrase coined by Montchrestien. He was slain during a Huguenot stir near Falaise, October 8, 1621. Consult: Duval, *Mémoire sur Antoine de Montchrestien* (Paris, 1868); Funck-Brentano, *Montchrestien, sa vie et son œuvre* (ib., 1889); Sporleder, *Ueber Montchrétiens 'Ecossaise'* (Marburg, 1892); Petit de Julleville, *Les tragédies de Montchrestien* (Paris, 1891).

MONTCLAIR'. A town in Essex County, N. J., 5 miles north by west of Newark, on the Lackawanna Railroad and the Greenwood Lake branch of the Erie Railroad (Map: New Jersey, D 2). It is picturesquely situated on the slope of one of the ranges of the Orange Mountains, its highest point having an elevation of about 650 feet, the average elevation being about 300 feet, and is chiefly a residential town, though of some reputation as a summer resort. The heights command a fine view of New York and its harbor. The town has a hospital, two orphan asylums, a public library of 13,000 volumes, and the Montclair Military Academy. Population, in 1890, 8656; in 1900, 13,962.

Until separately incorporated in 1868, Montclair was a part, first of Newark, and then of Bloomfield. The upper section was settled by Dutchmen from Hackensack and called Speertown, the lower by Englishmen from Newark and called successively Cranetown and West Bloomfield. The present name was not adopted until 1865. Consult Harris, *An Historical Sketch of Montclair* (Montclair, 1881).

MONT-DE-MARSAN, môɴ'de'mȧr'säɴ'. Capital of the Department of Landes, Southwestern France, situated on the Midouze River, 64 miles south of Bordeaux (Map: France, F 8). It has a normal school, a library, and a lycée. The chief manufactures are resins, oil, and plaster, which, together with wine and live stock, are the chief exports. Population, in 1901, 8785; of commune, 11,604.

MONTEBELLO, mōn'tȧ-bĕl'lō. A village in the Province of Pavia, Italy, 12 miles south-southwest of Pavia (Map: Italy, D 3). There on June 9, 1800, the French under Lannes defeated the Austrians. The engagement is sometimes called the battle of Casteggio, after a neighboring town. Five years later the victor received the title of Duke of Montebello. In May, 1859, the Austrians were again defeated here by the united armies of the French and the Piedmontese. Population, in 1901, 2119.

MONTE CARLO, kär'lō. A town in the principality of Monaco (q.v.), picturesquely situated on a beautiful and isolated elevation rising above a bay of the Mediterranean, a little over one mile northeast of Monaco, the capital of the principality (Map: France, O 8). The climate is celebrated for its salubrity and mildness. The town is most attractively laid out as a pleasure resort, and its scenic surroundings are celebrated. The Casino, containing the gaming rooms to which Monte Carlo owes its fame, and the principality its welfare, is a splendid building amid beautiful gardens, and contains besides the *salles de jeu*, a luxuriously appointed *salle des fêtes*, a reading room, etc. The chief games played are roulette and trente-et-quarante, with stakes ranging from 1 to 1200 and from 4 to 2400 dollars respectively. The gaming tables of Monte Carlo are patronized by people from all over the world, but are forbidden to the natives of the principality. The town was founded in 1856, and has been used as a gambling resort since its foundation. In 1863 the Casino was leased for fifty years to M. François Blanc, after whose death the control of the concern passed to the *Société Anonyme des Bains de Mer et Cercle des Etrangers*, capitalized at 30,000,000 francs. The company besides paying the Prince an annual rent of $340,000, pays the expenditure of the Government, maintains the charitable and religious institutions of the principality, takes care of the palace grounds, etc. The magnitude of the operations of the company may be judged from the fact that according to the budget for 1896-97 the expenditures for that season amounted to $4,061,580, of which $633,100 were spent on the maintenance of the Court and the principality, $3,360,300 on the management of the Casino and its adjuncts, and $170,450 on press subvention. The town had, in 1890, 3794 inhabitants, who depend for a living on the patrons of the Casino.

MONTE CASSINO, kås-sĕ'nō. A monastery situated on a hill overlooking Cassino (q.v.) in the Province of Caserta, Italy, 45 miles northwest of Naples (Map: Italy, H 6). It was founded by Saint Benedict about 529 on the site of a temple of Apollo, and was the original home of the Benedictine Order. It underwent various vicissitudes, and the present buildings were erected from 1637 to 1727 on the foundations of several predecessors; they are remarkable for their noble architecture, internal appointments, and beautiful situation. The library and archives are historically famous. In 1866 the monastery was enrolled as a 'national monument.' Consult:

Tosti, *Storia della badia di Montecassino* (Naples, 1842-43); Taeggi, *Paleografia artistica di Montecassino* (Monte Cassino, 1876 et seq.); Rickenbach, *Monte-Cassino von seiner Gründung bis zu seiner höchsten Blüte unter Abt Desiderius* (Einsiedeln, 1884-85).

MONTECATINI DI VAL DI NIEVOLE, mȯn'tȧ-kȧ-tē'nē dē väl dē nē-ā'vō-lȧ. A town in the Province of Lucca, Italy, 24 miles northwest of Florence (Map: Italy, E 4). Its warm baths are much frequented by invalids. Population (commune), in 1901, 8748.

MONTE CRISTI, krĭs'tē. A seaport of the Republic of Santo Domingo, situated on the north coast near the Haitian frontier. The town has a large harbor 7 miles in circumference, and is the station of a United States consular agent. Population, 3000.

MONTE CRISTO, krĭs'tō. A small island off the west coast of Italy, 28 miles south of Elba (Map: Italy, E 5). It consists largely of a mountain of granite, rising 2000 feet above the sea, and was made a penal colony in 1874. Monte Cristo acquired fame through Dumas's novel *The Count of Monte Cristo.*

MONTE CRISTO, The Count of. The most famous romance of Alexandre Dumas (1844-45), founded on Penchet's *A Diamond and a Vengeance.* The hero, Edmond Dantès, is unjustly imprisoned in the Château d'If (q.v.), an island made famous through Dumas's work, escapes, and after gaining a fabulous treasure, pursues with his vengeance those to whom his sufferings were due. The work abounds in melodramatic situations and excitement and attained immediate success.

MONTECUCCOLI, mȯn'tȧ-kōō'kō-lē, or **MONTECUCULI,** mōn'tȧ-kōō'kụ-lē. Raimondo, Count (1609-80). An Austrian general. He was born near Modena, February 21, 1609, and entered the Austrian artillery as a volunteer under his uncle, Ernesto, Count Montecuccoli, in 1625. During the Thirty Years' War he was employed in various services, military and diplomatic. In 1657 he was sent to support John Casimir of Poland against the Swedes and Prince Rákóczy of Transylvania, and compelled Rákóczy to make peace with Poland, and to break his alliance with the Swedes. In the following year he was made a field-marshal, and was sent to aid the Danes against the Swedes, in which also he was eminently successful. In 1660 he commanded the army sent to oppose the Turks, who had broken into Transylvania, and after an indecisive warfare of three years he won the great battle of Saint Gotthard, on the banks of the Raab, August 1, 1664. In the war between France and Holland, in which the Emperor took part with Holland, Montecuccoli was given the command of the Imperial army in 1672. He took Bonn, and notwithstanding the endeavors of Turenne to prevent it, effected a junction with the Prince of Orange. In 1675 he was opposed to Turenne on the Rhine, and they spent four months in manœuvres in which neither could gain any advantage. After the death of Turenne Montecuccoli pursued the French across the Rhine. The Emperor Leopold made him a prince of the Empire, and the King of Naples bestowed on him the Duchy of Melfi. He died at Linz, October 16, 1680. His memoirs were published in French (Amsterdam, 1770), and in the original Italian by Ugo Foscolo (Milan, 1807), and by Grassi (Turin, 1821). Consult, also: Campori, *Raimondo Montecuccoli, la sua famiglia e i suoi tempi* (Florence, 1877); Grossmann, *Raimund Montecuccoli* (Vienna, 1878).

MONTEFIASCONE, mȯn'tȧ-fē-ȧs-kō'nȧ (It., bottle-mountain). A town in the Province of Rome, Italy, nine miles northwest of Viterbo. It is situated three miles from the railway station at an altitude of 2010 feet, commanding a magnificent view. It is surrounded by walls; its chief buildings are the incomplete Cathedral of Santa Margherita, and the early eleventh-century Romanesque-Gothic Church of San Flaviano. Montefiascone is celebrated for its high quality wines. The town dates from the sacred Etruscan Fanum Voltumnæ. Population of commune, in 1901, 9371.

MONTEFIORE, mŏn'tē-fĭ-ō'rē, Claude G. (1858—). An English educator and author. He was born in London of Jewish parents, and was educated at Balliol College, Oxford. He devoted himself to communal work in behalf of London Jews, held various high offices in Jewish institutions in London, and with Israel Abrahams edited the *Jewish Quarterly Review.* Montefiore delivered the Hibbert Lectures for 1892 *On the Origin and Growth of Religion, as Illustrated by the Religion of the Ancient Hebrews.* With Israel Abrahams he wrote *Aspects of Judaism* (2d ed. 1895).

MONTEFIORE, Sir Moses Hayim (1784-1885). A Jewish philanthropist. The scion of a wealthy Anglo-Italian banking family, he was born at Leghorn, Italy. He was educated in London, became a member of the Stock Exchange, and in 1824, having realized a large fortune, retired from commercial pursuits, and commenced a crusade for the amelioration of his race. In 1812 he had married Judith Cohen, a relative of the Rothschild family. He was strenuous in his efforts to remove the civil disabilities of Jews in England, and finally, overcoming great opposition, received the honors of election as High Sheriff of Kent, and in 1837 Sheriff of London and Knighthood, and in 1846 Queen Victoria created him Baronet. From 1827-75 he made seven journeys to the Orient, conferring great benefits on his kindred, and being everywhere received by the rulers with the greatest marks of respect. He spent the last years of his life at Ramsgate, where, in 1865, he had endowed a Jewish college to the memory of his wife, who died in 1862. He died there July 28, 1885, in his 101st year. Consult Loewe (ed.), *Diaries of Sir Moses and Lady Montefiore* (London, 1890).

MONTE'GO BAY. A seaport on the north coast of Jamaica, 18 miles west of Falmouth (Map: West Indies, H 8). It has a good harbor defended by a battery, and a general trade of some importance. A United States agent resides in the town. Population, about 5000.

MONTÉGUT, môɴ'tȧ'gụ'. Jean Baptiste Joseph Emile (1825-95). A French writer and editor, born at Limoges. He practiced law until 1847, when he entered the field of letters by an article in the *Revue des Deux Mondes* on the philosophy of Emerson. Later he translated the works of Emerson, Macaulay, and Shakespeare into French, and it is chiefly because of his introducing these writers to French readers that he is remembered. In 1857 he became an editor of the *Revue des Deux Mondes,* but resigned in 1862 to join the *Moniteur Universel.* Among his writings are: *Les Pays-Bas. Impressions de voyage et d'art* (1869); *L'Angleterre et ses colonies australes* (1879); *Poètes et artistes de l'Italie* (1881); and *Esquisses littéraires* (1893).

MONTELEONE DI CALABRIA, mōn'tȧ-lȧ-ō'nȧ dē kȧ-lä'brē-ȧ. A town in the Province of Catanzaro, Italy, on a hill overlooking, and about two miles from, the Gulf of Santa Eufemia, 13½ miles by rail east of Tropea (Map: Italy, L 9). It is a garrison town and the see of a bishop. Its ruined castle was built by Roger the Norman. It has a trade in silk and oil. Monteleone is on the site of the Greek Hipponium mentioned as early as B.C. 389, and the Roman Vibo Valentia; it was almost destroyed by an earthquake in 1783. Population (commune), in 1881, 12,047; in 1901, 12,997.

MONTÉLIMAR, môɴ'tȧ'lē'mär'. The capital of an arrondissement in the Department of Drôme, France, near the confluence of the Roubron and Jabron, 27 miles by rail south of Valence (Map: France, L 7). It is irregularly built on a castle-crowned hill, commanding fine prospects of the Vivarais Mountains. Among its chief institutions are a chamber of agriculture, a communal college, and a public library. It has sawmills, manufactures of building materials, of silk, cotton, corsets, hats, and spirituous liquors, and is famed for 'Montélimar nougat,' an almond candy. In the vicinity coal and lignite are mined. Montélimar is on the site of the Acusium of the Romans; the thermal spring at Bondonneau, 2½ miles to the southeast, anciently used by them, was rediscovered in 1854. The town was destroyed by the Saracens and rebuilt by Montheil d'Adhémar in the tenth century. Here Calvinism was first embraced in France. Coligny besieged the town unsuccessfully in 1569. Population, in 1901, 13,351.

MONTELUPO, mōn'tȧ-lōō'pō, BACCIO DA (1449-c.1533). An Italian sculptor and architect, born at Montelupo, near Florence. He worked in the style of Verrocchio, and his sculpture shows power and technical ability. He made a fine statue of Saint John the Evangelist for Orsanmichele in Florence; a Hercules for Francesco de' Medici, and a number of crucifixes carved in wood, one of which is to be seen in the Convent of San Marco in Florence.

MONTELUPO, RAFFAELLO DA (1503-c.1567). An Italian sculptor and architect, the son of Baccio da Montelupo. He was a pupil of Michelangelo and assisted him in his works. He made three statues for the tomb of Pope Julius II., and partly built the monuments to Leo X. and Clement VII. in the Church of Santa Maria Sopra Minerva in Rome, besides executing a figure of Saint Damianus in the Medici Chapel in Florence, several bas-reliefs in the Casa Santa at Loreto, and the tomb of Baldassare Turini in the Duomo of Pescia. His last work was in connection with the cathedral at Orvieto, of which he was superintendent. He left part of an autobiography, which is translated in Perkins, *Tuscan Sculptors* (London, 1864).

MONTEMAYOR, mōɴ'tȧ-mȧ-yōr', JORGE DE (c.1515-61). A Spanish poet, born at Montemór-o-Velho, near Coimbra, Portugal. Little is known as to the details of his life. He is thought to have gone to England and to the Netherlands in the train of Philip II. of Spain, and he perished in a duel or was murdered in 1561. With the exception of a couple of songs and a few lines of prose in Portuguese, contained in his famous pastoral romance, he composed wholly in Castilian. His literary renown is based on his unfinished *Diana enamorada,* a work modeled on the Italian pastoral novel. It mingles verse with the prose, and beneath the fiction of the pastoral situation veils the love experiences of the author himself. An English version, made by Bartholomew Young in 1583 (printed in 1598), is of importance because of the influence which it had upon Sidney's *Arcadia.* As Montemayor's romance remained incomplete, several Spanish continuations of it were made. The best is that of Gaspar Gil Polo (1564). Lyrics of Montemayor are to be found not only in the *Diana,* but also in his *Cancionero* (Antwerp, 1544 and later). An edition of Montemayor came out in 1886 at Barcelona. Consult: Schönherr, *Jorge Montemayor, Sein Leben und sein Schäferroman* (Halle, 1886); the *Revue hispanique,* vol. ii., pp. 304 ff. (Paris, 1895); Rennert, *The Spanish Pastoral Romances* (Baltimore, 1892).

MON'TEM CUSTOM, THE. A famous traditional custom at Eton College. Its origin is lost in obscurity; it is described in Malim's *Consuetudinarium* of 1560. Until 1758 its observance took place in January; when it was changed to Whitsun Tuesday, it was held every second or third year, and triennially from 1775, until it was abolished in 1847, owing to the disorder which attended it. It was a procession of the Eton boys, attired in fancy dresses, to a certain mound (*ad montem,* hence the name) known as Salt Hill. They were licensed to levy contributions, known as 'salt,' from every visitor, and the receipts were given to the captain of the day, who kept what was left after the expenses of the festivity were paid to help him in his university career. For a full account, consult Sterry, *Annals of Eton College* (London, 1898).

MONTEMORELOS, mōn'tȧ-mō-rā'lōs. A town of the State of Nueva Leon, Mexico, 42 miles south of Monterey, on the Monterey and Mexican Gulf Railway (Map: Mexico, J 5). It lies in the midst of a fertile irrigated region, celebrated for its production of fruits, especially oranges. Its municipal population, in 1895, was about 3,500.

MONTEN, mōn'ten, DIETRICH (1799-1843). A German battle painter, born at Düsseldorf, where he began to study at the Academy in 1821. In the same year he became a pupil of Peter Hess in Munich, where, after a visit to Italy and study trips in other parts, he made his permanent home. The success of some battle-pieces he exhibited led to his being commissioned to paint in the Arcades of the Royal Garden three historical episodes, but his reputation dates more especially from his "Finis Poloniæ" (1832, National Gallery, Berlin), depicting the departure of the Poles from their country in 1831, a painting which became widely known through lithographic reproductions. Other specimens from his brush include "Death of Gustavus Adolphus at Lützen" (1835, Hanover Museum), and "Napoleon on a Reconnaissance" (New Pinakothek, Munich).

MONTENEGRO, mŏn′tā-nā′grō. An independent principality of Europe, situated in the western part of the Balkan Peninsula (q.v.), between latitudes 41° 55′ and 43° 18′ N., and longitudes 18° 30′ and 20° E. The name Montenegro, given to the country by the Venetians, is a translation of the Slavic Crnagora (pronounced cher-nȧ-gō′rȧ), which signifies Black Mountain. The mountains, however, are not black, but are white or grayish. The name was not known before the reign of Crnojevic, the Black Prince, in the fifteenth century, and he is supposed to have given his name to the mountains. The country is bounded by the Turkish Sanjak of Novibazar on the northeast, by Albania on the southeast, by the Austrian province of Dalmatia on the southwest, and by Herzegovina on the west and north. It has a short sea frontage but no good port on the Adriatic. The area is estimated at 3600 square miles. Montenegro is a part of the great Karst limestone plateau which, beginning in Southern Austria, extends along the east side of the Adriatic through Turkey and Greece. It is crowded with mountains from 2500 to over 8000 feet in height, the highest elevations being in the northeast. Nearly the whole country is covered by the Karst formation and has the peculiarities of similar limestone formations. Looked at from above the land would seem to be honeycombed with cells due to the agency of water. Rivers fully formed suddenly rise out of the rocks and disappear as suddenly. Here they have scooped out wide valleys and there they have merely produced sink holes into which they vanish. Thus large parts of the country have little surface water, and the inhabitants use rain water or snow. The two important rivers are the Zeta and the Morača. The Zeta disappears in a chasm on the plain of Nikšić and reappears miles away at the head of the Zeta Valley, the largest valley and the most fertile part of Montenegro. The Morača flows between stony banks, along which no track leads, and joins the Zeta, and their waters empty into the Lake of Scutari, on the borders of Albania.

Around the shores of the Lake of Scutari is a narrow plain, where agriculture is intensive; but there is no agriculture among the stony wastes of the Karst and no crops are raised excepting in the alluvial valley of the Zeta and some smaller streams and along the coast. Grain, tobacco, potatoes, and other vegetables are grown. The vine and fig thrive also, and the olive is produced along the narrow coastal plain. The mean annual temperature is from 61° in these regions to 35° on the higher parts of the plateau. On the whole the climate is raw excepting in the lowlying river valleys and along the coast. The pasture lands, poor as they are, afford grazing for cattle, goats, and sheep, which are the chief riches of the country. There are about 500,000 sheep and goats, 60,000 cattle, 8000 swine, and 3000 horses.

The flora, though sparse on the whole, includes a considerable variety, on account of the diversity of climate. Practically all the useful plants the people require are grown. Scattering beeches and oak trees are about all that relieve the monotony of the mountains except in the still almost inaccessible north, where fine oak, beech, and pine forests are found. The fauna includes the bear, wolf, and fox, and a considerable number of aquatic and other birds. The most important fish is the bleax, a considerable quantity of which is exported.

The people were estimated in 1898 to number 228,000. They are thinly scattered over the lower grounds, and on the slopes of the hills their rude stone huts with one door, one window, and roof of straw, stand at intervals of about a quarter of a mile; around them are little patches of wheat, barley, and potatoes. The settlements are connected with one another by bridle tracks about three feet broad winding over limestone boulders and covered with a loose sliding surface of limestone blocks of all sizes. Such is the characteristic aspect of the settled parts of Montenegro outside of the towns. There are no roads excepting a few recently built which connect Cetinje, Podgoritza (Podgorica) and Nikšić with one another and the coasts. The Montenegrins have not desired roads, and for ages took care not to construct them because they feared they would open their country. The Montenegrins are an offshoot of the Servian branch of the Slavic race. Physically they are among the largest and finest people in Europe and the conditions of their mountain life in a poor country have developed peculiarities that make them easily distinguishable from the Servians. They are a race of warriors, always ready to take arms against external encroachments and equally ready to defend at home what they regard as their personal rights. They have thus the reputation of being excitable, quarrelsome, and violent, but every man, even the poorest, has the bearing and dignity of a gentleman. Theft is unknown, and drunkenness almost unheard of. A recent report from a town official said that the only persons who had been in the prison for a half year were five men who had told ghost stories which were prejudicial to public morality. Women are universally respected. A woman may go in safety anywhere in the country.

Elementary education is free and nominally compulsory, though many of the women cannot read. The Montenegrins, who comprise about nine-tenths of the population, are members of the Orthodox Greek Church, their metropolitan obtaining his commission from the Holy Synod in Russia. The remainder of the inhabitants (Albanians and Serbs) are either Roman Catholics or Mohammedans. Though the government is nominally called a limited monarchy, it is actually a mild paternal despotism depending on the will of the Prince, who fills all executive offices; under the present régime only the best men are found filling every grade of offices throughout the country. The Prince is assisted by a State Council of eight members, half chosen by himself and the remainder elected by men of military age. The country also has a complete system of local government. There are several hundred village councils elected every three years, levying taxes, distributing charities, and appointing supervisors of education. Women are permitted to speak in the town meetings on public affairs, but are not allowed to vote.

There is no standing army, but all men physically fitted are trained as soldiers and liable to be called to arms, the militia numbering about 35,000 infantry and 1000 artillery. The State revenue, about $250,000 a year, is chiefly derived from customs duties (about $60,000 a year), the salt monopoly, and the land and cattle taxes.

The Prince appropriates half of the revenue, besides having a subvention from the Russian Government. Austrian, Russian, and Turkish money, weights, and measures are in use. The principal towns are Cetinje (q.v.), the capital (which is but a few miles distant from the Dalmatian seaport of Cattaro), Podgoritza, Dulcigno, and Nikšič.

The external trade is so small that it amounts to only about $2.00 per head of the population. For some years past the exports have averaged about $250,000 and the imports about $300,000 a year. The sales abroad are dried fish, insect powder (the two chief exports), smoked sardines, mutton, cattle, goats, sheep, wool, furs and hides, cheese, tobacco, wine, and olive oil. Cattle are shipped to Malta, Austria, Italy, and France. The chief imports are salt from Sicily, petroleum from Russia (both Government monopolies), maize (of which an insufficient quantity is raised at home), cottons, hardware, sugar, coffee, and rice.

History. Montenegro belonged in the Middle Ages to the great Servian kingdom, but after the power of the Servians was broken by the Turks in 1389 at the battle of Kossovo (q.v.), the Montenegrins under their Prince, who was of the royal blood of Servia, maintained their independence, though compelled to relinquish the plains about Scutari, with their chief fortress of Zabliak, and to confine themselves to the mountains (1485). In their warfare against the Turks the Montenegrins leaned upon Venice, mistress of the eastern coast of the Adriatic. In 1516 their last secular Prince resigned his office, and transferred the Government to the Vladika or Bishop, and the secular and ecclesiastical authority was thereafter united in the Prince-Bishop. The dignity of Prince-Bishop was elective; by the side of the chief magistrate was a civil governor. The Ottoman rulers continued to assert their claims to Montenegro, and included it in the Pashalic of Scutari; but the Montenegrins, in their rocky fastnesses, succeeded generally in asserting their independence, and more than once the Moslem invaders met with disaster. In 1696 the office of Vladika ceased to be elective. In that year the present reigning dynasty of Petrovič-Nyeguš was inaugurated in the person of Danilo Petrovič. For a century and a half the succession was from uncle to nephew, the Vladika not being permitted to marry. In 1710 the Montenegrins sought and obtained the protection of Russia, the Czar agreeing to grant them an annual subsidy, while they, on their part, agreed that the Vladika was to be consecrated by the Czar. In 1796 the Prince-Bishop Peter I. defeated the Pasha of Scutari, who had invaded Montenegro, and for the next quarter of a century there were no more Turkish invasions. The Montenegrins rendered important aid to Russia at the beginning of the nineteenth century against the French in Dalmatia, and took a prominent part in the attack on Ragusa and the capture of Curzola, but they were not allowed to realize their dream of becoming masters of the seaport of Cattaro. Peter II., who ruled from 1830 to 1851, made great efforts to civilize his people and improve their condition. He established the Senate, introduced schools, and endeavored, though unsuccessfully, to put an end to internal feuds and predatory expeditions into the neighboring provinces. In 1851 the last Prince-Bishop died, and his successor, Danilo I., in 1852 separated the religious from the secular supremacy, retaining the latter under the title of Gospodar, or Prince. In 1852 war broke out with the Turks, who, under Omer Pasha, invaded the country, but through the intervention of the Powers peace was arranged, February 15, 1853. Danilo went to the Paris Conference in 1856 to obtain recognition of the independence of Montenegro, but his efforts were unavailing. In 1861 the Montenegrins stirred up an insurrection against the Turkish rule in Herzegovina, which was soon suppressed, and in return they were so hard pressed by the Turks that they were glad to agree to a treaty (1862), by which the sovereignty of Turkey over Montenegro was recognized. Fresh complications caused Montenegro to declare war against Turkey in January, 1875, but a compromise was effected. Montenegro, however, supported the insurrection against Turkey that broke out in Herzegovina a little later, and in July, 1876, was again at war. The Montenegrins coöperated with the Russians against their hereditary enemy during the war of 1877-78; and by the Treaty of Berlin (1878) the European Powers recognized the independence of Montenegro with a greatly enlarged territory, including Nikšić, Podgoritza, and the port of Antivari, together with the seaboard district thereto appertaining. This was guarded by a restriction prohibiting Montenegro from having a navy and providing that its waters should be closed to ships of war of all nations. In 1880 the Great Powers made over Dulcigno to Montenegro. The Prince of Montenegro is probably the most absolute sovereign in Europe, the mountaineers of the little State showing the loyalty of clansmen for a chief. In 1879 the Senate was transformed into a State Council. A very close personal and political friendship exists between the reigning House of Montenegro and the Imperial House of Russia. On October 24, 1896, Helena, the third daughter of Prince Nikola I., who ascended the throne in 1860, married Victor Emmanuel, Prince of Naples, who succeeded his father, Humbert, as King of Italy in 1900.

Bibliography. Delarue, *Monténégro, histoire, description, mœurs, etc.* (Paris, 1862); Schwarz, *Montenegro* (2d ed., Leipzig, 1888); Hassert, *Reise durch Montenegro* (Vienna, 1893); id., "Beiträge zur physischen Geographie von Montenegro," in *Petermanns Mitteilungen* (Gotha, 1895); Norman, *The Near East* (London, 1896); Miller, *The Balkans* (London, 1896); id., *Travel and Politics in the Near East* (ib., 1898); and for the history: Andrič, *Geschichte des Fürstentums Montenegro* (Vienna, 1853); Crousse, *La péninsule gréco-slave* (Brussels, 1876); Denton, *Montenegro, Its People and Their History* (London, 1877); Maton, *Histoire du Monténégro* (Paris, 1881); Carr, *Montenegro* (Oxford, 1884); Coquelle, *Histoire du Monténégro et de la Bosnie* (Paris, 1895).

MONTENOTTE, môn'tȧ-nôt'tȧ. A village in the Province of Genoa, Italy, 26 miles west of Genoa (Map: Italy, C 3). Here, on April 12, 1796, Napoleon won his first victory over the Austrians.

MONTÉPIN, môɴ'tȧ'păɴ', Xavier Aymon, Count de (1824-1902). A French writer, born at Apremont (Haut-Saône). He studied at the Ecole des Chartes, entered journalism in 1848, founded *Le Canard,* was a contributor to the antirevolutionary *Pamphlet* and *Lampion*, and with de Calonne published two satirical pamphlets, *Les trois journées de Février* and *Le gouvernement provisoire*. He wrote almost a hundred works of fiction, originally published as feuilletons in the *Petit Journal,* and more than a score of plays. His plays were frequently the result of collaboration, and in several instances were based upon his own stories. Titles of the former include *Les chevaliers du lansquenet* (1847); *L'officier de fortune* (1857); *Le ventriloque* (1876); *Le secret de Titan* (1883); *La policière* (1897); of the latter, *Le conétable de Bourbon* and *Tabarin* (with Grangé, 1873).

MONTEPULCIANO, môn'tȧ-pụl-chä'nō. A town in the Province of Tuscany, Italy, 28 miles southeast of Siena. It is situated six miles from its railway station, at an altitude of 2070 feet, and is a conspicuous feature in the landscape. It is surrounded by mediæval ramparts, has interesting houses, palaces, churches, and a cathedral of the sixteenth century. The town is famous for its wines. Population of commune, in 1901, 15,399.

MONTEREAU, môɴ't'-rō'. A town in the Department of Seine-et-Marne, France, at the confluence of the Seine and Yonne, 49 miles southeast of Paris by rail (Map: France, J 3). Its chief buildings are the parish church, dating from the thirteenth century, and the Château of Surville. Porcelain and coarser pottery, agricultural and other machinery are manufactured, and there are iron foundries, sugar refineries, and a general commerce in agricultural produce and cattle. On the bridge across the river John the Fearless, Duke of Burgundy, was assassinated in 1419, at the instigation and in the presence of the Dauphin, afterwards Charles VII.; and in the immediate vicinity, on February 18, 1814, Napoleon gained his last victory over the Allies, which is commemorated in a bronze equestrian statue of the conqueror, on the bridge, by Pajol, son of a general who commanded in the battle. Population, in 1900, 7929.

MONTEREY, môn'tȧ-rā'. The capital of the State of Nuevo León, Mexico, situated 1600 feet above sea-level, 160 miles west of Matamoros (Map: Mexico, J 5). It is a handsome city with well-paved and clean streets, and is surrounded by beautiful gardens and orchards. The town has a fine cathedral and Government buildings, and among its educational institutions are schools of law and medicine, and a theological seminary. It is an important railroad junction and carries on an active trade, especially with the United States. It has a number of considerable manufacturing establishments, including foundries, sawmills, carriage factories, flour mills, breweries, and a large factory for woolen goods. There is also a growing interest in silver mining; a large smelting plant is in operation. Population, in 1895, 45,695; of the municipality, 56,326; in 1900 the municipality had a population of 72,250. Monterey was founded under the name of León in 1581, and received its present name in 1599. See Monterey, Battle of.

MONTEREY. A city in Monterey County, Cal., 120 miles south by east of San Francisco; on Monterey Bay, opening into the Pacific Ocean, and on the Southern Pacific Railroad (Map: California, B 3). The leading industries are farming, cattle-raising, and fishing, but Monterey is most important as a resort. It has an admirable site with beautiful surroundings, a climate remarkably mild and equable, and fine facilities for bathing. There are interesting specimens of the picturesque architecture left from the Spanish occupation. The city possesses a public library, and among the many points of interest are the San Carlos Mission, the old custom house, and Colton Hall, in which the convention in 1849 met to frame the State Constitution. Population, in 1890, 1662; in 1900, 1748.

In 1770 the Spanish established here the mission and presidio of San Carlos Borromeo de Monterey. In 1818 the place was captured by insurgents. From 1840 to 1845 it was the capital of the province. It was captured and held for a day in 1842 by Commodore Jones (U. S. N.), acting under the impression that war had broken out between Mexico and the United States. In 1846 (July 7) the American flag was raised here by Commodore Sloat, and in 1847 Monterey became the seat of the military Government of California. The State Constitutional Convention was held here in 1849, and the city was incorporated in the following year.

MONTEREY, Battle of. After the battles of Palo Alto and Resaca de la Palma (qq.v.), during the war between the United States and Mexico, General Taylor remained for some time at Matamoros, and in September, 1846, with a force of about 6700 men proceeded against Monterey, then strongly fortified and defended by about 10,000 Mexicans under General Ampudia. On September 19th he arrived before the city, and on the 21st simultaneous attacks were made by Generals Worth and Garland on the fortified heights west of the city, and the redoubts on the east respectively. The former succeeded, but the latter was repulsed with considerable loss. The fighting continued on the 22d and 23d, General Worth entering from the west and driving the Mexicans before him until they reached a strongly fortified position in the middle of the city. General Ampudia then made overtures of surrender, and on the 24th the terms were finally agreed upon. The Mexicans were to march out of Monterey with their small arms and accoutrements, one field battery, and twenty-one rounds of ammunition, seven days being allowed them to evacuate; a mutual armistice of eight weeks was agreed upon; and the munitions of war and supplies, together with the city and its fortifications, were to be left in the hands of the Americans. Much dissatisfaction was expressed in the United States, and even by the Administration at Washington, when the terms of this 'capitulation' became known, but Taylor fully justified his apparent leniency. During the three days the Americans lost more than 500 in killed and wounded, the Mexicans a very much larger number, though the exact figures have never been determined. Consult: Bancroft, *History of Mexico*, vol. v. (San Francisco, 1885); and Howard, *General Taylor* (New York, 1892).

MONTE ROSA, môn'tȧ rō'zȧ. Next to Mont Blanc the highest peak in the Alps. It is situated on the boundary between Italy and the Swiss Canton of Valais, where the Pennine and the Lepontine Alps meet (Map: Italy, B 2). It has eight principal peaks, all exceeding 13,000 feet in height, and the highest, the Dufour Spitze, attaining an altitude of 15,217 feet, 564 feet less than that of Mont Blanc. It is covered with glaciers on all sides, and has an abrupt, almost precipitous slope on the east, while on the west the great Gorner Glacier slopes more gradually toward the base of the Matterhorn. The main structure of the mountain is gneiss, while the upper parts consist of mica-slate. Iron, copper, and gold are found, and several mines are worked, one at an altitude of 11,000 feet. The passes over the chain near Monte Rosa are among the loftiest and most difficult in the Alps, and the peak itself is very difficult of ascent. The feat was first accomplished by the Smith brothers in 1855.

MONTESA, môn-tā′sȧ, ORDER OF OUR LADY OF. An order founded in 1317 by James II. of Aragon to take the place of the Templars after their dissolution. The city and Castle of Montesa in Valencia were given to it and it was endowed with the property formerly belonging to the Templars. It acknowledged the Order of Calatrava as its superior. In 1587 it was united with the Spanish Crown and is now a Court order with two classes.

MONTE SAN GIULIANO, môn′tȧ sȧn jōō-lyä′nȯ. A town in the Province of Trapani, Sicily, situated on a high mountain, four miles northeast of the town of Trapani (Map: Italy, G 9). On the mountain (anciently Eryx) are the remains of a famous temple of Venus. The town has a church dating from the fourteenth century, and remains of numerous ancient buildings. There are oil works and marble pits. Population (commune), in 1881, 21,388; in 1901, 28,939.

MONTESANO, mŏn′tė-sā′nȯ. A town and the county-seat of Chehalis County, Wash., 48 miles west by south of Olympia; at the head of tidewater navigation on the Chehalis River, and on the Northern Pacific Railroad (Map: Washington, B 2). It is in a lumbering and farming district, and has salmon fisheries, a creamery, and manufactories of furniture, shingles, sash and doors, sawed lumber, etc. There is a salmon hatchery on the Chehalis River, three miles above the town. Population, in 1890, 1632; in 1900, 1194.

MONTE SANT'ANGELO, môn′tȧ sänt-än′jȧ-lȯ. A town in the Province of Foggia, Italy, situated 27 miles northeast of Foggia, on one of the Gargano group of mountains, at a height of 2765 feet (Map: Italy, L 6). The Church of Saint Michael is a place of pilgrimage. Population (commune), in 1881, 19,234; in 1901, 21,870.

MONTESINOS, mōn′tȧ-sē′nȯs, FERNANDO (c. 1593-c.1655). A Spanish historian. In his youth he went to Peru, and eventually became a member of the Supreme Administrative Council at Lima. While employed in this capacity he visited different parts of Peru, studying Peruvian history. The fruits of his archæological research appeared in two historical works, the *Memorias antiguas historiales del Perú*, which was translated into French in 1849 by Ternaux-Compans and the *Anales Nuevas del Perú*.

MONTESPAN, môɴ′t′-späɴ′, FRANÇOISE ATHÉNAÏS DE ROCHECHOUART DE MORTEMART, Marquise de (1641-1707). Mistress of Louis XIV. She was born at the Château of Tonnay-Charente, the second daughter of the Duke of Mortemart. She was the wittiest and most beautiful member of a family renowned for its wit and beauty, and soon became the most popular of the Queen's ladies-in-waiting at Versailles. She married the Marquis de Montespan in 1663 and lived unhappily with him ever afterwards. About 1668 she became the King's mistress, sharing her power for some years with La Vallière (q.v.), whom she finally supplanted. Till 1678 she ruled the King and the Court, dictated matters of policy, and was uncrowned Queen of France. From that time on she was gradually supplanted in the King's affections by Mme. de Maintenon, whom she had hired as governess for the children she had borne the King. She left Court about 1690, wandered disconsolately over France, and finally found peace in a convent. Of her children by the King the best known were the Duke de Maine, the Count de Toulouse, Mademoiselle de Nantes, and Mademoiselle de Blois, who married the subsequent Regent Orléans.

MONTESQUIEU, môɴ′t′s-kyẽ′, CHARLES DE SECONDAT, Baron de la Brède de (1689-1755). One of the most celebrated politico-philosophical writers of France. He was born January 18, 1689, at his father's Château of Brède, near Bordeaux, of a distinguished family of Guienne and one noted for the number of eminent lawyers it produced. He was a brilliant, versatile scholar, illuminating his solid legal attainments by an ardent love of the classics and of science. In 1714 he was appointed a Councilor of the Parlement of Bordeaux, and two years after president of the Parlement. He cared nothing, however, for the routine of legal practice or for the requirements of official duty, and as his fortune was ample he was enabled to gratify his taste for study, travel, and observation without hindrance. He was a good deal of a skeptic and free thinker and loose in his morals, but in the field of politics he was the clearest thinker of his time. His first published work was his famous *Lettres persanes* (1721), in which, in the character of a Persian, he ridicules, with exquisite humor and perspicuous criticism, the religious, political, social, and literary life of his countrymen. Although he did not spare the Academy in these letters, he was made a member of it in 1728. In 1726 Montesquieu resigned his office in the Parlement of Bordeaux, and spent some years in foreign countries. In England he spent two years, during which he was much in the company of Lord Chesterfield and other distinguished personages. He was frankly an admirer of the English political system, a fact which appears in his great contribution to political science. After his return to France he published his *Considérations sur les causes de la grandeur et de la décadence des Romains* (1734), a masterly review of Roman history. It was followed after a long interval by his *Dialogues de Sylla et d'Eucrate, et de Lysimaque* (1748), published under an assumed name, in which the motives and feelings of a despot are skillfully analyzed. In the same year appeared his great work, on which he had been engaged for twenty years, the *Esprit des lois*, in which he attempted to discover the relation between the laws of different countries and their local and social circumstances. The book proved immensely popular.

The *Esprit des lois* is one of the classics of political science, one of the path-breaking works in establishing the science of politics upon an historical rather than an *a priori* basis. It has assured Montesquieu a place among the foremost political philosophers of all times. Without adopting Voltaire's hyper-eulogistic criticism, that "when the human race had lost their charters, Montesquieu rediscovered and restored them," it may be said that it was the first work in modern times in which the questions of civil liberty were ever treated in an enlightened and systematic manner. The *Esprit des lois*, next to Locke's *Essay on Government*, was probably the political work best known to the statesmen of the American Revolution and early constitutional period, and its influence was marked in the discussions attending the adoption of the Constitution. It was bitterly attacked in Montesquieu's own day for its radical attitude in regard to the Church and religion, and for its alleged Anglomania, but it was admired by the reform party in France and by the Moderates of the French Revolution, though not popular in France in later days. It is divided into thirty-one parts. The first eight deal with laws in general, their nature and principles; the next five with laws relating to offense and defense, political liberty, and taxation; the next twelve with laws in relation to climate, soil, manners and customs, commerce, population, and religion; the twenty-sixth deals with laws in their relation to the affairs which they determine; the remaining five books, relating to Roman, French, and feudal law, are a kind of historical supplement. Montesquieu died in Paris, February 10, 1755. The collective editions of his works are numerous. The best is that of Laboulaye in 7 vols. (Paris, 1875-79). All of his important works have been translated in numerous editions. The best short work on Montesquieu is Sorel, *Montesquieu*, trans. by Masson (London, 1887); the standard authority is Vian, *Histoire de la vie et des œuvres de Montesquieu* (Paris, 1879). There are good essays by Doumic, Brunetière, and Zevort. Consult, also, Lowell, *Eve of the French Revolution* (Boston, 1892).

MONTESQUIOU-FÉZENSAC, môɴ′t'skė′-o͞o′ fȧ′zäɴ′sȧk′, Robert, Count de (1855—). A French poet and author, born in Paris. His first verse, in the volume *Les chauves-souris* (1892), attracted considerable attention, because of its unusual form, imaginative quality, and a certain fastidiousness of language, characteristics which appear in all his writings. His poetical works include: *Le chef des odeurs suaves* (1893); *Le parcours du rêve au souvenir* (1895); *Les hortensias bleus* (1896); *Les perles rouges* (1899); *Les paons* (1901); and *Prières pour tous* (1901). He also became well known as a 'conférencier du salon,' and in this capacity he visited the United States in 1903. His prose essays are contained in *Roseaux pensants* (1897), and *Autels privilégiés* (1899).

MONTEVERDE, mȯn′tȧ-vâr′dȧ, or **MONTEVERDI**, Claudio (1567-1643). An Italian composer, born at Cremona. He rebelled against the limited and arbitrary musical forms of his day, and made valuable innovations. Before then, 'preparation' was considered a necessity for every dissonance; but Monteverde attacked directly, without preparation, the dissonances of the chords of the dominant seventh, the leading tone seventh, the diminished seventh, and in some instances the chord of the dominant ninth. He was a pioneer in the movement that led to modern opera. He improved and enlarged the orchestra, and in his operas gave to the instruments a score comparatively free from the limitation of the voice parts; an innovation which gained for him the title of 'the father of the art of instrumentation.' But few of his works survive, and while one or two of the smaller pieces, madrigals, etc., have been republished within comparatively recent times, the few really representative works that remain are in the possession of museums or collectors. His works consisted in part of: *Orfeo* (1603); *Arianna* (1608); *Il combattimento di Tancredi e Clorinda* (1624); *Proserpine rapita* (1630); *Adone* (1639); *Le Nozze di Enea con Lavinia* (1641); *Il ritorno d'Ulisse in patria* (1642); songs, motets, church music, and vespers. During his career he was maestro to the Duke of Mantua (1603), and maestro di capella at San Marco, Venice (1613). He died in Venice. See Opera.

MONTEVERDE, Giulio (1837—). An Italian sculptor, born at Bistagno (Piedmont). He studied at the Academy of Rome, where he afterwards became professor of sculpture. His works include the groups "The Genius of Franklin" and "Jenner Inoculating His Daughter," the monument to Victor Emmanuel, in the Pantheon at Rome, and the statue "The First Inspiration of Columbus," in the Art Museum at Boston.

MONTEVIDEO, mŏn′tė-vĭd′ė-ô, *Sp. pron.* mȯn′tȧ-vē-ᴅā′ȯ. The capital of Uruguay, situated on the north shore of the estuary of the Rio de la Plata, 68 miles east of Buenos Ayres (Map: Uruguay, F 11). It is built on a peninsula running westward from the mainland, and inclosing the bay forming the harbor. On the west side of the entrance to the bay, opposite the city, rises the Cerro, a picturesque mountain, in connection with which the name Montevideo is derived. The ground of the peninsula rises gradually from the water on either side to the central bridge, giving the city, besides an imposing appearance, an excellent natural drainage, which, together with its pleasant climate, good water supply, sewerage system, and general sanitary conditions, make it a very healthful place of residence. The streets are wide, straight, and well paved, and are regularly laid out both in the new and the old quarters. The latter occupies the western end of the peninsula, and is the chief commercial quarter. The central portion, occupying the eastern end of the peninsula, contains the cathedral and the chief public buildings. From the base of the peninsula the new parts of the city spread out like a fan over the heights of the mainland, with large avenues radiating in all directions, along nearly all of which street railway lines run to the suburbs.

The principal street is that of The Eighteenth of July, which runs down the central ridge of the peninsula, and terminates in the Plaza de la Independiencia, the principal square of the city, surrounded by prominent buildings and colonnades. There are several other squares, some of which have gardens and statues. Many of the streets are lined with shade trees, and the Prado, outside of the city, is a handsome park and promenade. The cathedral is a large and conspicuous, though not very artistic structure, but the Church of the Immaculate Conception is beautiful. The chief educational institution is the university, with faculties of law, medicine, mathematics, and pharmacy, and (1897) 600 students. There are also a seminary, a normal school, several Catholic and foreign academies, a national museum, a public library, with 29,000 volumes, and a large number of public schools. The manufacturing industries of Montevideo are inconsiderable, and the city is chiefly important as a commercial centre. As an outlet for the products of the south central part of the continent its position is even more favorable than that of Buenos Ayres. In its present condition the bay has become unsuitable for large modern ocean vessels, as it has begun to fill up. The depth at the entrance is only sixteen feet.

In 1899 a plan for harbor improvements involving an expenditure of from $15,000,000 to $20,000,000 was approved by the Government. It contemplates the deepening of the channel and other parts where necessary to 24½ feet at low water, and the building of a careening dock of sufficient depth to hold the largest vessels. In 1898 85 per cent. of the imports and 63 per cent. of the exports of Uruguay passed through the port, the values of the imports and exports of the city being respectively $21,135,967 and $19,272,554. The principal exports are hides, preserved beef, and other cattle, as well as agricultural products. In 1899, 3974 vessels, aggregating 4,105,102 tons, entered the port. The population of Montevideo has grown almost wholly during the last half century, the increase being chiefly due to immigration. In 1828 it had a population of 9000; in 1862, 45,765; in 1892, 238,080; and in 1900 it was estimated at 266,000. Nearly one-third of the population are foreigners, the chief nationalities represented being the Italian, Spanish, and Brazilian.

Montevideo owes its origin to a fort built in 1717 by the Viceroy of Buenos Ayres to check the encroachments of the Portuguese. The first settlements of civilians around the fort began in 1726. Its commercial importance was not recognized until fifty years afterwards. In the war of independence the Spaniards maintained possession of it until 1814. In 1828 it was made the capital of the new Republic of Uruguay. Between 1842 and 1851 it was besieged at intervals by Oribe (q.v.), who was supported by the Argentine dictator, Rosas, and has since been disturbed by internal dissensions. It has nevertheless steadily prospered, chiefly owing to its great natural advantages.

Consult: Bordoni, *Montevideo e la repubblica dell' Uruguay* (Milan, 1885); Vincent, *Round and About South Amerіca* (New York, 1890); Childs, *Spanish American Republics* (London, 1891).

MON'TEVID'EO. A village and the county-seat of Chippewa County, Minn., 130 miles west of Minneapolis; at the confluence of the Minnesota and Chippewa rivers, and on the Chicago, Milwaukee and Saint Paul Railroad (Map: Minnesota, C 6). It has a public library, a State high school, and Windom Institute (Congregational), and a public hall building that cost $20,000. The industrial establishments include several grain elevators, flouring mills, cheese factories, and a creamery. There is in the vicinity a fine monument which marks the surrender of the Sioux chief Little Crow in the Indian outbreak of 1862. Population, in 1890, 1437; in 1900, 2146.

MONTEZ, môn'tĕs, Lola. The assumed name of Maria Dolores Eliza Rosanna Gilbert, an adventuress, born probably in Ireland, in 1818 according to some, in 1824 according to her own statement. When very young she married a Captain James, followed him to India, grew weary of him and came back to Europe. She appeared as a danseuse in all the Continental capitals, and attracted a fair amount of notoriety by her beauty and escapades. In 1847 she became the mistress of King Louis I., of Bavaria, who made her Countess of Landsfeld and allowed her to have considerable influence in the government. An insurrection in 1848 drove the King from his throne, and Lola from Munich. She went to London, married Stafford Heald, a guardsman, was divorced from him quickly, and came to America in 1851. She traveled over the country, acting in a play entitled *Lola Montez in Bavaria*, married a number of times, lectured, published books, and finally settled in New York, devoting herself to rescue work. She died at Astoria, Long Island, January 17, 1861. Her writings comprise *The Arts of Beauty*, and *Lectures* (1858), the latter containing an autobiography.

MON'TEZU'MA. A town and the county-seat of Poweshiek County, Ia., 24 miles north by east of Oskaloosa; on the Iowa Central and the Chicago, Rock Island and Pacific railroads (Map: Iowa, E 3). It has a foundry and machine shop, a creamery, and manufactories of buggies, pearl buttons, and screens. There are deposits of coal in the adjacent region, which is engaged chiefly in agriculture, stock-raising, and dairying. Population, in 1890, 1062; in 1900, 1210.

MONTEZUMA, or, more correctly, **MOTECUHZOMA.** The name of two celebrated war chiefs of ancient Mexico. Montezuma I. (1390?-1464) was the son of Huizilihuitl, ruler of Tenochtitlan (Mexico), and during the reigns of his father, his uncle, and his brother, acquired fame as a warrior in numerous expeditions against surrounding tribes. In 1436 he was elected "Emperor," and soon after entered into a war against the town of Chalco to the southeast of Mexico. Chalco was destroyed and many of its inhabitants were carried to Mexico, where they were offered up as sacrifices during the festivities attending the coronation of Montezuma. In this reign the Mexicans extended their conquests to the Gulf of Mexico and the Pacific Ocean. The capital was greatly enlarged and beautified, and a vast system of dams was begun for the protection of the city against inundation.—Montezuma II. (?—1520), the last of the Aztec rulers of Mexico, became "Emperor" in 1502, succeeding his uncle Ahuizotl. His reign began with the usual warlike expedition undertaken with the purpose of obtaining human sacrifices for the royal coronation. Montezuma II. was successful in extending the limits within which the domination of the City of Mexico (Tenochtitlan) was recognized, especially toward the south, his expeditions reaching both Honduras and Nicaragua. The national tradition that Quetzalcoatl, a tribal divinity or hero, would return from the sun-rising, white in color and bearded, rendered the Aztec chieftain's course vacillating and weak when he was informed of the landing of Cortés (q.v.). He tried by diplomacy and gifts to keep the Spaniards away from his city, but refused to fight them until too late to oppose their progress effectively. After Cortés reached the city, Montezuma allowed himself to be detained as a prisoner, his uncertainty as to what should be done paralyzing all action by his warriors until the Spaniards had made their position secure. When the Mexicans refused longer to endure the actions of their Spanish visitors and called upon Montezuma's brother, Cuitlahuatzin, to lead them against the white men, Montezuma, acting presumably under pressure from Cortés, endeavored to quiet the revolt. Failing in this, he was probably killed by the Spaniards, who gave out that he died as a result of a blow from a stone thrown by one of his own people, while he was trying to address them from the roof of the house occupied by the Spaniards (June 27, 1520).

MONTFAUCON, môɴ'fō'kôɴ', Bernard de (1655-1741). A French scholar and antiquary. He was born at the Castle of Soulage in Languedoc; entered the army about 1672, and served under Turenne; but after the death of his mother entered the Benedictine Order (1676) at the Abbey of La Daurade in Toulouse. He went to Paris in 1687 to share in the translation into Latin of the Greek Church fathers and in the great Benedictine patrology, and spent two years (1698-1700) in research in Italy. Among his works are: *Diarium Italicum* (1702); *Palæographia Græca* (1708); *L'antiquité expliquée et representée en figures* (1719-24); and the editions of Athanasius (1693), of Origen's *Hexapla* (1713), and of John Chrysostom (1718-34). Consult De Broglie, *Bernard de Montfaucon et les Bernardins* (Paris, 1891).

MONTFERRAT, môɴ'fe-rä' (It. *Monferrato*). Formerly, an independent duchy of Italy, bounded by the territory of Genoa, the Po, and the Maritime Alps. It was divided into upper and lower Montferrat, the former including the cities of Mondovi, Acqui, and Alba; the latter, Alessandria, Asti, and Casale. The capital was Casale. Montferrat, after the disruption of the Frankish empire, was ruled by its own margraves or marquises till the beginning of the fourteenth century. This house for a long time disputed the sovereignty of Piedmont with the rulers of Savoy. Some of its members, notably Boniface II. (q.v.), became celebrated in connection with the Crusades. On the death of Marquis John I., in 1305, the second son of his sister, Iolande or Irene, who was Empress of Constantinople, succeeded to Montferrat, becoming the founder of the family of Montferrat-Palæologus, which became extinct in 1533, when Montferrat passed in 1536 to the Gonzagas of Mantua, for whom it was erected into a duchy. In 1631 the dukes of Savoy obtained possession of a portion of Montferrat, and in 1703, with the consent of the German Emperor, the remaining portion passed under their sway, and was incorporated with their dominions.

MONTFORT, môɴ'fôr' (Montfort l'Amaury). The name of a noble French house, descended from the early counts of Hainault. It took its name from a castle on a 'strong mount' between Paris and Chartres. The first member of importance was Simon III., Count of Montfort l'Amaury and Evreux, who married Amicia, sister of Robert Beaumont, Earl of Leicester. His second son was the famous Simon de Montfort, Count of Toulouse. This nobleman, so conspicuous in the crusade against the Albigenses (q.v.), was born about the year 1150. In 1198 he went to Palestine at the head of a troop of French knights, but failed to accomplish anything against the Saracens, and was obliged to return. In 1202 he joined the fourth Crusade, which, however, was soon diverted from its purpose (see Crusade), in consequence of which Montfort abandoned it and went to the Holy Land, where he did some fighting against the infidels. In 1208 he engaged in the war against the Albigenses, and signalized himself by his relentless ferocity and his brilliant successes. He was invested with the territories of the leader of the Albigenses, Count Raymond VII. of Toulouse. He was killed by a stone at the siege of Toulouse, June 25, 1218. His son Amaury continued the struggle, lost nearly his whole patrimony, but was recompensed by Louis VIII., who made him Constable of France. He died about 1241. The brother of Amaury was the Simon de Montfort (q.v.) famous in English history.

MONT'FORT, Simon de, Earl of Leicester (c.1208-65). A famous English statesman. He was the third son of Simon de Montfort (see Montfort), the leader in the Crusade against the Albigenses, and was born in France. He inherited the title of Earl of Leicester from his grandmother, Amicia de Beaumont, sister and heiress of Robert, Earl of Leicester. In 1231 Simon received the lands which his father had held, his elder brother Amaury having resigned his claim to him. In 1238 he married Eleanor, sister of King Henry III., and the youthful widow of the Earl of Pembroke. In 1239 he received the title of Earl of Leicester. In 1248 he was sent by the King to undertake the command in Gascony. He held this office until 1252, amid constant revolts; was charged with having governed badly, and quarreled frequently with the King; but he was supported by the nobles in England. After his resignation Henry III. was soon compelled to ask his aid. It is probable that he was a stern, ruthless, but not an unjust governor. In 1258 the King's debts were so great and the rapacity of his foreign relatives so unbearable, that the people were in a state of insurrection. The barons assembled, and under the direction of Montfort held the celebrated Parliament at Oxford. They passed statutes to enforce the provisions of Magna Charta, and from this resulted the Provisions of Oxford (q.v.), and a little later followed the Provisions of Westminster (q.v.). The King swore to observe them, but sent forthwith to the Pope praying to be absolved from his oath. The bull of absolution arrived. Henry set his barons at defiance, and finally both sides agreed to submit the matter in dispute to Louis IX. of France, and he rendered a decision, on January 23, 1264, which upheld Henry III. in all points. (See Mise of Amiens.) The nobles, however, would not accept the decision, and took up arms. They were aided by the whole middle class, who looked up to Montfort as their champion and leader, and the war began with the battle of Northampton. At Lewes (1264) the Royal forces were signally discomfited and the King taken captive. The conditions imposed upon the King were summed up in the Mise of Lewes (q.v.), and Montfort was the real ruler of the kingdom. In summoning a Parliament for 1265 to deliberate upon the measures to be adopted at this great crisis, writs were issued to the sheriffs in 1264 by Montfort directing them to return two knights for each shire, and two citizens for every borough, which is of importance in the development of the representation of the commons as an estate of the realm in Parliament. A second war broke out, after the young Duke of Gloucester deserted the baronial party and joined the King. Prince Edward (afterwards Edward I.) encountered the barons at Evesham with a greatly superior army. When defeat was inevitable, the great leader refused to flee, and fell fighting bravely (August 4, 1265). The death of Montfort filled the whole land with mourning; the people bewailed their dead champion, and the Franciscans pointed to his glorified spirit in heaven, regardless of the fact that on purely political grounds he had been excommunicated in 1264. The influence of Montfort was felt after his death, and his policy, in general, was followed by Edward I. (q.v.). Consult: Devic et Vaissète, *Histoire de Languedoc*, vol. vi. (Toulouse, 1879); Pauli, *Simon de Montfort*, translated by Miss Goodwin (London, 1876); Prothero, *Simon de Montfort* (London, 1877); but especially Bémont, *Simon de Montfort* (Paris, 1884); also Stubbs, *Constitutional History*, vol. ii. (4th ed., Oxford, 1896; Stubbs, *Early Plantagenets* (5th ed.. New York, 1886); and Green, *History of the English People*, vol. i. (London, 1895).

MONTGOLFIER, môɴ'gŏl'fyȧ', Joseph Michel (1740-1810), and Jacques Etienne (1745-99). Two French inventors, born at Vidalon-lez-Annonay in Ardèche. They were the sons of a paper manufacturer, and though Etienne studied architecture, he gave up his profession to take charge of his father's factory, as Joseph had gone into business for himself. The two brothers became interested in aëronautics (q.v.), and their fame rests upon their achievement in making the first successful balloons. For this work Louis XVI. decorated Etienne with the Order of Saint Michel, gave Joseph a pension of 1000 livres, raised their father to the nobility, and later granted the brothers 40.000 francs that they might devote their whole attention to aërial navigation. Their work was interrupted by the Revolution, and during the Reign of Terror Etienne, who had been administrator of his department, was denounced and escaped only through the devotion of his workmen. Napoleon decorated Joseph and appointed him to various offices, and the Institute in 1807 elected him a member of its section of general physics. He made several other inventions of considerable value, among them the parachute, and published *Discours sur l'aérostat* (1783); *Les voyageurs aériens* (1784); and, in collaboration with his brother, *Mémoire sur la machine aérostatique* (1784). Consult Turgan, *Les ballons* (Paris, 1851).

MONTGOMERIE, mŏnt-gŭm'*e*-rĭ, Alexander (c.1556-c.1610). A Scottish poet. He evidently received a scholarly training and for a time held an official position at the Court of James VI. Some years were spent in foreign travel. *The Cherrie and the Slae* (1597), still popular among the Scotch, gives him a conspicuous place in a period of the literature of his country which was without poetic genius. The poem lacks design, but contains many passages of homely beauty. He is also author of some sonnets and a scurrilous poem, entitled *The Flyting Between Montgomery and Polwart* (1621). A collection of his works was published by Laing in 1821, and another, edited by Cranstoun for the Scottish Text Society, appeared in 1887.

MONTGOMERY. The capital of Alabama, and the county-seat of Montgomery County, 180 miles northeast of Mobile; on the Alabama River, at the head of navigation, and on the Mobile and Ohio, the Central of Georgia, the Seaboard Air Line, the Louisville and Nashville, the Atlantic Coast Line, and the Western of Alabama railroads (Map: Alabama, C 3). The city is built on the high river bank, and has many spacious old-fashioned residences and large gardens. Its principal buildings are the State Capitol, a United States Government building, the city hall, court-house, Masonic Temple, and the Carnegie Library. A fine Confederate monument is located on the grounds of the Capitol. Among the charitable and educational institutions are the city infirmary, an orphanage, and a home for widows, a State normal school for colored pupils, and public, State, and Supreme Court (31,000 volumes), and State Board of Health libraries. There are about fifty acres of public parks.

Montgomery has a large cotton market, its annual trade being about 150,000 bales. Owing to its accessibility to timber and deposits of coal and iron, it has developed also into a manufacturing centre of considerable importance. By the census of 1900 it held second rank among the cities of the State, with an invested capital of $2,930,782 and a production valued at $5.035,190. Besides the various establishments representing the cotton industry, there are railroad car and repair shops, foundries and machine shops, carriage and wagon works, confectionery factories, fertilizer factories, marble works, cracker factories, barrel factories, etc.

Under a revised charter of 1897 the government is vested in a mayor, biennially elected, and a city council, which elects or confirms the executive's nominations of all administrative officials. The various municipal departments, with the exception of that of schools, are governed by single heads. The city spends annually in maintenance and operation more than $400,000, the principal items being about $105.000 for interest on debt, $55,000 for the water-works, $40.000 for the police department (including police courts, jails, reformatories, etc.), $30.000 for schools, $30,000 for the fire department, and $20,000 each for municipal lighting and street expenditures. The water-works are owned and operated by the municipality, having been acquired in 1898. The system, which includes 53 miles of mains, cost about $580,000. Population, in 1890, 21,883; in 1900, 30,346.

Montgomery was founded in 1817 as 'New Philadelphia,' and in 1819, with a population of 600, it was consolidated with 'East Alabama Town' as Montgomery. Incorporated in 1837, it supplanted Tuscaloosa as the State capital in 1847. The famous 'Alabama Platform' was adopted here, February 14, 1848, and Montgomery was the seat of the Confederate Government from February to May, 1861. It was occupied by the Union Army April 12, 1865. Consult Powell (editor), *Historic Towns of the Southern States* (New York, 1900).

MONTGOMERY, FLORENCE (1843—). An English novelist of Irish parentage. Her most popular books are for children or child-lovers; they include: *A Very Simple Story* (1866); *Peggy and Other Tales* (1868); *Misunderstood* (1869); *Thrown Together* (1872); *Thwarted* (1873); *Wild Mike and His Victim* (1874); *Seaforth* (1878); *The Blue Veil* (1883); *Transformed* (1886); *The Fisherman's Daughter* (1888); *Colonel Norton* (1895); *Tony* (1897); and *Prejudged* (1900).

MONTGOMERY, FORT. See FORT MONTGOMERY.

MONTGOMERY, GABRIEL, Count de (1530-74). A French knight of Scottish extraction. He was an officer in the Scottish Life Guard of the King of France, and in a tournament held June 29, 1559, accidentally inflicted a mortal wound on Henry II. Montgomery, although blameless, left France, and soon after embraced Protestantism in England. On the commencement of the religious wars in 1562, he returned to his native country to support the Protestant cause, and defended Rouen with great bravery. In the third civil war he was one of the leaders of the Protestants, and gained many advantages over the Royalists in Languedoc and Béarn. During the massacre of Saint Bartholomew he happened to be at Paris, but fled to England, owing his escape to the fleetness of his horse. In April, 1573, he appeared off Rochelle with a small fleet, but failed in accomplishing anything. Next year, at the head of a band of Huguenots, he landed in Normandy and commenced war there; but being compelled at last to surrender the Castle of Domfront, he was carried to Paris, and was beheaded.

MONTGOMERY, JAMES (1771-1854). An English poet, the son of a Moravian preacher. James Montgomery was born at Irvine, Ayrshire, Scotland, November 4, 1771. At the age of seven he was sent to the Moravian settlement at Fulneck, near Leeds, to prepare for the Moravian ministry. To the annoyance of the Moravians, his leisure at school was employed in the composition of epics on King Alfred and the fall of man. In 1787 he ran away, and after four years of various employment became engaged as clerk to the editor of *The Sheffield Register*. In 1794 he started *The Sheffield Iris*, which he edited till 1825. He was twice fined and imprisoned in York Castle for libel. He afterwards became a moderate Conservative, and in 1835 was granted a Government pension of £150. He died at Sheffield, April 30, 1854. His principal volumes of verse are: *The Wanderer of Switzerland* (1806); *The West Indies* (1809); *The World Before the Flood* (1812); *Greenland* (1819); and *The Pelican Island, and Other Poems* (1826). Montgomery is now chiefly remembered for his hymns (collected in 1853), of which nearly a hundred are still in use. Among them are *Go to Dark Gethsemane*, and *Forever with the Lord*. Montgomery had little depth and drew his observations from books rather than from nature. His fame is kept up not by lovers of literature, but by lovers of religious feeling. Consult: *Lives* by Holland and Everett (London, 1854-56), and by King (ib., 1858); *Poetical Works*, ed. by their author (ib., 1841; reprint 1881), and by Carruthers (Boston, 1860).

MONTGOMERY, JOHN BERRIEN (1794-1873). An American naval officer, born in Allentown, N. J. He entered the Navy as a midshipman in 1812; served in the attack on Kingston, Canada, in November of the same year, and in the capture of York in April of the following year; and for gallantry on board the *Niagara* in Perry's victory on Lake Erie, September 10, 1813, received a vote of thanks and a sword from Congress. In 1815 he served in Decatur's squadron in the war with Algiers, was made a lieutenant in 1818, and commander in 1839. During the Mexican War, in command of the sloop *Portsmouth*, he took possession of various places on the coast of California, blockaded Mazatlan for some months, and, with the assistance of Captain Lavalette in the *Congress*, captured Guaymas. He was made a captain in 1853, commanded the Pacific Squadron in 1860-61, was advanced to the rank of commodore (retired list) in 1862, and became a rear-admiral in 1866.

MONTGOMERY, RICHARD (1736-75). An American soldier, prominent in the French and Indian War and the American Revolution. He was born near Feltrim, Ireland, and was educated at Saint Andrew's College and Trinity College, Dublin. In 1754 he obtained a commission as ensign in the British Army, came to America with his regiment in 1757, during the French and Indian War (q.v.), and displayed personal courage and military sagacity at the siege of Louisburg and in various actions. In 1760 he was made adjutant of his regiment, and in 1762 was promoted to be captain. After the conquest of Canada he took part in the expedition against Havana and Martinique, and in 1765, after being stationed in New York for two years, returned to England, where he remained until 1772, when, selling his commission, he emigrated to New York. In 1775 he represented Dutchess County in the first Provincial Convention, and in June was appointed by Congress brigadier-general in the Continental Army. He was second in command of the expedition sent under General Philip Schuyler against Canada, but owing to the illness of Schuyler, became the actual leader in October. He at once pressed forward, and before the end of November captured successively Chambly, Saint Johns, and Montreal. In the next month he joined Benedict Arnold before Quebec. On December 9th Montgomery was promoted to be major-general. On December 31st, shortly after midnight, the assault upon the town was attempted. Montgomery scaled the Cape Diamond bastion and, pressing forward at the head of his troops, was instantly killed by the first and only volley. The undisciplined colonial troops were then overwhelmed and a precipitate retreat ensued. Montgomery's conduct and character were eulogized in Parliament by Burke, Chatham, and even Lord North; Congress recognized his services by resolutions of respect, and by its order a monument was erected in his honor in front of Saint Paul's Church, New York City, where in 1818 his remains were interred with impressive ceremonies. Consult Armstrong, *Life of Richard Montgomery* (Boston, 1834), in Spark's "American Biography."

MONTGOMERY, Robert (1807-55). An English preacher. He was born in Bath; graduated at Lincoln College, Oxford, in 1833; was ordained in 1835; served as pastor at Whittington, Shropshire, and the Church of Saint Jude in Glasgow, and in 1843 became minister at Percy Chapel, Saint Pancras, London, where he remained for the rest of his life. He was an impressive and successful preacher and very popular, wrote much on theological subjects, and in his later days was interested in works of benevolence. He was most widely known through his numerous poetical compositions, which were extravagantly praised by readers who, enjoying their religious tone and facile versification, overlooked their poetical defects, and were condemned by literary critics like Macaulay, after whose reviews they lost their popularity. Editions of his poems appeared in 1839, 1840, 1841, and 1853.

MONTGOMERY, Sir Robert (1809-87). A British administrator in India. He was born in County Donegal, Ireland, and received his education at Foyle College, Londonderry, and at Wraxall Hall School, North Wiltshire, England. He entered the Bengal civil service in 1827, was actively engaged in organizing the Punjab after the annexation of that province, and at the outbreak of the Sepoy Mutiny was the highest civil officer in its capital city, Lahore. He promptly disarmed the Sepoy garrison, and thus not only saved the Punjab from the horrors which befell the neighboring provinces, but made it a rallying point from which the British began the task of reconquest. In 1858 he became chief commissioner of Oudh, and the next year Lieutenant-Governor of the Punjab. In 1865 he resigned and returned to England, where he was appointed one of the council of the Secretary of State for India. Consult Dodwell and Miles's *Bengal Civil Servants* (London, 1839).

MONTGOM'ERYSHIRE. An inland county of North Wales, between Shropshire on the east and the Welsh counties Merioneth and Cardigan on the west (Map: England, C 4). Area, 797 square miles; almost wholly mountainous. The mineral wealth is not great, but copper, lead, and zinc are obtained; and millstones, slates, and limestone are quarried. The uplands provide pasturage and cattle; sheep and the pure breed of Welsh ponies called 'merlins' are reared. The Welsh flannel manufacture is extensively carried on in the county. The capital is Montgomery, but the county business is carried on at Welshpool and Newton alternately. Population, in 1891, 58,000; in 1901, 54,900.

MONTH (AS. *mōnaþ*, Goth. *mēnōþs*, OHG. *mānōd*, Ger. *Monat;* connected with OIr. *mī*, Lett. *mēnes*, Lat. *mensis*, Gk. *μήν*, *mēn*, month, Skt. *mās*, moon, month, probably from Skt. *mā*, to measure, and ultimately connected with Eng. *moon*). Originally the period of the moon's revolution round the earth. If this is reckoned from the position of the moon among the stars to her return to the same position, the period is called a *sidereal* month, and averages 27 days, 7 hours, 43 minutes, 11½ seconds in length; but if from new moon to new moon, it is longer, being on the average 29 days, 12 hours, 44 minutes, 3 seconds; this is called a *synodic* month. (See Moon.) The latter period forms one of the three natural measures of the lapse of time, and ranks next to the day in importance. There are several other periods used by astronomers to which the name 'month' is applied, as the *nodal* month (27 days, 5 hours, 5 minutes, 36 seconds), from ascending node to ascending node (see Nodes); the *anomaslistic* month (27 days, 13 hours, 18 minutes, 37 seconds), from perigee to perigee; and the *solar* month, which is the twelfth part of a solar year, consisting of 30 days, 10 hours, 29 minutes, and 4 seconds. Distinct from all these is the *civil* or *calendar* month, fixed by law for ordinary purposes, and consisting of a fixed number of days—from 28 to 31—according to the particular month. The calendar months, with the number of days belonging to each, are as follows:

		Days
1.	January	31
2.	February	28
	“ (leap years)	29
3.	March	31
4.	April	30
5.	May	31
6.	June	30
7.	July	31
8.	August	31
9.	September	30
10.	October	31
11.	November	30
12.	December	31

The names by which the months are designated throughout Christendom were given them by the Romans. In the earliest time the number of Roman months seems to have been ten, namely: (1) Martius, (2) Aprilis, (3) Maius, (4) Junius; the remaining six were numbered as the fifth month, sixth month, etc.; (5) Quinctilis, (6) Sextilis, (7) Septembris, (8) Octobris, (9) Novembris, (10) Decembris. The months are thought to have been lunar; but how the year was filled out is unknown. To the time of the kings is ascribed a reform according to which were added two new months, Januarius and Februarius. February had 28 days, March, May, Quinctilis, and October, 31; the rest 29. The sum is 355, being one in excess, seeing 354 days go to the lunar year. The reason for the addition, and for making months of 31 days instead of 30, as usual, is said to have been that luck lies in odd numbers; but this explanation is only the conjecture of an ancient writer. Adjustment with the sidereal year was effected by intercalating two months, respectively of 22 and 23 days, inserted after February 23d, the feast of the Terminalia (and ritual conclusion of the year), added in the course of a four-year period. The odd day still was in excess; moreover, the Pontifices, who were charged with the duty of making the intercalation, were, by reasons superstitious or political, often induced to neglect their task; accordingly, the Roman months were constantly varying from their proper seasonal position and required arbitrary adjustment. In the reform of Julius Cæsar (see Calendar) the ten days additional required to make a true solar year were distributed among the deficient months of 29 days; two each were given to Sextilis, December, and January; one each to April, Quinctilis, September, and November. Hence our present numeration. The year was made to begin with January, shortly after the winter solstice. The month Quinctilis received the name of Julius, and later Sextilis took that of Augustus. The Roman names were adopted throughout Europe. In the French revolutionary calendar (see Calendar) the months received new names, which had reference to the weather, vegetation, and harvest, but these were discarded when the revolutionary calendar went out of use. As to symbolic art, the months have borrowed from the zodiacal signs. (See Zodiac.) In poetry, they have received symbolic representation chiefly on the basis of their seasonal characteristics in Central and Western Europe. Consult: Chambers, *Book of Days*, and Hone, *Everyday Book*. See Calendar; Moon.

MONTH. In law, both solar (or calendar) and lunar months are recognized. At the early common law, where the term was not otherwise defined, it was held to mean the lunar month of 28 days, except in case of commercial paper and other mercantile obligations, when, by the custom of merchants, it was deemed to mean the calendar month of 30 or 31 days. By statute in England the term month, where it occurs in statutes, must be interpreted to mean calendar month, but this does not alter the common law rule as to contracts and other transactions. In the United States generally, the term, unless otherwise defined, is usually construed to mean a calendar month. It is so defined in New York by statute. However, in the interpretation of the word where found in statutes, it seems the common law rule still prevails in some jurisdictions. See Time.

MONTHOLON, môn'tȯ'lôn', Charles Tristan, Marquis de (1783-1853). A French soldier and writer of Napoleonic memoirs. He was descended from an ancient French family and was born in Paris. He displayed great zeal on behalf of the First Consul on the 18th Brumaire in the capacity of *chef d'escadron*, served in a number of campaigns, and was severely wounded at Wagram. Napoleon made him his chamberlain in 1809. He became brigadier-general in 1814, and was appointed to the chief command in the Department of Loire. On Napoleon's abdication, Montholon remained in France, held aloof from the Bourbons, and joined the Emperor on his return from Elba. He was present at Waterloo and accompanied Napoleon to Saint Helena, continuing his devoted attentions to him till he breathed his last, and having been named in his will as one of his trustees, spared no exertion to carry its provisions into effect. For participating in Louis Napoleon's unsuccessful *coup* at Boulogne, in 1840, Montholon was sentenced to twenty years' imprisonment, but was pardoned in 1848. With General Gourgaud he published *Mémoires pour servir à l'histoire de France sous Napoléon écrits à Sainte Hélène sous sa dictée* (1823). He was also the author of *Récits de la captivité de Sainte Hélène* (1847).

MONTH'S MIND. In the Roman Catholic Church, the requiem mass celebrated for a deceased person a month after death, as 'year's mind' was used for an anniversary mass in a similar case.

MONTHYON, môn'tē'ôn'. An incorrect spelling of Montyon (q.v.).

MONTI, mōn'tē, Vincenzo (1754-1828). An Italian poet, born near Fusignano, in the Province of Ferrara, February 19, 1754. He studied jurisprudence very much against his will, being inclined to classical studies. In 1778 he went to Rome and stayed there some time as secretary to Prince Braschi. In 1791 Monti's evident leaning toward the ideas represented by the French Revolution brought him into bad odor, and the feeling against him was hardly allayed by the composition of the *Bassevilliana* (1793), which seemed to show his horror of the excesses due to revolutions. Finally in 1797 Monti fled from Rome and accompanied the French agent, Marmont, to Florence and Bologna. Afterwards at Milan he obtained a position in the government of that region, and when the Cisalpine Republic fell he betook himself to Paris. After Napoleon's victory at Marengo he took the chair of oratory and poetry at the University of Pavia in 1802. By Napoleon's favor he held a position at the Collège de France, where he ended his tragedy, *Caio Gracco*, and began in Dantesque style a poem on the mathematician Mascheroni. When Napoleon became King of Italy, Monti was made historiographer of the realm, an office which he lost in 1814, although he was permitted to retain his professorship. The rest of his life was passed in study, but was saddened by adversity. He died at Milan, October 13, 1828.

The various political changes through which Monti passed reveal themselves in his literary works. The first edition of the lyrics of Monti was the *Saggio di poesie* (Leghorn, 1779); the next the *Versi* (1788). In 1783, or thereabouts, he began the *Feroniade*, a mythological poem in blank verse on the draining of the Pontine marshes. The work was never finished, although the poet spent the last years of his life in elaborating it. One of his most notable poems, because of its perfection of form, was the *Mascheroniana* (1801), in which the spirit of Mascheroni discourses with others of the misfortunes of Italy. To about 1825 belongs the *Sermone sopra la mitologia*, a manifesto in verse in favor of classicism and attacking romanticism. Although his temperament was not eminently dramatic, Monti essayed the drama with some success. The *Aristodemo* was printed at Parma in 1786 and performed at Valle di Roma in 1787. His *Galeotto Manfredi* is really a romantic drama; it was published at Rome in 1788. Monti's most successful dramatic composition is the *Caio Gracco* (Milan, 1802). His translations include versions of the *Satires* of Persius, of a fragment of the *Philoctetes* of Sophocles, and, most notable of all, of the *Iliad*. This last, published at Milan, 1810 and 1812, is pretty true to the tone of the Homeric epic. Monti's prose works are less numerous than his works in verse. Among them are the *Lezioni di eloquenza*, delivered from his chair at Pavia; the *Lettere filologiche;* the *Lettera*, addressed to Bettinelli; and the *Dialoghi*, on true Italian speech. With the aid of his son-in-law, Perticari, he prepared a lexicographical work, the *Proposta di alcune correzioni ed aggiunte da Farsi al vocabolario della Crusca* (Milan, 1817-26). Consult: A. Monti, *Vincenzo Monti, ricerche storiche e letterarie* (Rome, 1873); Cantù, *Monti e l'età che fu sua* (Milan, 1879); Vicchi, *Vincenzo Monti, le lettere e la politica in Italia dal 1750 al 1830*, especially vols. vi.-viii. (Faenza, 1870, and Rome, 1885-87).

MONTIANO Y LUYANDO, mȯn'tė-ä'nȯ ė lo͞o-yän'dȯ, Agustin de (1697-1764). A Spanish poet, born at Valladolid. His first poem, *Robo di Dina*, was written while he was a young man at Majorca. Afterwards he went to Madrid, where he was connected with the Department of State for many years. He was a man of acknowledged authority in literary matters, and was director of the Academy of History, founded in 1738. With the accession of the Bourbon King Philip V. everything French was the fashion, and all Montiano's writings were designed to reorganize Spanish drama on the classic lines of Racine. *Virginia* (1750) and *Athaulpho* (1753), both tragedies, accompanied with introductions setting forth his theories, were too dull ever to be acted.

MONTICELLI, mȯn'tė-chĕl'lė, ADOLPHE (1834-86). A French historical, genre, and portrait painter, born at Marseilles. He was a pupil of the Academy of Fine Arts in his native city, and when a young man went to Paris, where he lived almost continuously until 1870. He then returned to Marseilles and passed there the remainder of his life. During his last years he was demented, his imagination ran riot, and his paintings tended to become chaotic masses of color. His first manner was influenced by his study of the great Venetians, the great Dutch masters, of Delacroix and Diaz. Some splendor from each one of these sources enriched his own palette and brought to his second period remarkable color conceptions and combinations of tints. Like Watteau, he painted 'fêtes galantes,' which are his favorite subjects. In them, figures of gorgeously clothed men and women are grouped beneath splendid trees, or on marble steps, while dogs, horses, and other animals are introduced as accessories. Such a picture is his "Court of Henry III." (1874), a characteristic work. He is quite as effective with an eastern subject, a scene from Boccaccio, in the landscapes of his own province, and in marines; "The Miraculous Draught of Fishes," a remarkable treatment of light effects on water; in still life subjects and in portraits, which have been likened to those of Velazquez. Consult: Gouirand, *Monticelli* (Paris, 1900); Fézensac, "Monticelli," in the *Gazette des Beaux-Arts*, ser. iii., vol. xxv. (Paris, 1901); and Guigou, *Vingt planches d'après les tableaux originaux de Monticelli* (Paris, 1890).

MON'TICEL'LO (It., Little Mountain). The name given by Thomas Jefferson to his residence and estate in Albemarle County, Va., about three miles east of Charlottesville. The mansion, designed by Jefferson himself and first occupied, though then in an unfinished condition, in 1770, stands on the summit of a hill overlooking a large extent of the neighboring country, and was long one of the finest and most picturesque residences in the South. It was Jefferson's home for fifty-six years, but passed out of the hands of his heirs a short time after his death. On the estate Jefferson, his wife, and two daughters were buried.

MONTICELLO. A town and the county-seat of Drew County, Ark., 40 miles west of Arkansas City; on the Saint Louis, Iron Mountain and Southern Railroad (Map: Arkansas, D 4). There are minor manufactures and a considerable trade in fruit, cotton, and lumber. The Arkansas Baptist Orphans' Home is here, also Hinemon University School. Population, in 1890, 1285; in 1900, 1579.

MONTICELLO. A town and the county-seat of Jefferson County, Fla., 30 miles east by north of Tallahassee; on the Savannah, Florida and Western Railroad (Plant System), and the Seaboard Air Line (Map: Florida, E 1). It is interested principally in fruit-growing and agriculture. Population, in 1890, 1218; in 1900, 1076.

MONTICELLO. A city and the county-seat of Piatt County, Ill., 145 miles south by west of Chicago; on the Wabash and the Illinois Central railroads (Map: Illinois, D 3). It is surrounded by a productive farming and stock-raising country, and is of considerable importance as an industrial centre, its manufactures including patent medicines, mail wagons, carriages, cigars, brick and tile, foundry and machine-shop products, etc. Population, in 1890, 1643; in 1900, 1982.

MONTICELLO. A town and the county-seat of White County, Ind., 25 miles north by east of Lafayette; on the Tippecanoe River, and on the Pittsburg, Cincinnati, Chicago and Saint Louis, and the Chicago, Indianapolis and Louisville railroads (Map: Indiana, C 2). Good water power is derived from the river; and there are various manufacturing establishments, the principal of which are flouring mills. The waterworks are owned by the municipality. Population, in 1890, 1518; in 1900, 2107.

MONTICELLO. A village and the county-seat of Sullivan County, N. Y., 40 miles west-northwest of Newburg; the terminus of the Port Jervis, Monticello and New York Railroad (Map: New York, F 4). There are some manufactures, but the village is known principally as a summer resort. Population, in 1890, 1016; in 1900, 1160.

MONTIGNIES-SUR-SAMBRE, môɴ'tė'nyė'-sụr-säɴ'br. A town of Belgium, in the Province of Hainault, situated 30 miles south of Brussels. It is the centre of a coal-mining region, and has machine shops, blast furnaces, rolling mills, and nail factories. Population, in 1890, 15,479; in 1900, 19,126.

MONTIJO, mȯn-tē'ʜȯ, EUGÉNIE-MARIE DE. Empress of the French. See EUGÉNIE-MARIE DE MONTIJO.

MONTILLA, mȯn-tē'lyȧ. A town of Southern Spain, in the Province of Cordova, 23 miles south of Cordova, on the railroad between that city and Malaga (Map: Spain, C 4). It stands on a hillside rising from the south bank of a tributary of the Jenil. Manufactures of coarse linen and earthenware are carried on, and oil-mills are in operation. A famous white wine is produced in the vicinity. The palace of the dukes of Medinaceli, located here, is the birthplace of Gonsalvo de Córdova, the 'Great Captain.' Population, in 1900, 12,943.

MONTJOIE, môɴ'zhwä', or **MONTJOYE.** The name given in the Middle Ages to any hillock situated on the boundary between two territorial divisions and serving as a meeting place for hostile armies. From this the word became a common war-cry. Special designations were added for each political division: e.g. Montjoie Saint-Denis for the kings of France, Montjoie Saint-George for the kings of England, etc. Montjoie is also the surname of the king-at-arms of France.

MONTLUC, môɴ'lụk', BLAISE DE. See MONLUC.

MONTLUÇON, môɴ'lụ'sôɴ'. The capital of an arrondissement in the Department of Allier, France, on the Cher, 45 miles northwest of Clermont Ferrand (Map: France, J 5). It is the industrial capital of Central France. The town consists of two parts: the mediæval portion on the right bank of the river with its interesting Hôtel de Ville, formerly an ecclesiastical establishment, and its timbered houses dating from the fifteenth and sixteenth centuries, dominated by a castle-crowned hill (the ancient fortification now converted into barracks); and the newer portion extending along the left bank of the Cher, where are located the extensive glass, steel, iron, and woolen factories. The town owes its rapid development to the opening up of the Commentry coal field. It has a considerable trade in grain, corn, and fruit. Population, in 1901, 35,062.

MONTMAGNY, môN'må'nyė', CHARLES JACQUES HUAULT, DE (?-c.1651). A governor of New France. His education was under Jesuit auspices, and he became a Knight of Malta. Though probably appointed Governor soon after the death of Champlain in 1635, he did not arrive at Quebec until June, 1636. During his stay, the strength of the colony increased, a seminary for Huron boys was founded, and the Iroquois were defeated in several skirmishes. As a result of the fight at the mouth of the Richelieu River, a peace was made at Three Rivers in 1645, but this was broken the next year. Montmagny was intensely religious, but viewed with disfavor the colony at Montreal, thinking it a mistake to divide the strength of the missionary forces. He was recalled in September, 1647.

MONTMARTRE, môN'mär'tr'. A northern district of Paris (q.v.).

MONTMEDY, môN'mȧ-dė'. The capital of an arrondissement and a fortified town in the Department of Meuse, France, near the German frontier, on the Chiers, 31 miles by rail southeast of Sedan (Map: France, M 2). It consists of two parts, the upper containing the citadel on a commanding rock, and the lower portion, or Bas-Médy, surrounded by a strongly fortified wall. The town has some domestic manufactures and an agricultural trade, but its importance is purely military. It was in the line of the German invasion of France in 1870, and contained a vast supply of war materials. It resisted the bombardment of the Germans in September, but succumbed to another attack December 14. Population, in 1900, 2600.

MONTMORENCY, môN'mȯ'räN'sė'. An old and illustrious French family named from a village near Paris, whose members in 1327 received the title of first baron of France. The mythical founder of the house is LESBIUS (or *Lisbius*), who is said to have died with the martyr Dionysius; the first authentic lord of Montmorency is BOUCHARD I., about 950; MATTHIEU II. (1189-1230) is the most famous member of the family before the sixteenth century. He was called the 'Great Constable:' in the reign of Philip Augustus he captured Château Gaillard, in Normandy, and in 1214 won the battle of Bouvines; in 1226 he defeated the Albigenses; and during the regency of Queen Blanche, the mother of Louis IX., was a powerful upholder of royal power. After Matthieu's death the family divided into two houses—the baronial branch of Montmorency and the younger line of Montmorency-Laval. The former attained the title of duke with ANNE DE MONTMORENCY (1493-1567). He was born March 15, 1493, at Chantilly, and was educated with the princes of the royal blood. He became a soldier at an early age, and distinguished himself by his gallantry and military skill in the wars of Francis I., particularly at Melegnano (1515), at the defense of Mézières (1521), and in the battle of La Bicocca (1522). In 1522 he was made marshal of France, and in 1525 was taken prisoner with his sovereign in the battle of Pavia. He then helped to negotiate the Treaty of Madrid, and in 1526 became grand master of the royal household and Governor of Languedoc. In 1536 he repelled Charles V.'s invasion of Provence, and in 1538 was made Constable of France. In this capacity he directed the foreign and domestic affairs of France for some years with energy and ability. His brusqueness of manner, however, made him an object of dislike to many; and the suspicions of the King having been aroused against him, he was suddenly banished from Court in 1541. The next six years were passed in retirement on his estates, but with the accession of Henry II. in 1547 he came again to the head of affairs, though he shared this power with Henry's mistress, Diana of Poitiers, and the family of Guise. In 1557 he commanded the French army which was defeated at Saint-Quentin (q.v.). Here he was taken prisoner, but he was liberated by the treaty made at Câteau-Cambrésis between France and Spain in 1559. During the minority of Charles IX. Montmorency with the Duke of Guise and the Marshal Saint-André composed the famous triumvirate which resisted the influence of Catharine de' Medici in State affairs. He commanded the royal army against the Huguenots, though Coligny was his nephew, and was defeated and captured at Dreux (1562), but later gained victories over them. In 1563 he forced the English to evacuate Havre. At the battle of Saint-Denis against the Huguenots under Condé he received a fatal wound and died in Paris on the following day, November 11, 1567.—HENRY, Fourth Duke of Montmorency (1595-1632), was the grandson of the Constable Anne de Montmorency, and was born at Chantilly, April 30, 1595. When he was seventeen years of age Louis XIII. made him Admiral of France and Viceroy of Canada, and in 1613 he became Governor of Languedoc. When the Huguenot wars broke out afresh he fought successfully for the King, and in 1625 took the Isle of Ré during the siege of La Rochelle. He afterwards gained other victories, and in 1630 received the chief command of the French troops in Piedmont during the War of the Mantuan Succession. He defeated the Spaniards and received the marshal's baton. Having espoused, in 1632, the cause of Gaston, Duke of Orleans, brother of King Louis XIII., and opponent of Richelieu (q.v.), he was declared guilty of high treason, and Marshal Schomberg defeated him at Castelnaudry and took him prisoner. He was carried to Toulouse, and there sentenced to death through the influence of Richelieu. This sentence was summarily executed; he was beheaded in spite of powerful intercession on his behalf by various rulers, October 30, 1632. Consult Ducros, *Histoire de la vie de Henri, dernier duc de Montmorency* (Paris, 1643).—LAVAL MATTHIEU JEAN FÉLICITÉ, DUC DE MONTMORENCY-LAVAL (1767-1826), was born in Paris. He served in the

American Revolution; and after the outbreak of the French Revolution as a representative of the nobility in the Constituent Assembly he urged the abolition of the privileges of his order. After the overthrow of the constitutional monarchy of 1791 he joined Mme. de Staël, with whom he was long intimate, at Coppet in Switzerland, and returned to France in 1795, then to become quite as closely attached to Mme. Récamier, whose memoirs give a vivid picture of him. In 1821 Montmorency was appointed Minister of Foreign Affairs, and as representative of France at the Congress of Verona (1822) urged armed intervention in Spain in behalf of Ferdinand VII. Consult Vetillard, *Notice sur la vie de M. le duc de Montmorency* (Le Mans, 1826).

MONT′MOREN′CY, Falls of. A picturesque cascade, 150 feet wide and 265 feet high, at the mouth of the Montmorency River, an affluent of the Saint Lawrence, six miles northeast of Quebec, Canada (Map: Quebec, E 4). They supply the power for Quebec's electric plants and are much visited by tourists.

MONTORO, môn-tō′rȯ. A town of Southern Spain, in the Province of Cordova. It is situated on a rocky peninsula formed by the south bank of the Guadalquivir, 18 miles east-northeast of Cordova (Map: Spain, C 3). The river is here spanned by one of its best bridges, built in the sixteenth century by popular subscription. In spite of the uneven ground, the streets are well paved, and they are lighted by electricity. Until a few years ago the town was quite without a water supply, but water is now brought through iron pipes from springs five miles distant, and distributed to 12 fountains. One of the largest and best hospitals of Southern Spain is located here. There are many interesting Roman, Gothic, and Moorish remains. The chief industry is the manufacture and exportation of olive oil. Population, in 1900, 11,376.

MONTORSOLI, môn-tôr′sȯ-lė, Fra Giovanni Angelico (or Angiolo) da (1507-63). A Florentine sculptor and architect. He was born at Montorsoli; worked in Florence, Genoa, Bologna, and Messina; visited Paris; and died in 1563 in Florence, where he was interred in a tomb erected by himself (1561) in the chapter-house of the Annunziata Church. He was for a short time connected with the Order of the Servi, whence the Fra commonly prefixed to his name. His earliest important work was at Genoa (1522-25), where he built or enlarged the Serra and Doria palaces, and remodeled the interior of the Church of San Mateo, to which he added a chapel with a monument to Andrea Doria. Between 1530 and 1534 he assisted Michelangelo on the Medicean Chapel, Florence, for which he carved the statue of Saint Damian. In 1547 he went to Messina, where he executed the fountain in front of the cathedral and another near the custom-house, and built several chapels in the cathedral, the Church of San Lorenzo, and the lighthouse.

MONTOUR, mŏn-to͞or′, Esther. An Indian chieftainess, usually known by the name of 'Queen Esther.' She is reputed to have been the granddaughter of Count de Frontenac, and became the wife of Eghobund, a chief of the Senecas. Owing to her strength of mind, she gained great influence among her people. She several times visited Philadelphia with the delegates of the Six Nations, and is said to have comported herself on such occasions with dignity and good manners. Despite some good qualities, however, she was at heart a savage, and in the Wyoming massacre of July, 1778, tomahawked more than a dozen helpless prisoners in revenge for the death of her son, who was killed the day before. Consult Cook, *General Sullivan's Indian Expedition* (Auburn, 1887).

MONTPELIER, mŏnt-pē′lyẽr. A city, the capital of Vermont, and county-seat of Washington County, 40 miles southeast of Burlington; on the Winooski River, and on the Central Vermont, the Montpelier and Wells River, and the Montpelier and Barre railroads (Map: Vermont, D 4). The handsome Capitol is built of granite, its dome rising to a height of 124 feet and surmounted by a statue of Agriculture. Among other features of the city are the State Library, the Wood Art Gallery, the Kellogg-Hubbard Library, Washington County Grammar and Montpelier Union School Library, and the Montpelier Seminary. Montpelier is the home of Admiral George Dewey and of Rear-Admiral Charles E. Clark. The principal industries are granite working and the manufacture of saddlery, hardware, and saw-mill and other machinery. The city controls an important trade with the surrounding region, which is largely agricultural, and is the centre of large insurance interests. Under a revised charter of 1900 the government is vested in a mayor, annually elected, and a unicameral council which confirms the executive's appointments of police, and elects superintendents of streets and water, health officer, overseers of the poor, and minor officers. The city owns and operates the waterworks. Population, in 1890, 4160; in 1900, 6266. A charter to the land about Montpelier was secured in 1781, but no settlement was made until 1787. In 1791 Montpelier was organized as a town, and in 1805 became the capital of the State; it was incorporated as a village in 1855, and in 1894 it was chartered as a city. Consult: Thompson, *History of Montpelier, 1781-1860* (Montpelier, 1860); Hemenway, *History of the Town of Montpelier* (ib., 1882).

MONTPELLIER, môɴ′pĕl′lyȧ′. The capital of the Department of Hérault, France, on the Lez, and an important railroad junction, 480 miles south of Paris, 76 miles northwest of Marseilles, and 7 miles from the Mediterranean (Map: France, K 8). Montpellier has an imposing appearance, seen from a distance; its suburbs are clean and well built, but the older portion of the town has dark and narrow streets. Boulevards have replaced the ancient walls and mediæval fortifications, of which the only remains are the citadel and the twelfth-century Tour de la Babotte. The principal attraction is the Peyrou or public square on high ground commanding splendid views of the Alps, the Cévennes, the Pyrenees, and the Mediterranean, and ornamented with a triumphal arch and equestrian statue, both commemorating Louis XIV. The water-works, water tower, and aqueduct, having a double-arched structure 2893 feet long, are monumental features. The most noteworthy buildings are the cathedral, the theatre, the exchange, the halls of justice, the prefecture, the observatory, and the university buildings. Montpellier has a botanical garden, the oldest in Europe, a public library of

120,000 volumes, a pharmaceutical school, an agricultural school, and a museum containing a fine collection of paintings and curios. The climate is mild, and the city is a favorite winter resort for invalids. Railways to Marseilles, Cette, and other ports, besides various canals, facilitate commercial and social intercourse, and few cities of the Republic hold out greater attractions in regard to intellectual culture. Among the industries the making of wine is the most important. Machinery, chemicals, corks, sugar, leather, cotton, and woolen goods are manufactured, and the city is noted for its fine confectionery; this industry, as also the manufacture of various novelties, is in the hands of the Jews. There is an important trade in manufactured articles, wine, olive oil, and fruits. Founded in the eighth century, Montpellier began to prosper in the twelfth century, when its school of medicine acquired fame. It had a stirring history in the Middle Ages, during which it was for a time under the rule of Aragon, Majorca, and Navarre, before its final union with France toward the close of the fourteenth century. Comte, the philosopher, was born at Montpellier. Population, in 1900, 75,950. Consult: Aigrefeuille, *Histoire de Montpellier* (Montpellier, 1877-88); Guiraud, *Recherches topographiques sur Montpellier* (ib., 1895); Febre, *Histoire de Montpellier* (ib., 1897).

MONTPELLIER, University of. A French university. As early as the first half of the twelfth century, the university of medicine at Montpellier was famous beyond any other in Europe save Salerno. To this, about 1160, was added a university of law by Placentinus, a distinguished doctor of law exiled from Bologna and Mantua. A university of theology grew up around a Carthusian college founded in 1263, and a university of arts came into existence somewhat earlier. Besides the colleges of the four mendicant Orders seven others were founded from time to time, and from the twelfth to the fourteenth century Montpellier was one of the great universities of Europe. Save in medicine, the fame of the university declined greatly after the latter period. It remained the chief medical school of France till modern times. Here Rabelais taught in 1537, and in the next century, during a period of Protestant supremacy, Casaubon. Under Napoleon the university was reorganized and thrown into the general scheme of national education. It comprises four faculties, law, medicine, mathematics-science, and philosophy, besides a school of pharmacy. Its budget is 1,087,292 francs, and in 1901 it had 1602 students. Its library contains nearly 100,000 volumes.

MONTPENSIER, môɴ'päɴ'syȧ', Anne Marie Louise d'Orléans, Duchess of (1627-93). The daughter of Gaston d'Orléans, brother of Louis XIII. of France, known as La Grande Mademoiselle. She grew up beautiful, eccentric, and ambitious. While still a child there was idle talk of a marriage with Louis XIV. of France, and subsequently her matrimonial aspirations centred about the persons of the future Philip IV. of Spain, the Emperor Ferdinand III., and his brother, the Archduke Leopold. All these plans miscarried, probably through the secret hostility of Cardinal Mazarin. Upon the outbreak of the troubles of the Fronde, Mademoiselle, with her worthless father, whom she appears to have loved, remained faithful to the Court, but in 1651 she embraced the cause of the great Condé, whom she originally hated most bitterly, but later seemingly sought in marriage. Her vanity and courage found delight in the rôle of party leader, which she now was enabled to play. In March, 1652, she held the city of Orleans against the Royal army and then went to Paris, where her masculine decision made her for a time the leader practically of the resistance to the King. On July 2, 1652, when Condé, after stubborn fighting in the Faubourg Saint-Antoine, had been decisively beaten by Turenne, Mademoiselle saved the Prince's army from annihilation by training the guns of the Bastille on the Royal forces and opening the gates of the city to receive the defeated troops. In October she was banished from the Court and lived for some time in retirement. She was recalled to Court in 1657, and after some years fell violently in love with the Duke of Lauzun (q.v.), a handsome and accomplished Gascon cavalier, and a favorite of Louis XIV. In December, 1670, the King consented to the marriage, but within three days withdrew his sanction, owing probably to the enmity of Madame de Montespan for Mademoiselle. In the following year Lauzun was thrown into the Bastille, where he remained for ten years in spite of the exertions of Mademoiselle, who finally obtained his freedom by ceding the County of Eu and the Principality of Dombes to the Duke of Maine, son of Madame de Montespan. There is some reason to believe that a secret marriage took place between Lauzun and Mademoiselle. It is certain that Lauzun repaid her devotion by brutal neglect and that they became totally estranged. She died in Paris, April 5, 1693, leaving behind her *Mémoires*, first published at Amsterdam in 1729, and subsequently edited by Chéruel (Paris, 1858). Consult Margerie, *La Grande Mademoiselle* (Nancy, 1869).

MONTPENSIER, Antoine Marie Phillipe Louis d'Orléans, Duke of (1824-90), fifth son of Louis Philippe. He was educated at the Collège Henri IV., and went to Africa in 1844 as lieutenant in the artillery. After a tour in the East he married, in 1846, the Infanta Louisa de Bourbon, sister of Queen Isabella II. The marriage created great excitement, Louis Philippe being generally credited with the intention to seat his son upon the throne of Spain. During the Revolution of 1848 the Duke resided in England, but soon returned to Spain, taking up his residence at Seville. In 1859 he was appointed Captain-General of the Spanish Army. During the political agitation preceding the flight of Isabella the Duke quitted Spain. Returning in 1868, under the Provisional Government, he offered himself as a candidate for the throne, but destroyed whatever chances for election he may have had by killing his cousin, the Infante Don Enrique de Bourbon, in a duel, March 12, 1870. His eldest daughter, Marie, was married to the Count de Paris in 1848; and his third daughter, Maria de las Mercedes, married her cousin, Alfonso XII., in 1878.

MONTREAL, mŏn'trē-a̤l' (Fr., Mount Royal). The largest city in the Dominion of Canada, situated in the Province of Quebec, 180 miles southwest of Quebec, and 420 miles north of New York, on the southeast side of Montreal Island, at the confluence of the rivers Saint Lawrence and Ottawa, 620 miles from the sea by the course of the Saint Lawrence. (Map: Quebec, C 5). It occupies a low tract of land, about two miles wide, between the Saint Lawrence River and Mount Royal, a mountain rising to an elevation of 900 feet above the sea, which gives a picturesque background to every view of the city, the summit being laid out as a public park of 460 acres. Fine residential streets lie in terraces upon the slope. Those in the lower part of the town are narrow, irregular, and dingy, but are undergoing gradual improvement. The chief business streets are Saint James, Saint Paul, Saint Lawrence, McGill, Bleury, Craig, Notre Dame, and Saint Catherine, the latter once an aristocratic centre. The French section is on the east, the dividing line being Saint Lawrence Street. Montreal is about four and one-half miles long, and contains many public squares and parks, such as Dominion, Victoria (with a fountain and a statue of Queen Victoria), Saint Louis, and the Viger Gardens, Logan and Mount Royal parks. The buildings are chiefly of gray limestone, quarried in the vicinity, and include Notre Dame, built in 1824, opposite the site of an earlier church (1672); it is one of the largest cathedrals in America, being 255 feet long by 145 feet wide, and can accommodate over 10,000 people. Its towers are 220 feet high and have a noted chime of bells. Near it is the seminary of Saint Sulpice, the oldest building in Montreal (1684). Other important edifices and places of interest are the court house, city hall, custom house, the old Château de Ramezay (1705), for a time the official residence of the British Governors, and headquarters of the American General and Commissioners in 1775-76; the Champ-de-Mars, the old parade ground of the British troops; Jacques Cartier Square, with a statue of Nelson (1808); the Church of Saint Gabriel, the oldest Protestant church (1792); Bonsecours Market, 500 feet long; the Church of Notre Dame de Bon Secours; Saint Patrick's Church; the Cathedral of Saint James, known commonly but erroneously as Saint Peter's, a reproduction on a small scale of Saint Peter's in Rome (1868); Christ Church Cathedral, Episcopal, a fine example of Gothic architecture; Saint James's Methodist Church; Church of Notre Dame de Lourdes (1874); the Jesuit Church, noted for its frescoes; Saint Andrew, Saint Bartholomew, Saint Paul's, Saint George, Erskine Presbyterian, and Church of the Messiah. Among other points of interest are the Fraser Institute, a public library and art gallery; the Protestant and Roman Catholic deaf and dumb asylums; an asylum for the blind, and the great convent of the Holy Names of Jesus and Mary. The most important educational institutions are McGill University (q.v.), founded in 1824 by a bequest of James McGill, also containing the Redpath Library, an observatory, and a natural history museum; the Roman Catholic Laval University; and the Collège de Montreal or Petit Séminaire. There are Presbyterian, Wesleyan, and other colleges, academies, schools, and libraries; a French school of medicine and surgery; Grey Nunnery, a hospital and orphan asylum; Nazareth Asylum for blind children; the Hôtel Dieu, founded in 1644 by Mlle. Mance, an original settler of Montreal; the Royal Victoria, the Montreal General, and the Western hospitals; and the Victoria Rifles Armory. There are publications printed in French and English, the leading one being *The Gazette*, founded in 1778 and continuous since 1795.

Montreal's wealth and importance accrued from the fur, lumber, and grain trade of the Northwest. It is now the metropolis of Canada, and the chief port of entry; its fine harbor, with quays, wharves, and docks of solid masonry extending for miles, lies at the head of ship navivation, and accommodates the largest vessels afloat. The construction of canals has enabled Montreal to command the navigation of the Great Lakes. The Lachine Canal was opened in 1825, the Grand Trunk Railway in 1852; the Victoria tubular bridge, built over the Saint Lawrence in 1854-59, was reconstructed and enlarged as a truss bridge in 1898-99; the Champlain and Saint Lawrence Railway, from Laprairie to Saint John's, was opened in 1886, and the Canadian Pacific the same year. Various steamships run to transatlantic ports, and many railway lines connect the city with all parts of Canada and the United States. The United States is represented by a Consul-General. The exports in 1901 amounted to $59,708,154, and the imports to $64,372,300; in 1890 they were respectively $31,660,216 and $45,934,406. In 1901, 742 ocean-going vessels and 8450 coasting vessels with a total of 3,136,234 tons cleared the customs. The exports and manufactures include lumber, grain, flour, apples, butter, phosphates, cheese, boots, shoes, woolens, hardware, glass, carriages, sleighs, drugs, paints, steam-engines, locomotives, boilers, printing-presses, sewing-machines, musical instruments, paper, etc. There are also saw, flour, and rolling mills, brass and iron foundries, lead works, etc.; gas and electric light plants, electric street railroads, and a costly system of water-works. There are many banks, the Bank of Montreal claiming to have the largest capital of any bank in North America, and to rank as the fifth in the British Empire. The climate presents great extremes of heat and cold, the temperature reaching 90° in summer, and sometimes sinking to 20° below zero in winter. The winter carnivals attract thousands of visitors to engage in the gay skating tournaments, the snow-shoe parades, the masquerades, the tobogganing, and the storming of the ice castle (generally erected in Dominion Square) by torchlight, amid the display of gorgeous pyrotechnic devices.

Montreal's first record dates from 1535, when Jacques Cartier ascended the Saint Lawrence and found an Indian village named Hochelaga at the foot of the mountain, a name still preserved in a portion of the modern city. It was inhabited by the Hochelaga or Beaver Indians, active traders, who traversed the Saint Lawrence from their district to Ottawa. When Champlain visited the spot in 1603 the Indian town had vanished, as the result of a war between the Hurons and the Iroquois; and here he established, eight years later, a trading post. In 1642 Paul de Chomedy, Sieur de Maisonneuve, for 'La Compagnie de Montréal,' founded the 'Ville Marie-de-Montréal' on romantic ideas of religion and patriotism. The town was engaged in struggles with the Iroquois for many years, and in 1665 the Marquis de Tracy arrived from France with the famous Carignan-Salières Regiment, which broke the power of the red men. In 1672 the town became the centre of the fur trade and the starting point for military and exploring expeditions, from which it became known as the 'Mother of Cities.' With Indian massacres and warfare, and strife between the religious and civil authorities, Montreal soon acquired a romantic history. In 1760 the British took the town, and their entry marked a new era. In 1775-76 it was occupied by the Continental forces, but the citizens resented Franklin's incitement to revolt against British rule. In 1844 it was made the seat of the Canadian Government, but it lost the honor after the riot of 1849, when the Parliament buildings were destroyed by the mob. The British garrison was removed in 1870. In 1901 a great fire devastated four acres of the commercial portion of the city, the Board of Trade building constituting the chief loss. The damage was estimated at $4,000,000.

With its suburbs, Montreal's population numbered, in 1891, 220,181; in 1901, 266,826, half being French, the rest of Irish, English, and Scottish descent. Three-fourths of the inhabitants are Roman Catholics, and the city is the seat of both Roman and Anglican bishops.

Consult: Sandham, *Ville Marie: or, Sketches of Montreal Past and Present* (Montreal, 1870); Maclennan, *Montreal and Some of the Makers Thereof* (ib., 1893); and the authorities referred to under Canada.

MONTREAL. An island in Canada formed at the junction of the Ottawa with the Saint Lawrence River (Map: Quebec, C 5). It is 30 miles long, 10 miles wide at its greatest breadth, and contains 197 square miles. It is of great fertility and productiveness, and celebrated for its apple orchards. Undulations, called *coteaux*, culminate in Mount Royal. The city of Montreal is located on it.

MONTREAL D'ALBANO, mōn'trȧ-äl' dȧl-bä'nō, or Fra Moreale, frä mō'rȧ-ä'lȧ (?-1354). A famous Italian condottiere. He was a native of Narbonne in Provence (France), and as a young man entered the Order of the Knights of Saint John, but was ultimately expelled. He subsequently distinguished himself as a soldier under Louis I. of Hungary in the wars with Naples, and refused to surrender Aversa to Queen Joanna of Naples, but was driven out in 1352 and entered the service of the Church. In 1353 he started his 'Great Company,' a band of mercenaries, which soon became the terror of Italy. In 1354 he aided Rienzi in getting possession of Rome, but was suspected of intriguing with Rienzi's enemies, the Colonna. He was therefore seized, and, after a short trial, beheaded on August 30, 1354. Consult Papencordt, *Cola di Rienzo und seine Zeit* (Hamburg, 1841).

MONTREUIL, môɴ'trē'y'. A town of France in the Department of Seine, situated one and one-half miles east of Paris, near Vincennes. It is surrounded by large peach orchards, has gypsum quarries, and manufactures porcelain, paints, glue, soaps, and chemicals. Population, in 1891, 23,891; in 1901, 31,673; of commune, 31,773.

MONTREUIL, Gerbert de (fl. c.1250). A French poet of the thirteenth century about whom hardly anything is known. His great work is the *Roman de la Violette* (q.v.). Gerbert also wrote a long sequel to the *Perceval* of Chrétien de Troyes. This sequel is still unprinted.

MONTREUIL (MONTEREAU), Pierre de (thirteenth century). A French architect of the Gothic period. He was principal architect to Louis IX., for whom, in 1245-48, he built the Saint Chapelle (q.v.), one of the finest creations of the matured Gothic style. Among other important works built by him were the refectory and the lady chapel of the Monastery of Saint Germain des Près, destroyed during the Revolution. His relative, Eudes de Montreuil (died 1289), architect, engineer, and sculptor, accompanied Saint Louis to the Holy Land, where he fortified Jaffa. Returning to Paris in 1254, he built there the Hospice des Quinze Vingts, the chief asylum of the blind, and a number of churches. All of these buildings were demolished during the Revolution. In 1285 he became architect to the King. For his own tomb in the Church of the Cordeliers he carved a relief of himself between his two wives.

MONTREUX, môɴ'trē'. A parish in the Canton of Vaud, Switzerland, at the eastern extremity of Lake Geneva, including the villages of Clarens, Territet, Vernex, Glion, Veytaux, Colonges, Charnex, and others (Map: Switzerland, A 2). The district is noted for its romantic alpine scenery and mild and healthful climate, and is a favorite and well-appointed resort of tourists and invalids. From Glion a rack and pinion railway leads up to the Rochers de Naye, at 5800 feet elevation, commanding a magnificent view. Near Veytaux is the celebrated Castle of Chillon.

MONTROND, môɴ'trôɴ', Casimir, Count of (1768-1843). A French political agent. He served in the army up to the Revolution, and then rashly stayed in Paris instead of accompanying his family in exile. In 1794 he was arrested and imprisoned, but escaped with Mlle. de Coigny, Duchess of Fleury, the heroine of Chénier's *Jeune captive*, whom he married, but soon divorced. It was at this time that he came under the influence of Talleyrand and became his most trusted agent. Montrond was prominent in bringing about the second Restoration. After the Revolution of 1830 he lived in England, where he boasted that Louis Philippe paid him 20,000 francs a year to speak well of him in the English clubs.

MONT'ROSE. A royal burgh and seaport in Forfarshire, Scotland, at the mouth of the South Esk, 80 miles northeast of Edinburgh, and 34 miles southwest of Aberdeen (Map: Scotland, F 3). The town stands on a level peninsula between the mouth of the river and the basin of the Esk (an expanse seven miles in circumference and dry at low water). A fine suspension bridge connects the town with Rossie Island, which is again connected with the mainland by a small drawbridge. Two lighthouses are in a line on the north bank of the river, and the magnificent tower, named the Scurdyness Lighthouse, is at the mouth of the stream. Flax spinning is the chief industry; linen, canvas, rope and soap manufacture, iron founding, tanning, brewing, fish curing, wood carving, and shipbuilding are also carried on. The corporation owns the water supply. The harbor, one of the best on the eastern coast, is provided with quays and dry and wet docks. It affords accommodation to vessels drawing 19 feet of water. The principal exports are manufactured goods, agricultural produce, and fish; imports, timber and coal. The city was chartered in the twelfth century by David I. and was made a royal burgh in the fourteenth century. Population, in 1891, 14,400; in 1901, 12,400. Consult Mitchell, *History of Montrose* (Montrose, 1866).

MONTROSE, mŏn-trōz′. A town and the county-seat of Montrose County, Colo., 353 miles southwest of Denver; on the Denver and Rio Grande Railroad (Map: Colorado, F 3). It is situated in the Uncompahgre Valley, a district made highly productive by irrigation, and is engaged chiefly in farming and fruit growing, though stock-raising also is an important industry. Population, in 1890, 1330; in 1900, 1217.

MONT′ROSE. A borough and the county-seat of Susquehanna County, Pa., 38 miles north by west of Scranton; on the Lehigh Valley, the Lackawanna, and the Montrose railroads (Map: Pennsylvania, F 2). It is known as a summer resort, having an attractive and elevated location, some 2000 feet above the sea. There are creameries, and manufactories of agricultural implements, saws, lumber, etc. Population, in 1890, 1735; in 1900, 1827.

MONTROSE, mŏn-trōz′, JAMES GRAHAM, first Marquis of (1612-50). He was the son of John, the fourth Earl of Montrose, and his family can be traced back to 1128. He studied at Glasgow, and in 1626 succeeded to his father's earldom. After studying and traveling for some years he became involved in 1637 in the national movement, for Charles I. had treated him coldly, and the King's representative in Scotland, Hamilton, was vain and incapable. In 1638 was signed the National Covenant, which was to prevent the introduction of the prayer-book and the ascendency of the bishops in Scotland. In support of the Covenant, Montrose took up arms several times, until the Treaty of Berwick (June 18, 1639) put an end to the fighting. About this time Montrose met Charles I., and partly through his personal influence, and also because the Scottish Parliament had fallen under the control of the radical Presbyterians, Montrose became a supporter of the King, but changed sides again, as a result of Charles's blundering policy. In May, 1641, however, he threw himself completely on the Royalist side. Argyll, the Governor of Scotland, was preparing to aid the English Parliament, yet Charles would not permit Montrose to begin an insurrection in Scotland until the Scots had actually begun the invasion of England in support of Parliament. Then, when it was too late, Montrose was appointed (1644) Lieutenant-General of Scotland, and after he had made an unsuccessful inroad into Scotland from across the border, he was created, on May 6, 1644, Marquis of Montrose. On August 18th he again entered Scotland, this time in disguise, and won six pitched battles over the Covenanters. Montrose's tactics and ability to meet changing conditions were a revelation to his enemies, but he was nevertheless unable to range the Lowlands on the Royal side, and on September 13, 1645, he was defeated at Philiphaugh by David Leslie; his army, composed of heterogeneous elements, melted away, and in 1646 Montrose escaped from the country to Bergen. He went to Paris, but could gain no support there. In 1649 Montrose again invaded Scotland, but was defeated at Invercarron on April 27, 1650, and ultimately fell into the hands of his enemies. He was executed on May 21, 1650. Montrose was an able man, of noble character. But as his armies were without discipline, he was unable to restrain their ravages, and his name and reputation have had to suffer in consequence. Consult Gardiner, *The Great Civil War* (London, 1891).

MONTS, mōɴ, PIERRE DU GUAST, Sieur de (1560-1611). A French explorer and colonizer of Canada. He was born in Saintonge, France, of an Italian Roman Catholic family, but was converted to Protestanism, and attached himself to Henry IV., who appointed him to an important office in the royal household. In 1603 the King made him Governor of the French Company of Canada, which was given exclusive right to trade in furs between latitudes 40° and 50° N., and the right to make land grants and govern the country, under the name of Acadia, with the title for himself of Vice-Admiral and Lieutenant-General. Taking with him Samuel Champlain, Poutrincourt, Biencourt, and Pontgrave as chief officers, he sailed from Havre, March 7, 1604. After exploring the Bay of Fundy they passed the winter on an island at the mouth of the Saint Croix River, and in the summer of 1605 founded Port Royal on the present site of Annapolis. De Monts made Poutrincourt Governor of Port Royal, explored the Bay of Fundy, made Tadoussac in the Saint Lawrence his fur trade depot, and returned to France. There he found that his monopoly had excited such lively opposition that his privileges had been withdrawn. He succeeded, however, in recovering a part on more specific conditions and continued to send out expeditions to Canada, and in the course of one of these Champlain founded the city of Quebec in 1608. After Henry IV.'s death, in 1610, De Monts's privileges were taken away, to his financial ruin. He died soon after in Paris. Consult Parkman, *Pioneers of France in the New World* (Boston, 1865).

MONT-SAINT-MICHEL, mōɴ săɴ mē′shĕl′. A remarkable granite cone in the Bay of Cancale or Saint Michel, in the Department of Manche, France, near the mouth of the River Couesnon, here separating Brittany and Normandy, six miles southwest of Avranches (Map: France, E 3). It was formerly isolated, but since 1879 a causeway three-quarters of a mile long connects the Mont with the mainland. Capped by an imposing mass of monastic buildings with a statue-tipped apex towering 233 feet above the level of the extensive bay, it forms the most striking feature in the landscape. The bay, left bare at low water, extends 8 miles from north to south with a maximum width at its mouth of 15 miles, and is noted for its quicksands and the treacherous rapidity of its rising tides. The base of the Mont, two miles in circumference, is surrounded by sixteenth-century ramparts, towers, and bastions. A single gate gives admittance to a small village on the southern slope, with mediæval houses, hostelries for pilgrims and travelers, an interesting museum, the famous Porte du Roi, Dugueselin's observatory, and an ancient parish church. The village is built along a narrow, winding street which, with numerous flights of steps, leads to the summit crowned by the abbatial castle surmounted by a basilica or church with a lofty Gothic spire. The principal features of the abbey are the Crypte de l'Aquilon, almonry, cellar, and dungeons, dating from the twelfth century; the Crypte des Gros Piliers, the Salle des Chevaliers, the refectory, the graceful cloister, dormitory, and La Merveille, or north wall of the abbey, 246 feet long and 108 feet high, dating from the thirteenth century, and the châtelet or donjon, and the flamboyant Gothic church, dating from the fifteenth century. The Mont was the ancient Mons Tumba, an elevation, crowned by a temple of the Druids, in the Forest of Scissy, which was submerged by an inundation in the seventh century. The abbey was founded in 709 by Saint Aubert, Bishop of Avranches. It became a noted pilgrimage resort, and in the twelfth century was famous for its library and the learning of its monks, whose chronicles describe it as the 'mons in periculo maris.' The buildings date chiefly from after 1203, when the abbey was burned down by the soldiers of Philip Augustus. It successfully resisted the assaults of the English and Huguenots; was dismantled at the Revolution and converted into a political prison; and is now included among the historical monuments of France. During the last three decades it has been undergoing a process of restoration, not yet completed. Population of village, in 1901, 235.

MONTS DE PIÉTÉ, môɴ de pyâ'tâ' (Fr., funds of pity). A name applied throughout Europe to public or semi-public institutions organized to loan money to the poor at low rates of interest on goods deposited. The establishment of the monts de piété dates from the middle of the fifteenth century, when a certain Barnarbé Terni proposed a charitable bank which should lend money without interest. To this was given the name Monte di Pietà. The principle was adopted by Orvieto (1464), Bologna (1475), and Milan (1496). At first no interest was charged, but as it was impossible to secure sufficient funds gratuitously, a moderate rate of interest was demanded. This policy was attacked on the ground that it violated the canon law forbidding 'usury.' In 1515 the Fifth Lateran Council declared that it was permissible to take a low interest to meet the necessary expenses. Cities in other countries soon adopted the plan. In 1534 a pawn bank was started at Ypres and one at Bruges in 1572, and by 1633 they existed in some sixteen cities. Their success has not been uniform, but they now do a large business. In 1895 the various Belgian institutions had 891,756 articles pledged (or pledges renewed). The rate of interest varies from 4 to 16 per cent. per annum. The net profit in 1895 was $12,477.84. In Holland the first mont de piété, the Groote Banck van Leening, was established at Amsterdam in 1614. In 1895 it had a capital of over $505,000, nearly $200,000 of which was borrowed. Financially the Dutch banks have not been profitable, as the constant endeavor has been to keep the rate of interest low. In Germany, Augsburg, in 1591, appropriated funds to form a loan bank (Leihhaus), and in 1618 Nuremberg followed this example. To-day public pawnshops are found in many cities. The laws fix the interest at 2 per cent. per month on all sums of less than 30 marks and 1 per cent. per month on larger sums.

Monts de piété were introduced into France, at Avignon (1577), Carpentras (1612), and Aix (1635). The famous Mont de Piété at Paris was established in 1777 by the General Hospital, which was to have the profits. It has had a varied history, but is in successful operation to-day. It has now a central station and over 20 auxiliary stations. Since the Revolution the pawn-broking business of France has been under the direct charge of the communal and city authorities. At the head of the Paris bank is the Prefect of the Seine with a special council of lawyers who form a 'comité consultatif,' and have charge of the legal work of the institution. The interest rate is now 6 per cent. per annum. In 1895 over 1,928,300 articles were under pledge, and on these some $10,071,000 were loaned. The ledger of the institution for 1896 showed a credit of $789,783 and a debit of $756,428. In England a 'Charitable Corporation' began business in 1708, but this was so mismanaged that it became a subject of Parliamentary investigation and was closed. The principles of the monts de piété were introduced into the United States by the Collateral Loan Company of Boston in 1859; they have also been adopted by the Workingmen's Loan Association of Boston (1888), the Saint Bartholomew's Loan Association of New York (1894), and many others. Among the Jews there exists the Hebrew Free Loan Association of New York, which loans money without interest.

The monts de piété have been of great service and have always tended to keep the rates of interest low. In all countries it is the custom to restrict the articles on which loans may be made and to take the necessary precautions against fraud and loss. If the pledges are not redeemed within a given time the goods are sold. Sometimes the owner has the right to ask for the sale of the goods. It is usual to return to the owner any sum realized above the indebtedness.

Consult: Blaize, *Des monts-de-piété et des banques de prêts* (Paris, 2d ed., 1856); Vanlaer, *Les monts-de-piété en France* (Paris, 1895); Patterson, *Pawnbroking in Europe and the United States*, Bulletin No. 21, Department of Labor (Washington, 1899). See PAWNBROKING.

MONT'SERRAT'. One of the Leeward Islands, British West Indies, situated 34 miles northwest of Guadeloupe, and 26 miles southwest of Antigua (Map: West Indies, Q 6). It is triangular in shape, 11 miles long by 7 miles broad, and has an area of 32 square miles. It is of volcanic origin, and its surface is mountainous, reaching a height of 3000 feet in the volcano of Souffrière. The chief products are sugar, coffee, cocoa, arrowroot, and lime juice. Its industries received a heavy blow from a destructive hurricane which swept over the island in 1899. Montserrat is subject to the general government of the Leeward Islands, and is locally governed by a nominated legislative council. Its population, in 1891, was 11,762, and in 1901, 12,215. The capital is Plymouth, on the southwest coast, with a population (1901) of 1461. The island was discovered in 1493 by Columbus, and colonized by the British in 1632.

MONTT, mônt, JORGE (1846—). A President of Chile, son of Manuel Montt (q.v.). He was a captain in the navy when, in January, 1891, the relations between President Balmaceda (q.v.) and the Chilean Congress reached the point of active hostilities, and the fleet under his leadership declared for Congress. On January 7th a

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number of the Senators and Congressmen embarked on the warships and organized a provisional government or junta, with Montt at its head. The army remained faithful to Balmaceda, but the majority of the people were hostile. An army of about 10,000 men was raised without much difficulty by the Congressionalists. Toward the end of August the Congressionalist forces administered a severe defeat to their opponents only a few miles from Valparaiso, and followed it up a few days later with a second victory at Placilla, which finally destroyed Balmaceda's power. Montt then established a provisional government in Santiago, and called for the election of a new President and Congress. This election, probably the first in the history of Chile that was not largely influenced by the party in power, resulted in the almost unanimous choice of Montt for President. The confidence thus shown in him was amply justified by his administration. He exerted himself to mend the breach made by the civil war, and granted amnesty to all who had supported Balmaceda. He thoroughly reorganized the army and navy, placed the currency of the country again on a gold basis, and granted a large measure of local autonomy to the municipalities. In foreign affairs he endeavored to settle the boundary dispute between Chile and Argentina by providing for the submission of the question to Great Britain; but in this he was not entirely successful. On September 18, 1896, having completed the five years of his term of office, he quietly resigned the Government to Federico Errazuriz, who had been elected his successor.

MONTT, Manuel (1809-80). A President of Chile. He was educated at the National Institute at Santiago, and was for a time rector of that institution. Entering politics, he held a number of State offices, and in 1841 became Minister of Justice and Public Instruction under the Conservative President Bulnes. One of his services while holding this position was the establishment of the University of Chile. In 1851 he was elected President of the Republic over the Liberal candidate, General Cruz. The party of Cruz at once broke out in rebellion, but on December 8, 1851, were defeated in the sanguinary battle of Longamilla, and after a time the revolt was crushed. Montt was reëlected in 1856, and served until 1861. Under his administrations the railway from Valparaiso to Santiago was begun, gas was introduced into the principal towns, schools and libraries multiplied rapidly, and an astronomical observatory was established at Santiago. In 1859 another civil war broke out, and was suppressed only after much fighting and the death of about 5000 men. At the time of his death, in 1880, Montt was president of the Supreme Court.

MONTÚFAR, môn-to͞o'fär, Lorenzo (1823—). A Central American jurist, politician, and author. He was born in Guatemala, studied law, and was admitted to the bar in 1845. At different times he took an active part, often in the highest position, in the government of Guatemala, San Salvador, and Costa Rica, practiced law for a while in Lima, and served as Minister to the United States, Peru, Spain, and elsewhere. He also did journalistic work, wrote books, was a judge, taught political economy, and participated in many revolutions. Among his published works are *Critica del gobierno servil de Guatemala* (1854), and *Memorias históricas de Centro América* (1881).

MONTYON, môɴ'tē-ôɴ' (sometimes incorrectly Monthyon), Antoine Jean Baptiste Robert Auget, Baron de (1733-1820). A celebrated French philanthropist. He was born in Paris, December 23, 1733. His father having left him in possession of a considerable fortune, he made a wise and generous use of it. He became an advocate and was successively a counselor to the Grand Council, Master of Requests to the Council of State, and intendant of Auvergne, Provence, and La Rochelle. In 1775 he became a Councilor of State, and in 1780 he was appointed Chancellor to Monsieur, the brother of the King. On the outbreak of the Revolution Montyon emigrated, and resided first in Geneva and later in England, and did not return to France until the Bourbon Restoration. Throughout his whole life he was generous with his wealth, relieving the poor and founding prizes for the encouragement of invention and improvement in French arts and manufactures. Many of the prizes given by the Institute of France were founded or endowed by him, and he made large and munificent gifts to the hospitals and other charitable institutions of Paris. He was a prolific writer on historical, political, and economic subjects, but his works have become antiquated, and he is chiefly remembered for his philanthropy. He died in Paris, December 29, 1820. Consult: Franklin, *Eloge historique de Montyon* (Paris, 1834); Dumoulin, *Montyon* (ib., 1884); Labour, *M. de Montyon d'après des documents inédits* (ib., 1880). For the different prizes endowed by Montyon, see Institute of France.

MONUMENT (OF., Fr. *monument*, from Lat. *monumentum*, *monimentum*, memorial, from *monere*, to warn, admonish). Anything durable made or erected to perpetuate the memory of persons or events. The chief kinds of monuments are described under their special names. It is also used, by extension, of any large work of architecture or sculpture, such as a church, castle, palace, monastery, etc. See Arch, Triumphal; Brasses; Mausoleum; Obelisk; Pillar; Pyramid; Sepulchral Mound; Tomb; etc.

MON'UMEN'TA GERMA'NIÆ HISTOR'ICA (Lat., historical monuments of Germany). A great work on the antiquities of Germany, the chief source for the history of the Middle Ages. It was begun by the "Gesellschaft für ältere deutsche Geschichtskunde," founded in 1819, and after that body was dissolved the Prussian Academy of Sciences assumed charge of the enterprise, to which the German and Austrian governments gave financial support. The work proceeds under various divisions—historians, laws, archives, documents, letters, chronicles, and antiquities,—of which forty-seven volumes were issued up to 1874. Since 1876 twenty volumes of a *New Archives* have been in publication. The first volume was published in 1826 by the Hahnsche Hofbuchhandlung in Hanover under the direction of Pertz, who was succeeded in 1874 by Waitz, and after his death in 1886 by Dümmler.

MONVEL, môɴ'vĕl'. The assumed name of Jacques Marie Boutet (1745-1812). A French actor and dramatist, father of the famous Mlle. Mars (q.v.). He made his appearance on the stage of the Comédie Française in 1770. He was also the author of some successful plays, among them *Les victimes cloîtrées*, in which he gave expression to his sympathy with the principles of the Revolution.

MONVEL, Louis Maurice Boutet de (1850—). A French genre and portrait painter and illustrator, born in Orleans. He studied under De Rudder, and then with Cabanel at the Ecole des Beaux-Arts, and after the war of 1870-71, in which he took part, he studied in the Atelier Julien, and still later with Carolus Duran. He began to exhibit in 1874, and afterwards won several medals, but meanwhile he took up illustrating. Soon his individual, unmistakable style showed itself in the drawings he made for *Chansons et rondes* (1883); *Chansons de France* (1884); *Nos enfants* (1886); *La civilité puérile;* the fables of La Fontaine (1888); and the exquisite black and white work in Fabre's *Xavière* (1890). His work is usually done in flat tones, and is exceedingly decorative in quality. His technical training made him a faultless draughtsman. The decision and beauty of his line, his strong, clear color, the charm and naïveté of his delineation of child-life, have made him a conspicuous figure in this field of illustration. His "Jeanne d'Arc" (1897) is a masterpiece of composition. He also did six canvases, representing the history of the Maid, for the memorial church at Domrémy. His portraits, particularly those of children, and notably the daughter of Madame Réjane, are well known in America. His large pictures, which include "The Apotheosis" (1885), an episode of the Commune, are less interesting. Consult *Modern French Masters*, edited by Van Dyke (New York, 1896).

MONZA, mōn'tsȧ. A town in the Province of Milan, Italy, on the Lambro, 10 miles north-northeast of Milan (Map: Italy, D 2). The Cathedral of San Giovanni, founded in the sixth century by Theodolinda, and rebuilt in the fourteenth century, contains interesting memorials of this Queen and the famous iron crown of Lombardy. Other notable buildings are the Church of Santa Maria in Istrada, the Gothic town-hall, and the palace, the summer and autumn residence of the royal family, situated in beautiful grounds traversed by the Lambro. The town has manufactures of silk and woolen goods, hats, leather, and machines, and is surrounded by a fertile district, which yields abundance of grain, fruits, and wine. Monza, the ancient Modicia, was the residence of the kings of Lombardy, and was conspicuous for its wealth and the extent of its cloth trade. Here on July 29, 1900, King Humbert of Italy was assassinated. Population (commune), in 1881, 28,012; in 1901, 42,599.

MOOD (AS, *mōd*, OHG. *muot*, spirit, courage, Ger. *Mut*, courage, Goth. *mōds*, wrath; possibly connected with Gk. *μαίεσθαι*, *maiesthai*, to desire, OChurch Slav. *sŭmēti*, to dare). A weak emotion, usually of long duration. The mood, like the emotion, is made up of ideas and affection; but it does not centre about a 'situation' as the emotion does. The emotion of fear, e.g. always has its object. One fears an enemy, an approaching storm, a ruined reputation. And the object occupies the 'focus' of consciousness. But the fusion of ideas and feelings that compose the mood is marginal. All sorts of mental processes may demand the attention in turn and in turn pass out of consciousness; but the mood remains as a vague background to them all. Moods fulfill various offices in mental economy. (1) They determine associations; according as one is cheerful or melancholy, one thinks of cheerful or melancholy things. (2) The 'at home' mood is an important factor in recognition and imagination. (3) The moods of acquiescence, of discomfort, of mild surprise, of expectancy, etc., are prominent in belief, comparison, judgment, and reasoning. Consult: Titchener, *Outline of Psychology* (New York, 1899); Kuelpe, *Outlines of Psychology* (ib., 1895); Sully, *The Human Mind* (ib., 1892); Wundt, *Physiologische Psychologie* (Leipzig, 1893). See Recognition; Imagination; Belief.

MOODS (in Logic). See Syllogism.

MOO'DY, Dwight Lyman (1837-99). An American evangelist. He was born at Northfield, Mass., February 5, 1837. At the age of seventeen he became clerk in a shoe store in Boston. In 1856 he removed to Chicago, became active in mission work, and established a Sunday-school which numbered over a thousand children. During the Civil War he was employed by the Christian Commission and subsequently as city missionary in Chicago by the Young Men's Christian Association. A church was built for him, and though unordained, he became its pastor. The building was destroyed by the fire of 1871, but a new one was erected to hold 2500 persons. In 1873 he visited Great Britain and Ireland with Ira D. Sankey, the singer, and in 1875 held a long series of meetings in Brooklyn and Philadelphia, and in 1876 in New York. Similar services followed in many large cities throughout the country. In 1882 a second visit to England was made. Most of his work was done in the provinces, but he held large meetings also at the universities of Oxford and Cambridge. He also held meetings at Paris. His later years were applied to the building up of a seminary for young women and a training-school of Christian workers, both at Northfield, Mass., and the Mount Hermon School for Boys at Gill, near Northfield. He died at Northfield, December 22, 1899. He published numerous discourses and works of a popular character. Consult his biography by his son (New York, 1900).

MOODY, James (1744-1809). An American Loyalist, born in New Jersey. In 1777 he joined the British, and for several years he was very active as a partisan leader and spy, performing many daring exploits in Pennsylvania and New Jersey. At the close of the war he went to England, and later settled in Nova Scotia. In reward for his services the English Government gave him the half pay of a lieutenant and an estate. An account of his adventures, entitled *Lieutenant James Moody's Narrative of His Exertions and Sufferings in the Cause of Government Since 1776*, was published in London in 1783 and in New York in 1865.

MOODY, William Henry (1853—). An American lawyer and administrator, Secretary of the Navy in Roosevelt's Cabinet. He was born in Newbury, Essex County, Mass., graduated at Phillips Andover in 1872, and at Harvard in 1876, and studied law. From 1890 to 1895 he was district attorney for the Massachusetts Eastern District, carried through successfully the prosecution of boodling aldermen in the city of Lawrence, and assisted Attorney-General

Knowlton in the case of the State against Lizzie Borden. In 1895 he was chosen to succeed General Cogswell as Congressional Representative. Politically independent, he made his reputation on the floor of the House by his knowledge of parliamentary procedure, so that he was mentioned as a possible candidate for the Speakership to succeed Thomas B. Reed, and by his perseverance. In the Committee on Appropriations he had especial charge of the Sundry Civil Appropriation Bill, and in general was reckoned an able second to Chairman Cannon. Upon the resignation of J. D. Long, in March of 1902, Moody was named successor, and received the portfolio of the navy on May 1.

MOODY, William Vaughn (1869—). An American poet, born in Spencer, Ind. He graduated at Harvard in 1893, became instructor in English there and later at the University of Chicago, devoting much time to the composition of verses, showing talent and care. *The Masque of Judgment* (1900) is marked by lyric power, but aloofness from present interests; the *Poems* (1901) show high thought and feeling, applicable to current needs. Much of the latter volume had been published in periodicals and widely noticed. He also edited Milton's "Poems" in the *Cambridge Poets* (1899), and in 1902 he wrote a short *History of English Literature* in collaboration with R. R. Lovett.

MOOLTAN, mōōl-tän′. A city of British India. See Multan.

MOON (AS. *mōna*, Goth. *mēna*, OHG. *māno*, Ger. (with excrescent *d*) *Mond*, moon; connected with Lith. *menu*, moon, Gk. *μήν*, *mēn*, month, Skt. *mās*, moon, month, probably from Skt. *mā*, to measure, and ultimately connected with Eng. *month*). The satellite of our earth, revolving round the earth from west to east in a period of one month (q.v.), and accompanying the earth in its motion round the sun.

Phases of the Moon. The first peculiarity about the moon is the constant and regular change of its illuminated surface from a thin crescent to a circle, and vice versa, and a corresponding change in the time of her appearance above the horizon. These changes depend upon the position of the moon relative to the earth and the sun, for it is only the half of the moon facing the sun that is illuminated by his rays, and the whole of this illuminated portion can be seen from the earth only when the sun, earth, and moon are nearly in a straight line (the line of *syzygies*), and the earth is between the sun and moon. When the moon is in the line of syzygies, but between the earth and the sun, no part of her illuminated disk can be seen from the earth. In the former case, the moon is said to be *full*, and in the latter, *new*. A few days after 'new moon' the moon appears to be a little to the east of the sun as a thin crescent, with the horns pointing to the east, and as she increases her angular distance from the sun at the rate of about 12° daily, the crescent of light becomes broader till, after the lapse of a little more than seven days, at which time she is 90° in advance of the sun, she presents the appearance of a semicircle of light. The moon is then said to have completed her first quarter. Continuing her course, she becomes 'gibbous'; and at the 15th or 16th day from the new moon attains a position 180° in advance of the sun, and now presents the appearance known as full moon. From this point she begins to approach the sun, again appearing 'gibbous,' and after a third period of more than seven days, reaches a point 90° west of the sun and enters her last quarter. Here, again, she appears as a semicircle of light, the illuminated portion being that which was not illuminated at the end of the first quarter. The moon, now rapidly approaching the sun, resumes the crescent form, but this time with the horns pointing westward, the crescent becoming thinner and thinner, till the moon reaches the position of 'new moon' and disappears. The earth as seen from the moon presents similar phases, and has consequently, at the time of new moon, the appearance of a round illuminated disk, and at full moon is invisible. This explains the peculiar phenomenon occasionally observed when the moon is near the sun (either before or after the new moon), of the part of the moon's face which is unilluminated by the sun appearing faintly visible, owing to the reflection upon it of strong earth-light. This phenomenon is often called the new moon in the old moon's arms. At new moon, the moon comes above the horizon about the same time as the sun, and sets with him, but rises each day about fifty minutes later than on the day previous, and at the end of the first quarter rises at midday and sets at midnight, continuing to lag behind the sun. When full, she rises about sunset and sets about sunrise, and at the commencement of her last quarter she rises at midnight and sets at midday. The daily retardation of the moon's rising, just stated to be about fifty minutes, is subject to considerable variations. In the latitude of New York it may range from 23 minutes to 1 hour 17 minutes. See Harvest Moon.

Distance and Magnitude. From repeated observations of the moon's horizontal parallax (q.v.), and of the occultations by her of the fixed stars, her mean distance from the earth has been estimated at 238,840 miles, and her mean angular diameter at 31′ 7″, and her actual diameter as 2162 miles, or about 3-11ths of the earth's diameter. Her actual distance from the earth may vary from 252,972 miles at apogee to 221,614 at perigee. Her volume is about 1-49th that of the earth, her density 0.61 (that of the earth being taken as unity), and her mass $\frac{1}{81.5}$ of the earth's mass.

Orbit. The moon revolves round the earth in an elliptic orbit with the earth in one focus; the eccentricity of the ellipse being 0.05491, or more than 3¼ times that of the earth's orbit. The place of her orbit does not coincide with the ecliptic, but is inclined to it at an angle of 5° 8′ 40″, and intersects it in two opposite points, which are called the nodes (q.v.). Were the moon's orbit a true ellipse, which, owing to various irregularities known as perturbations (q.v.), it is not, the lunar theory (q.v.) would be exceedingly simple; but these perturbations cause in the case of the moon a distinct and well-marked deviation from her previous course in a single month. The retrogradation of her nodes along the ecliptic causes a continual change in the plane of her orbit, so that if, during one revolution round the earth, she occults certain stars, at the next revolution she may pass to one side of them, and will remove farther and farther from them in each successive revolution. Owing to this continual change of her orbit, the moon in course of time passes over or occults every star situated within 5° 24′ of the ecliptic. The motion of the nodes is so rapid that they perform a complete circuit of the orbit in 18.6 years. Another important change in the moon's orbit is the revolution of the line of apsides (q.v.), by which the perigee and apogee are continually changing their position relative to the earth and sun. This revolution is more than twice as rapid as that of the nodes, being performed in 8.85 solar years. This motion is analogous to the perturbations of planetary orbits, and its nature and origin are treated in the article PERTURBATIONS. Its effect upon the moon is to produce a variation in her distance from the earth, independent of that produced by her elliptic motion. Among the further disturbances or perturbations of the lunar orbit we may mention the evection (q.v.), which may displace the moon's position in the sky 1° 16′ 27″, the variation, which may amount to 39′ 31″, and the annual equation, whose maximum is 11′ 9″. See LUNAR THEORY.

ECLIPSES. As the moon in her course passes the sun once every month, and also places the earth between herself and the sun once a month, it is evident that if she moved in the plane of the ecliptic there would be either a total or an annular eclipse of the sun and a total eclipse of the moon every month. The inclination of her orbit, allowing her to pass the sun 5° 9′ to the north or south of his track, prevents such a frequent occurrence of eclipses. See ECLIPSES.

ROTATION. The moon rotates on her axis with a velocity such that one complete revolution occupies precisely the same time needed for one revolution of the moon around the earth. As a consequence of this, the moon always turns the same side toward us, and we see only one-half her surface plus a small additional amount brought into view by libration (q.v.).

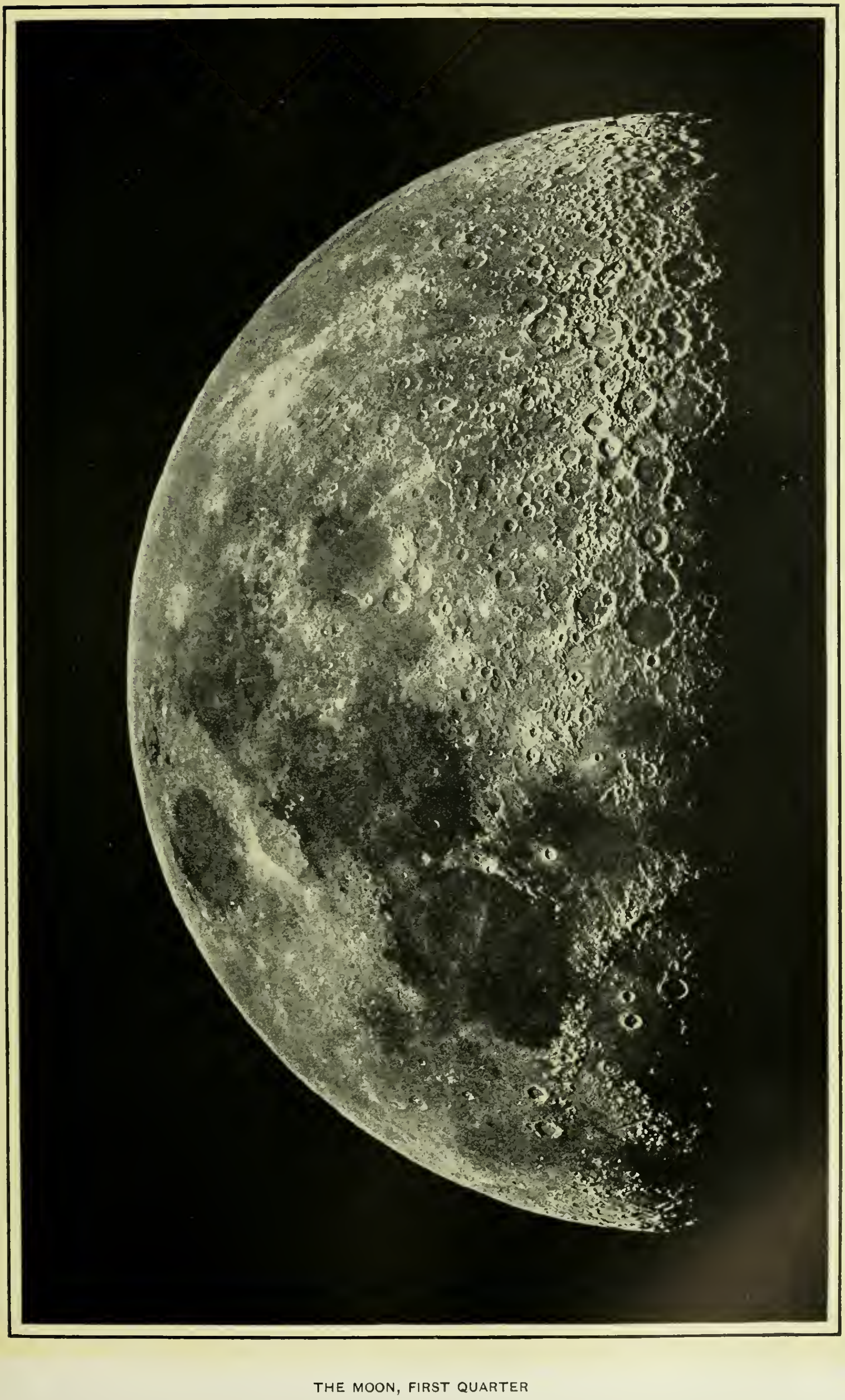
PHYSICAL FEATURES. The surface of the moon, as seen from the earth, presents a most irregular grouping of light and shade. The dark portions were named by the earlier astronomers as seas, lakes, etc., and still retain these names, although there is strong evidence against the supposition that the moon, or at least that portion of it presented to us, contains any water. The brighter parts of the moon are mountainous, as is proved by the fact of their casting shadows when the sun's rays fall upon them obliquely, and also by the ragged appearance presented by the interior illuminated border of the moon, an appearance which can only be satisfactorily accounted for on the supposition that the surface of the moon is not level, in which case the higher portions will be illuminated some time before the light reaches the level parts; and it is observed that as the illumination proceeds, bright spots start up in advance of it, and when the moon is on the wane, these same spots continue to shine for some time after the surrounding surface is immersed in gloom. The mountains occur either singly, when they are generally of a circular form, and are called *craters*, or in groups, which are mostly annular, and form a sort of wall inclosing a deep depression or plain, in which are situated one or more conical mountains. The craters are not infrequently 8 or 10 miles in diameter, and some measure more than 100 miles across. The principal mountains attain an altitude of about 20,000 feet, according to a micrometric measurement of the length of their shadows. The moon everywhere presents traces of volcanic agency, but no active volcanoes have yet been discovered, nor is there any sign of recent volcanic action. Through the telescope, she presents a desolate appearance, without indications of animal or vegetable existence. She appears to be devoid of an atmosphere, or, if one exists, it must be of exceeding rarity, or else concentrated into cavities within the moon's rocky surfaces. Probabilities are in favor of a low surface temperature, not higher, perhaps, than that of ordinary ice. (For the influence of the moon upon terrestrial tides, see TIDES.) Recent theorists hold that very large lunar tides, caused by the earth, existed many thousands of years ago, when the moon was still in a semi-plastic condition. This tidal theory can be made to account for the remarkable coincidence of the lunar axial rotation period with that of her revolution round the earth. The best lunar map is that of Beer and Maedler, which was published in 1837. This map is based upon visual observations, and will undoubtedly be replaced in time by the results of photographic work. At present (1903) an elaborate series of lunar photographs is being published by the Paris Observatory; and a very good set of drawings from photographs taken at the Lick Observatory is being made by Weinek of Prague.

SUPERSTITIONS REGARDING THE MOON. The moon was anciently an object of worship, and has remained to the present day the centre of many superstitions. The times for killing animals for food, gathering herbs, cutting down wood for fuel, sowing seeds of various kinds, were all regulated by the 'age' of the moon. There were similarly defined periods for taking particular medicines, and attempting the cure of particular diseases. In northern European countries the waning moon has been considered to have an evil influence, and full or new moon to be the most auspicious season for commencing any enterprise. Farmers and sailors still believe in the influence of changes in the lunar phases on the weather. See SUPERSTITION; ALMANAC.

MOON, WILLIAM (1818-94). An English philanthropist, born in Horsemonden, Kent. He was educated in London, and in 1840 gave up his studies for the Church because of total blindness. Moon started a school for blind children, and finding that previous systems were too complicated, devised an embossed type for the use of the blind with only nine letters, which, by variation of position, made up a complete alphabet. Following the same method, he published pictures and maps for the blind. Moon traveled in Europe and in the United States (1882) and established loan libraries of his books and schools for home instruction. All his philanthropic efforts were largely tinged with evangelistic methods. Consult Rutherford, *William Moon and His Work for the Blind* (London, 1898). See BLIND, EDUCATION OF THE.

MOONBILL. A local name in the United States for the ring-necked scaup duck. See SCAUP.

MOONCALF. A shapeless abortion, supposed to be caused by the influence of the moon, or, according to Pliny, to be engendered by woman only. The term is applied also to a doltish person.



THE MOON, FIRST QUARTER
From a Photograph by Loewy and Puiseux

MOON'EY, James (1861—). An American ethnologist, born at Richmond, Ind. In 1885 he became connected with the Bureau of American Ethnology at Washington. His first labor in Indian ethnography, which had occupied him since boyhood, was a tribal list, containing 3000 titles. He discovered the Cherokee ritual, studied the ghost dance in 1890, and later the Kiowas. His writings include: *Myths of the Cherokees; Sacred Formulas of the Cherokees; Siouan Tribes of the East* (1894); *The Messiah Religion and the Ghost Dance;* and *Calendar History of the Kiowa Indians* (1898).

MOONEYE, Lake Herring, or Whiting. Names applied to the Cisco or Whitefish (q.v.).

MOONFISH (so called from its shape). (1) A fish of the family Carangidæ, allied to the pompanos, and having compressed, oval, silvery bodies. The species (*Selene vomer*), called 'jorobado,' 'look down,' 'horsehead,' and 'horsefish,' is numerous on both coasts of the warmer parts of America, and grows to a foot or more. It passes through a remarkable series of transformations in growth, being so thin when young as to be useless for food, though well liked as a pan-fish when adult. (See Plate of Horse Mackerels and Allies.) (2) A closely related fish (*Vomer setipennis*), known about New York as 'blunt-nosed shiner,' and highly esteemed as food. Some other species are known, but their habits and manner of breeding remain obscure. (3) The opah (q.v.).

MOONFLOWER. See Ipomœa.

MOONGA, or **MOOGHA.** See Silkworm.

MOONJAH, mo͞on'jȧ. **MUNJAH, MOONYAH,** Sara, or Shur (Anglo-Ind., from Skt. *muñja*, reed), *Saccharum Sara.* An East Indian grass of the same genus as the sugar-cane, growing on the banks of the Ganges and the Indus. The leaves yield a tough fibre, not thoroughly tested, but used for making rope.

MOONLIGHT SONATA, The. A sonata by Beethoven (1802). It is the second of two sonatas forming Opus 27, C sharp minor, *Sonata quasi una Fantasia*, dedicated to Countess Guicciardi. The imaginary title is probably due to Rellstab's likening the first movement to boating on Lake Lucerne by moonlight.

MOONSEED, Yellow Parilla (so called from the crescent-shaped seeds), *Menispermum canadense.* A North American climbing plant of the natural order Menispermaceæ, with peltate, roundish-cordate, and angular leaves, small clusters of white or greenish-yellow flowers, and black, kidney-shaped fruits. The cylindrical root, which attains a length of several feet and a diameter of a quarter of an inch, was formerly known in commerce as Texas sarsaparilla.

MOON-SNAKE. A Brazilian colubrine venomous snake of the genus Scytale. They are of small size and dull colors. Some of them are arboreal, others fully terrestrial. They hunt almost exclusively at night and feed mainly on lizards. Although their fangs (see Opisthoglypha) are large, these reptiles seem never to attack human beings.

MOONWORT. A fern. See Botrychium.

MOOR, MOORING (probably from Dutch *marren*, to tie, moor, hinder, retard, AS. *mirran*, *myrran*, *merran*, OHG. *marrjan*, *marren*, dialectic Ger. *marren*, to entangle, Eng. *mar*). To moor a vessel is to secure it with ropes or chains to anchors or to a wharf or to the buoys of permanent moorings. The common method of mooring with two anchors is to drop one anchor, veer chain to sixty, seventy-five, or ninety fathoms and let go the other; and then heave in on the long chain and veer on the shorter until lying with both chains equal, or with one about fifteen fathoms shorter than the other. This method is generally resorted to when the anchorage ground is contracted and there is insufficient room for a ship to swing about a single anchor with a full scope of chain. In many harbors, where the anchorage space is limited, permanent moorings are laid down. These usually have buoys to which the anchor chains are attached, the ship being secured to the buoy by a hawser or short length of chain. See Anchor; Hawse.

MOOR, Edward (1771-1848). An English writer on India. He entered the service of the East India Company in 1782, but in 1790 joined the army. He retired in 1806 on a special pension and a large grant as a reward for his bravery and for a *Digest of the Military Orders and Regulations of the Bombay Army* (1800). Moor's most valuable book was the *Hindu Pantheon* (1810), which is still an authority because of its unique illustrations.

MOOR'CROFT, William (c.1765-1825). An English veterinary surgeon and traveler, born in Lancashire. He studied medicine in Liverpool, but subsequently devoted himself to veterinary surgery. In 1808 he became veterinary surgeon to the Bengal army and superintendent of the East India Company's stud at Púsá, near Cawnpore. While occupying these positions he undertook a series of remarkable journeys in Northern India, was the first Englishman to cross the Himalayas, vainly endeavored to penetrate Chinese Turkestan, and died while returning from Bokhara. His papers were edited by Prof. H. H. Wilson and published in 1841 under the title *Travels in the Himalayan Provinces of Hindustan from 1819 to 1825.* Among his other writings is a translation of Valli's *Experiments in Animal Electricity* (1793).

MOORE, mo͞or *or* mōr, Albert Joseph (1841-93). An English figure painter, born in York, of a family of painters. He studied at the Royal Academy School, and began his career by a number of purely decorative works done principally for theatres and churches. He afterwards exhibited constantly at the various London galleries. His subjects are usually figures of women; his style is classic, his colors are particularly harmonious and pleasing, and his composition is simple and decorative, with a quality that is Japanesque. His works include "Midsummer" (1887); "Blossoms" (1881); "A Summer Night" (in the Liverpool Corporation Gallery); and "The Open Book" (in the Victoria and Albert Museum, South Kensington). For his biography, consult Baldry (London, 1894).

MOORE, Alfred (1755-1810). An American jurist, born in Brunswick County, N. C., a son of Maurice Moore (q.v.). He was educated in Boston. In August, 1775, he was made captain in the First Regiment, North Carolina Line, of which his uncle, James Moore, was colonel, and took part in the defense of Charleston, S. C., in

June, 1776. He resigned in March, 1777, but served in the militia against Cornwallis after the battle of Guilford Court House. In 1782 he was elected Attorney-General by the Assembly, though he knew little or no law. He was elected judge of the Superior Court in 1798, but in December of the next year was appointed by President Adams to the Supreme Court of the United States. He resigned in 1805.

MOORE, Benjamin (1748-1816). A Protestant Episcopal Bishop of New York. He was born in Newtown, L. I.: was graduated at King's College in 1768, prepared for the ministry, and went to England, where he was ordained by the Bishop of London in 1774. Returning to America, he was appointed assistant minister in Trinity Church, New York, in the same year. In 1800 he became rector of Trinity Parish. In 1801 he was consecrated Bishop of New York, and at the same time was appointed president and professor of logic and rhetoric in Columbia College. He performed the duties of both these positions till 1811, when he was disabled from active service by paralysis. Bishop Moore's publications include sermons and a pamphlet in vindication of episcopal services.

MOORE, Charles Leonard (1854—). An American poet, born in Philadelphia. To the pen of this lawyer are due several volumes of artistic poetry: *Atlas* (1881); *Poems Antique and Modern* (1883); *Book of Day Dreams* (1883); *Banquet of Palacios* (1889), a comedy; *Odes* (1896); *The Ghost of Rosalys* (1900), a poetical drama of much beauty and ingenuity. Mr. Moore, who was Consul at San Antonio, Brazil, 1878-79, is known for his critical contributions to the Chicago *Dial*.

MOORE, Clara Jessup (1824-99). An American philanthropist and writer, born in Philadelphia. She organized in Philadelphia a hospital relief committee during the Civil War, and assisted in the foundation of the Temperance Home for Children. After the death of her husband in 1878, she spent much of her time in London, where she died. She published *Miscellaneous Poems* (1875); a romance called *On Dangerous Ground* (1876); *Sensible Etiquette* (1878); *Social Ethics and Social Duties* (1892); and other books.

MOORE, Clement Clarke (1779-1863). An American poet and educator, and a son of Bishop Moore of New York. He was born in New York, July 15, 1779; he graduated at Columbia (1798), and was made professor of biblical learning in the General Theological Seminary in New York (1821), a post that he held until 1850. The ground on which the seminary now stands was his gift. He compiled a *Hebrew and English Lexicon* (1809), and published a collection of *Poems* (1844), among which is "'Twas the Night Before Christmas," or more properly, "A Visit from Saint Nicholas," which has long been famous. It was written for his children in 1822 and appeared anonymously and without his knowledge in the *Troy Sentinel*, December 23, 1823. Consult Stedman, *An American Anthology* (Boston, 1900).

MOORE, David Hastings (1838—). An American bishop of the Methodist Episcopal Church, born at Athens, Ohio. He graduated at the university of his native State in 1860, was ordained to the ministry the same year, entered the Civil War as a private and rose to be lieutenant-colonel of volunteers. He was successively president of the Wesleyan College, Cincinnati, Ohio, and of the Colorado Seminary, and was chancellor of the Denver University until 1900, when he was elected bishop and sent to take charge for four years of the Methodist missions in China, Japan, and Korea.

MOORE, Edward (1712-57). An English dramatist. He was born at Abingdon, Berkshire. He was a linen draper in early life, but failed in business and devoted himself to literature, *Fables for the Female Sex* (1744) being his first publication. He afterwards wrote two unsuccessful comedies, *The Foundling* (1748), and *Gil Blas* (1757). These were followed by *The Gamester* (1753), the good fortune of which may have been due to Garrick's acting and his collaboration. In 1753 he became editor of the *World*, a satirical weekly, with a very talented staff, including Lord Lyttelton, Horace Walpole, and Lord Chesterfield. His *Poems, Fables, and Plays* were collected and published in 1756. The *Fables* were often reprinted with those of John Gay, and were translated into German.

MOORE, Edward (1838—). An English scholar, born at Cardiff. He was educated at Bromsgrove Grammar School, and at Pembroke College, Oxford (1847). For a while he was rector of Gatcombe, Isle of Wight. From 1862 to 1864 he was fellow and tutor of Queen's College, Oxford. In 1864 he became principal of Saint Edmund Hall. His publications comprise: *Aristotle's Ethics* (books i.-iv.; 5th ed. 1896); *Aristotle's Poetics, with Notes* (1875); *Time References in the Divina Commedia* (1887), translated and published at Florence in 1900 with the title *Gli accenni al tempo nella Divina Commedia; Textual Criticism of the Divina Commedia* (1889); *Dante and His Early Biographers* (1890); *Tutte le opere di Dante Alighieri*, the "Oxford Dante" (1894); *Studies in Dante* (first series, 1896; second series, 1899). The "Oxford Dante" is by all means the best edition of Dante's works. Moore's studies placed him among the first of Dante scholars. His Aristotelian studies also are valuable.

MOORE, Eliakim Hastings (1862—). An American mathematician, born at Marietta, Ohio. He studied at Yale and at Berlin; taught mathematics at Yale (1887-89), at Northwestern University (1889-91), and then at Chicago, where in 1896 he was made head of the department of mathematics. He was editor of the *Transactions* of the American Mathematical Society (1900) and president of the society in 1901.

MOORE, Frank (1828—). An American journalist and compiler, a brother of George Henry Moore. He was born in Concord, N. H., but removed to New York City and became a journalist and general writer. In 1869-72 he was assistant secretary of legation in Paris. He edited *Songs and Ballads of the American Revolution* (1856); *Diary of the American Revolution* (2 vols., 1860); *The Rebellion Record* (12 vols., 1861-68), a collection of original material bearing on the Civil War; *Lyrics of Loyalty* (1864); *Life and Speeches of John Bright* (1865); *Women of the War 1861-66* (1866); *Songs and Ballads of the Southern People, 1861-65* (1887).

MOORE, Frank Frankfort (1855—). A British novelist and dramatist, born at Limerick, Ireland, and educated at the Royal Academical Institution, Belfast. His plays include: *A March Hare* (1877); *The Queen's Room* (1891); and *Kitty Clive, Actress* (1895). Some of his novels are: *Told by the Sea* (1877); *Coral and Cocoanut* (1890); *The Two Clippers* (1894); *The Secret of the Court* (1895); *The Millionaires* (1898); *A Damsel or Two* (1902); all more or less sensational in character.

MOORE, George (1853—). A British novelist and dramatist, born in Ireland. He studied art under Luyten in London, and completed his education in France. His first efforts in literature were confined to the magazines, and under the title *Notes and Sensations,* he contributed from time to time to the London *Hawk.* His first publication was a volume of verse, *Flowers of Parnassus* (1877), the treatment of which at the hands of the critics is supposed to have been largely responsible for the fact that, with the exception of *Pagan Poems* (1881), he has published but little verse. For a long time in England his critical work was regarded as of more permanent value than his novels.

His later activities largely consisted of critical studies in aid of the Irish Renaissance. He allied himself with Martin and Yeats in founding the Irish Literary Theatre at Dublin. In the preface of his comedy, *The Bending of the Bough* (1900), he defines his interest in the movement for the revival of the Celtic tongue and literature, as not merely a desire to reform dramatic literature, but as arising solely from "alarm over the present course of English fiction." He inveighed against the trend of modern English literature, which he regarded as wholly given up to the mere portrayal of "manners, facts, and social customs," and advocated the return to the novel of "human passion and moral ideas." He declared that France alone had followed the truth in literature, and he threw in his lot with the French school. These views he consistently carries out in his novels, and some of them, especially *A Modern Lover* (1883), *A Mummer's Wife* (1884), and *Esther Waters* (1894), aroused vigorous protest as being unduly realistic. But his indisputable power of keen observation and delicacy of appreciation have won increased admiration. In *Sister Teresa* (1901), which is at once a sequel and a recasting of *Evelyn Innes* (1898), he shows these powers abundantly, together with sound knowledge of art and music. Among his other works are: *Confessions of a Young Man* (1888); *Spring Days* (1888); *Miss Fletcher* (1889); *Impressions and Opinions* (1890); *Modern Painting* (1893); *The Strike at Arlingford: A Play* (1894); and *The Celibates* (1895).

MOORE, George Foot (1851—). An American Orientalist, born at West Chester, Pa. He graduated at Yale in 1872, and at the Union Theological Seminary in 1877; entered the Presbyterian ministry, and was pastor of the Putnam Presbyterian Church at Zanesville, Ohio. In 1883 he was appointed Hitchcock professor of Hebrew and the history of religions at Andover Theological Seminary, where he was president of the faculty from 1899 to 1901, when he was appointed professor of divinity in Harvard University. He was for several years editor of the *Journal of the American Oriental Society.* His publications include: *A Commentary on Judges* (1895); *Judges,* a translation with notes for the Polychrome Bible (1898); and *The Book of Judges in Hebrew* (1900).

MOORE, George Henry (1823-92). An American historical writer and librarian, born in Concord, N. H. He removed in 1839 to New York City, and in 1843 graduated at New York University. Before leaving college he had become connected with the New York Historical Society, as an assistant to his father, Jacob Bailey Moore, the librarian, and in 1849 succeeded him as its librarian. In this position he remained until 1872, when, on the opening of Lenox Library, he became its first superintendent. Here he remained until his death. He was a frequent contributor to historical magazines, and to the proceedings of historical societies. Among his best known works are: *The Treason of Charles Lee* (1858); *The Employment of Negroes in the Revolutionary Army* (1862); *Notes on the History of Slavery in Massachusetts* (1866); and *A History of the Jurisprudence of New York* (1872).

MOORE, Harry Humphrey (1844—). An American painter, born in New York City. He studied at the Ecole des Beaux-Arts and under Gérôme in Paris. Afterwards he became the pupil and friend of Fortuny in Madrid, and still later traveled and painted in Germany, Italy, and Japan. His works include "Gypsy Encampment, Granada," "Moorish Water-Carrier," "Almeh," "The Blind Guitar-Player," and "A Moorish Bazaar." He received the Order of Charles III. of Spain.

MOORE, Sir Henry (1713-69). An English colonial governor, born in Vere, Jamaica. He became Lieutenant-Governor of his native island in 1756, and, except for a few weeks in 1759, was head of the administration until 1762. In reward for his services in suppressing the slave insurrection of 1760 he was made a baronet. In July, 1765, he was appointed Governor of New York, where he arrived at the beginning of the trouble over the Stamp Act. Influenced by public opinion, he suspended the execution of the act. His administration was generally popular with the people. He continued to hold the office of Governor until his death.

MOORE, Henry (1751-1844). A Wesleyan minister and biographer of John Wesley. He was born in a suburb of Dublin, and was apprenticed to a wood-carver. Impressed by the preaching of John Wesley, he frequented the Methodist meetings and joined a class in Dublin in 1777. He began to preach, gave up the wood-carver's art, and started a classical school. He received an appointment from Wesley to the Londonderry circuit in 1779. He was subsequently called to London, served from 1784 to 1786 as assistant traveling companion and amanuensis to John Wesley, and again from 1788 to 1790. Wesley made him one of his three literary executors, and appointed him to be, after his death, one of the twelve ministers to regulate the services of City Road Chapel. He was president of the Wesleyan Conference in 1804 and 1823. Moore clung to the methods of Wesley. He refused ordination in the Church of England, although he accepted it from Wesley assisted by two Episcopal clergymen; opposed Coke's Lichfield scheme of 1794 for the creation of a Methodist hierarchy, and also the proposal brought forward in 1834 for the establishment of a theological school; and on the formation of a centenary fund in 1839 objected to the acquisition of land by the Methodist body. In conjunction with the Rev. Thomas Coke, and under the authority of the Conference, he published a *Life of the Rev. John Wesley* in 1792; which, however, owing to a difference with the third literary executor, they had been obliged to prepare without access to Wesley's papers. Most of the papers were afterwards obtained, and a new *Life* was published in 1824-25. Moore's other works are: *A Reply to Considerations on the Separation of the Methodists from the Established Church* (1794); *Thoughts on the Eternal Sonship* (1816); *The Life of Mrs. Mary Fletcher of Madeley* (2 vols., 1817); *A Short Account of Miss Mary Titherington of Liverpool* (1819); *Sermons* (1830), with autobiography to 1791. His life was published by Mrs. Richard Smith, with the autobiography, in 1844.

MOORE, Henry (1831-96). An English landscape and marine painter, a brother of Albert Joseph Moore, born in York. He was the pupil of his father, William Moore, and studied also at the York School of Design and the Royal Academy Schools. At first a landscape painter, he gave himself after 1857 almost entirely to marine subjects. He depicts the sea in all its changes with understanding and sincerity. His works include: "The Newhaven Packet" (bought by the Birmingham Corporation), "Catspaw off the Land" (bought by the Chantrey Fund Trustees, 1885), "Mount's Bay" (bought by the Manchester Corporation, 1886), and "Hove-to for a Pilot" (1893). He was elected a Royal Academician in 1893, and was a member of the Legion of Honor.

MOORE, Jacob Bailey (1797-1853). An American journalist and historical writer, born at Andover, N. H. He learned the printer's trade at Concord, engaged in editorial work, and was a member of the Legislature in 1828. In 1839 he removed to New York and edited the *Daily Whig*. He was in the Government employ in Washington 1841-45, but returned to New York and served as librarian of the Historical Society from 1845 to 1849. From 1849 to 1853 he was postmaster of San Francisco. He published, with John Farmer, *Collections Historical and Miscellaneous* (3 vols., 1822-24), relating principally to the early history of New Hampshire; and *Gazetteer of the State of New Hampshire* (1823). He also published a volume on the colonial Governors of Connecticut and New Plymouth (1846).

MOORE, James (c.1640-1706). An American colonial soldier and official. He was said to be a son of Roger Moore, the Irish rebel, and came to South Carolina about 1665. He settled on Goose Creek near the Cooper River, and soon became prominent in resisting the demands of the Lords Proprietors. He was a member of the Governor's Council in 1682, and of the Assembly in 1692, and in the latter year was excluded from pardon by name by the Proprietors. In 1694 he was a member of Governor Archdale's Council and traded extensively with the Indians. He was elected Governor by the Council in 1700 and served until the arrival of Sir Nathaniel Johnson in 1703. The Assembly made him leader of an expedition to capture Saint Augustine. The town was easily taken, but the fort resisted successfully. On the arrival of Governor Johnson he was made attorney-general and led a successful expedition against the Apalachi Indians.

MOORE, James (1667-1723). An American soldier and colonial official, born in Charleston, S. C. He saw service in various Indian expeditions, under his father, James Moore, and in 1713 commanded the forces sent by Governor Craven to aid the colony of North Carolina in its desperate struggle with the Tuscarora Indians. In 1715 he was made lieutenant-general of the expedition against the Yamassee Indians. When the Convention threw off the Proprietory Government and deposed Governor Robert Johnston in 1719, James Moore was made Governor and served until the arrival of Francis Nicholson with the King's commission, in 1721.

MOORE, John (1729-1802). A Scottish physician and author, born at Stirling. He studied at the University of Glasgow, was apprenticed to a surgeon, became in 1747 surgeon's mate in the army, and served in military hospitals in the Netherlands during the War of the Austrian Succession. After further study, and two years of practice at Glasgow, he traveled extensively on the Continent. In 1792 he was in France during the disturbances of August and September, and in 1793-94 published his two-volume *Journal* of his residence, frequently quoted in Carlyle's *French Revolution*. His works of travel, *A View of Society and Manners in France, Switzerland, and Germany* (1779) and *A View of Society and Manners in Italy* (1781), are merely interesting in style. He wrote also a volume of *Medical Sketches* (1786), containing some results of first-hand investigation, a biography of Smollett (1797), not without merit, and three dull works of fiction, *Zeluco* (1786), *Edward* (1796), and *Mordaunt* (1800), to the first of which Byron referred in the addition to the preface of *Childe Harold*. Prevost and Blagdon edited *Mooriana: or Selections from the Moral, Philosophical, and Miscellaneous Works of Dr. John Moore* (London, 1803). Consult the *Life*, by Anderson (Edinburgh, 1820).

MOORE, Sir John (1761-1809). A British general. The eldest son of Dr. John Moore (q.v.), he was born at Glasgow. He entered the army when only fifteen, and served with distinction in Nova Scotia, Corsica, the West Indies, Ireland, and Holland. He was in Egypt with the army under Abercromby, and obtained the Order of the Bath for his services during the operations around Abukir Bay. In 1802 Moore served in Sicily and Sweden. In 1808 he was sent with a corps of 10,000 men to strengthen the English army in the Peninsula. In October he moved his army from Lisbon, with the intention of advancing by Valladolid to unite with the Spanish general Romana, and threaten the communications between Madrid and France. But the apathy of the Spaniards and the successes of the French in various parts of the Peninsula soon placed him in a critical position. He had determined to make a bold advance from Salamanca to attack Soult, when the news reached him that Madrid had fallen, and that Napoleon was marching to crush him at the head of 70,000 men. Moore's forces amounted to only 25,000 men, and he was consequently forced to retreat. In December he began the march from Astorga to Coruña, a route of nearly 250 miles, through a desolate and mountainous country, made almost impassable by snow and rain, and harassed by the enemy. The soldiers suffered intolerable hardships, and arrived at Coruña in a very distressed state; but it was impossible to embark without fighting. On January 16, 1809, the French under Soult attacked in four strong columns, and a desperate battle ensued. In an early stage of the action Moore was struck by a cannon ball on the left shoulder, and died in the moment of victory. The French were repulsed with the loss of 2000 men. Consult: Carrick Moore, *Life of Sir John Moore* (London, 1835); Napier, *History of the Peninsular War* (5 vols., New York, 1856).

MOORE, John Bassett (1860—). An American jurist, born at Smyrna, Del. He graduated at the University of Virginia, studied law, became a law clerk in the State Department in 1885, and was promoted to the position of Third Assistant Secretary of State (1886), a post which, although a Democrat, he held under the Republican Administration until 1891, when he was appointed professor of international law at Columbia University. For a few months in 1898, he served as Assistant Secretary of State, and then became secretary and counsel to the Peace Commission at Paris. He became an editor of the *Political Science Quarterly* and of the *Journal du Droit International Privé*. His publications include: *Reports on Extraterritorial Crime* (1887); *Extradition and Interstate Rendition* (1891); *American Notes on the Conflict of Laws* (1896); and *History and Digest of International Arbitrations* (1898).

MOORE, Maurice (1735-77). An American colonial legislator and jurist, born in Brunswick County, N. C. He was the grandson of James Moore, Sr. (q.v.), of South Carolina, and was educated in New England. He became a member of the Assembly in 1757 and sat almost continuously until his death. From 1767 to 1773 he was one of the three judges of the Superior Court. His sympathies at first were with the Regulators (q.v.), but, alarmed by their excesses, he served as colonel of brigade in Governor Tryon's expedition against them in 1771. In this year he published the venomous attack on Governor Tryon signed "Atticus." He was a member of the Provincial Congresses of 1775 and 1776, and of the Constitutional Convention of 1776.

MOORE, Thomas (1779-1852). An Irish poet, born in Dublin, May 28, 1779. Having been for a while under an eccentric schoolmaster named Malone, Moore went to a grammar school kept by Samuel Whyte. In 1794 he went to Trinity College, Dublin, which had been opened to Roman Catholics in 1793. He had already shown a remarkably quick mind, a gift for music, and had written in 1793 "Lines to Zelia" and "A Pastoral Ballad." These verses appeared in the *Anthologia Hibernica*, a periodical which lived only two years. Moore began his university life in 1795. He won some fame as a wit, but few honors. He went to London in 1799 and soon arranged for the publication by subscription of his *Anacreon*. He was vexed on discovering that the Irish subscribers numbered two, the Provost and a Fellow of Trinity, but he had the good luck to find a patron in the Prince of Wales, who accepted the dedication of the poem. The *Anacreon* was followed by *Poetical Works of the Late Thomas Little* (1801), a volume of sweet but over-sensuous verse, much blamed but widely read. Moore's musical talents soon made him a welcome guest among the aristocracy. In 1803 he was appointed admiralty registrar at Bermuda; but disliking the post, he intrusted it to a deputy (1804), and traveled through the United States, where he visited New York, Washington, Baltimore, Philadelphia, and Boston. He returned to England in November, 1804. In 1806 appeared *Odes* and *Epistles*, which Jeffrey made the occasion for a savage attack on Moore's earlier erotics (*Edinburgh Review*, July, 1806). The incident led to a duel interrupted by the police (August 11, 1806). After this fiasco the combatants became cordial friends. In 1807 Moore published his *Irish Melodies*, 124 in number, in ten parts. He thus became the lyrist of Ireland, whose poetic side he fancifully and pathetically revealed to the English people. His three satires, "Corruption" and "Intolerance" (1808) and the "Sceptic" (1809), fell flat, as they deserved to do. On the other hand, lampoons on the Regent and his favorites went from mouth to mouth and were still liked when they were gathered in "The Twopenny Post Bag" in 1813. About 1817 he became embarrassed by the defalcation of the deputy left at Bermuda, and was compelled to retire for a time to the Continent. At Venice he visited Lord Byron, from whom he received the famous *Memoirs*, afterwards reluctantly burned. Moore returned to England in 1822. In 1835 he was granted a literary pension of £300, which was supplemented in 1850 by a civil pension of £100. He died at Sloperton, February 25, 1852. Lord John Russell and Lord Lansdowne were his friends to the end.

Moore was as popular in his day as either Byron or Scott. As a poet his fame now rests mostly upon the *Irish Melodies* (10 pts., 1807-34) and *National Airs* (1815), containing "Oft in the Stilly Night." Since the Elizabethan age the lyric had been dissociating itself from music. Moore again united them, and so completely that it is unfair to estimate his lyrics independently. They are light, airy, and graceful, though without the passion of Byron or Shelley. For a great poem by which he expected to be remembered, he turned to Oriental romance. *Lalla Rookh* (1817), everywhere applauded, was translated into several languages. Among Moore's other works are: *The Fudge Family in Paris* (1818), humorous verses; *The Loves of the Angels* (1823), partly in imitation of Byron's *Heaven and Earth; The Memoirs of Captain Rock* (1824), an attack on the Irish Church; a prose romance entitled *The Epicurean* (1827); lives of Sheridan (1825), of Byron (1830), of Edward Fitzgerald (1831); and a *History of Ireland* (completed in 1846). The *Life of Byron*, the main source for all later biographies, is still a classic. Consult: Lord John Russell (ed.), *Memoirs, Journals and Correspondence of Moore* (8 vols., London, 1853-56); Kent, *Poetical Works*, with memoir, (London, 1883); G. Vallat, *Thomas Moore, sa vie et ses œuvres* (Paris, 1887); and Gunning, *Thomas Moore, Poet and Patriot* (London, 1900).

MOORE, Willis Luther (1856—). An American meteorologist, born at Scranton, Pa. He was at first a reporter for the Binghamton (N. Y.) *Republican*, and then was on the staff of the Burlington (Iowa) *Hawkeye*, from which he entered the United States Signal Corps. There he rose rapidly, becoming professor of meteorology in 1894. He was stationed in Chicago until 1895, when he became chief of the United States Weather Bureau. He wrote a *Meteorological Almanac and Weather Guide* (1901).

MOORE'HEAD, Warren King (1866—). An American archæologist and anthropologist, born in Siena, Italy. He studied at Denison University and the University of Pennsylvania, and under Wilson, curator of anthropology in the Smithsonian Institution, and spent several years in exploring the mounds of the Ohio Valley. He became an assistant in the archæological department of the Columbian Exposition, and soon after he was appointed curator of the museum of the Ohio State University. His publications include: *Fort Ancient* (1890), *Primitive Man in Ohio* (1892), and *Prehistoric Implements* (1900).

MOORE'S CREEK. A small stream in North Carolina, on the banks of which, about 20 miles from Wilmington, a battle of the American Revolution was fought on February 27, 1776, between 1500 Loyalists, mostly Highland Scotch, under Brig.-Gen. Donald MacDonald, and about 1000 militia and minute men, under Cols. Richard Caswell and Alexander Lillington. The Loyalists charged across the girders of a bridge from which the planks had been removed, but were utterly defeated. Thirty of them were killed, many wounded, and about 800 taken prisoners. The effect of this battle, says Fiske, "was as contagious as that of Lexington had been in New England."

MOOR'FIELDS. A tract of marshy ground outside the old wall of London, north of the Tower. It was later called Fensbury or Finsbury, the present name of the district.

MOORFOWL. See Grouse; Ptarmigan.

MOORGATE. The later name of a gate in the wall of Roman London leading to Moorfields. It was removed about the middle of the eighteenth century. Its name is preserved in the present Moorgate Street.

MOOR'HEAD. A city and the county-seat of Clay County, Minn., on the Red River of the North, opposite Fargo, N. D., and at the junction of the Northern Pacific and the Great Northern railroads (Map: Minnesota, B 4). It is the seat of a State normal school and of Concordia College. Moorhead is an important distributing centre for the tributary agricultural country, and has a large trade in wheat. It has grain elevators and flour mills, brick yards, and a foundry and machine shops. The waterworks and electric light plant are owned and operated by the municipality. Population, in 1890, 2088; in 1900, 3730.

MOORHEN. The British gallinule. See Gallinule.

MOORING-SWIVEL. A device employed to join the two chain cables by which a ship is moored so that the swinging of the vessel with the tide will not cross the cables or produce turns in the hawse. It consists of an iron swivel with two shackles, to which the chain cables leading to the anchors are attached, and two shackles above which are capable of revolution, to which the chains leading through the hawse holes to the vessel are connected. A vessel so moored has many advantages, as the fouling of the hawse is prevented together with the constant necessity of unshackling the chain to "clear the hawse." See Hawse.

MOORISH ART. A term applied to the monuments produced by the civilization of the Mohammedans in Spain and in North Africa. See Mohammedan Art.

MOORS (ML. *Morus*, Lat. *Maurus*, Gk. Μοῦρος, perhaps from μαῦρος, *mauros*, ἀμαυρός, *amauros*, dark, or perhaps from their original native name). The name given to a mixed people constituting a very important element in the population of Northern Africa. Their appearance indicates their origin, which is a mixture of the Mauri, Numidians, Phœnicians, Romans, and Arabs, who have successively held possession of the country. They are a well-formed race, with fine Oriental features, and a mild and melancholy expression of countenance. The Moors employ the Arabic language, but with many corruptions and deviations from the original, and these appear to increase toward the west. The Moors first appear in history as the allies of the Vandals in their attack upon Roman Africa. They were conquered and converted by the Arabs at the beginning of the eighth century after a severe struggle. Having once embraced Mohammedanism, they joined the Arabs in the invasion of Spain, passing over in such numbers that in the early period of Spanish history the terms Moors, Saracens, and Arabs are used synonymously to designate the Mussulmans of the Peninsula. In the tenth century Moorish domination supplanted that of the Arabs in Northwestern Africa. At the close of the eleventh century the Moorish sect of the Almoravides (q.v.), who had established their sway in Morocco, invaded Spain and swept away the Arab kingdoms which had arisen on the ruins of the Caliphate of Cordova. After half a century their realm fell to pieces, and the Moorish sect of the Almohades (q.v.) became dominant in Morocco and Spain. In the meanwhile the Christian power in Spain had been steadily growing, and in 1212 the power of the Almohades was shattered in the battle of Navas de Tolosa. What was left of Moorish dominion in the Peninsula was soon consolidated in the Kingdom of Granada, which rose to a height of splendor almost rivaling that of the former Caliphate of Cordova. The kings of Granada carried on a vigorous warfare with the kings of Castile; but at length, weakened by internal discord, they succumbed in 1492 to the arms of Isabella of Castile and Ferdinand of Aragon. The Moors, or at least that portion of them who refused to accept Christianity, were then expelled from Spain, and began their piratical career in the Barbary States. Those who accepted the religion of their conquerors came to be known as Moriscoes. They were subjected to the most rigorous supervision, and any lapses from their adopted religion were ruthlessly punished by the Inquisition. For more than three-quarters of a century they lived as peaceful subjects of Spain and constituted by far the most industrious and intelligent element in the population. The persecutions of Philip II. drove them to revolt (1568-70), but the insurrection was suppressed with great cruelty by Don John of Austria, and a large number were driven from the country. The policy of oppression was continued with increased severity under

Philip II.'s successor, and in 1609 the Moriscoes were finally expelled from the country, the loss of more than half a million of her most active citizens proving in the end a disastrous blow to Spain. The Moriscoes crossed over to Africa, but were received with hostility by their kin, from whom long absence had estranged them.

Consult: Abu ibn Mohammed al Makarri, *The History of the Mohammedan Dynasties in Spain*, trans. and annotated by P. de Gayangos (2 vols., London, 1840-43); Aschbach, *Geschichte Spaniens und Portugals zur Zeit der Herrschaft der Almoraviden und Almohaden* (Frankfort, 1833-37); Coppée, *History of the Conquest of Spain by the Arab Moors* (2 vols., Boston, 1881); Dozy (ed.), *Histoire de l'Afrique et de l'Espagne* (Leyden, 1848-51), trans. from the Arabic of Ibn Adhari; id., *Recherches sur l'histoire politique et littéraire de l'Espagne pendant le moyen âge* (2 vols., 2d ed., Leyden, 1860); Lane-Poole, *The Moors in Spain* (London, 1886); Lea, *The Moriscoes of Spain* (Philadelphia, 1901).

MOORSHEDABAD, mo͞or'shē-dȧ-bäd'. A town of British India. See Murshidabad.

MOO'RUP (native name). A cassowary (q.v.); often wrongly written *mooruk*.

MOOS, mōs, Salomon (1831-95). A German aurist, born at Randegg, Grand Duchy of Baden. He studied at Heidelberg, Prague, and Vienna, in 1859 became lecturer in aural surgery at the first-named university, and in 1866 was appointed professor there. His researches in the pathology of the labyrinth of the ear were important. He first showed that the derangement of hearing and equilibrium observed in certain infectious diseases is due to the presence of minute organisms in the labyrinth. Among his publications are: *Ueber Pilzinvasion des Labyrinths nach Diphtheria* (1887), and *Untersuchungen über Mittelohrerkrankungen bei den verschiedenen Formen der Diphtheria* (1890). From 1868 he edited at Wiesbaden in collaboration with Knapp the *Zeitschrift für Ohrenheilkunde*, of which an edition in English was also published.

MOOSE (Algonquian *musu*, Knisteneaux *mouswah*, wood-eater). The popular name for the deer of the genus Alces, the largest quadruped of North America. The male, called 'bull moose,' is much larger than the female ('cow'), and stands six feet high or more at the shoulders, while the weight may exceed half a ton. The head is very large, and bears antlers of remarkable size and shape. They consist of an imperfectly separated anterior and posterior part, both in the female, and in the yearling male are only knobs an inch high. The ungainly aspect of the head is greatly increased by the large nostrils, and the large, hairy muzzle, which is almost long and muscular enough to be a proboscis, and it practically serves that purpose in gathering leaves, lichens, and twigs. The neck is short and stout, but the legs are very long, so that the animal cannot accommodate itself to feeding from the ground, and consequently seeks its food on shrubs and trees. The front legs are considerably longer than the rear ones, and this makes its gait, whether slow or fast, extremely awkward. The color of the moose is generally some shade of brown, the legs yellowish, but the pelage varies with age and season, and may be strongly grayish. During the summer moose are solitary in their habits, except that the young are usually found with the mother. The breeding season begins in September and mating goes on through the fall. At this season the bulls lose their natural timidity, become savage, and will readily attack any animal or even man, if their rage is aroused.

During the winter the moose often gather in small herds and form 'moose-yards' by trampling down the snow over a limited area, so that the shrubs and young trees become available for food. The young are born in the spring or early summer, one or two at a birth, and remain with the mother until the third year. Moose are among the very finest of game animals and have been so eagerly sought, not only for sport, but for meat, which is highly prized, that their numbers have been greatly reduced in all the settled parts of America. They are hunted in the late summer and early fall, oftentimes by means of jack-lights, as are other deer, but later in the season they are generally captured after being called within gunshot, the 'call' being a rude trumpet made of a roll of birch-bark, through which the voice of the animal is imitated. In winter moose are often followed on snowshoes. When taken young, moose are easily tamed, and there are many instances recorded of their use as draught animals.

Many writers regard the elk (*Alces malchis*) of the Old World as identical with the moose, while others hold the moose specifically distinct (*Alces Americana*). Recently the moose of the Yukon valley, called the Alaskan moose (*Alces gigas*), has been separated as a third species. The differences between these species are, however, very slight, consisting of slight variations in the palmation of the horns, the color of the pelage, and the size. The Alaskan moose is undoubtedly the largest form known. In the Old World the elk is found throughout Northern Asia and Europe, as far south as Eastern Prussia, the Caucasus, and Northern China. The common moose of America is found throughout Canada and southward into Maine, Minnesota, and the northern Rocky Mountains. The killing of moose is now (1903) prohibited in all the northern tier of States, and in Ontario and Newfoundland, except as follows: Bull moose may be killed for 47 days in October and November in Maine, and for 5 days in November in Minnesota. There is an open season for moose in the fall in Oregon, Wyoming, Washington, and all parts of Canada, not mentioned above. In Maine, Quebec, Ontario, Minnesota, and Washington, only one moose may be shot by one hunter in a season. The Alaskan moose is found in Northwestern British Columbia, Yukon, and Alaska as far north as the Arctic Ocean, and westward to the Yukon Delta and along the south coast as far as Katmai. Consult authorities mentioned under Deer; and see Plate of North American Deer.

MOOSEBIRD (so called from its frequent companionship with the moose). A local name in Eastern Canada for the Canada jay. See Jay.

MOOSE-FLY. A biting fly (*Hæmatobia alcis*) closely allied to the horn-fly (q.v.). It is a very annoying parasite of the moose in the great cranberry swamps of northern Minnesota and elsewhere. Unlike other external parasites of animals, it does not leave the body of the host as long as it remains unskinned.

MOOSE′HEAD LAKE. An irregular body of water on the border of Somerset and Piscataquis counties, Maine (Map: Maine, D 4). It is the largest lake in the State, being about 35 miles long and from one to ten miles wide. It receives the Moose River and several other streams, and is the source of the Kennebec, while toward the north it also drains into the Penobscot. It lies in the midst of a wild and sparsely inhabited forest region where game is still found. A railroad now runs along the southern shore through Greenville, and steamboats have for many years plied on the lake.

MOOSEWOOD. See LEATHERWOOD.

MOOT (AS. *mōt*, meeting, assembly; connected with *mētan*, to meet). The name given in Anglo-Saxon England to the meetings of the tribe or district and the like. In these moots was transacted a great part of the public business, whether executive, legislative, or judicial. The best known of these assemblies is the one which was attended by the great men of the whole nation or tribe, and was known as the moot of the wise men or Witenagemot (q.v.). But smaller districts, like the shire, the hundred, and the township, also held moots, which were usually attended by all the freemen of the district. The place of meeting of such an assembly was also frequently termed moot. Consult Stubbs, *Constitutional History of England*, vol. i. (6th ed., Oxford, 1897).

MOP′SUS (Lat., from Gk. Μόψος). (1) In Greek mythology, a seer, one of the Thessalian Lapithæ, the son of Apollo by Himantis, or of Ampyx by Chloris. He took part in the combat between the Centaurs and Lapithæ, in the Calydonian Hunt, and in the Argonautic Expedition, during which he was killed by a snake in Libya. After his death he was honored as an oracular hero. (2) A renowned seer, the son of Apollo and Manto, daughter of Tiresias. At Colophon he surpassed Calchas in phophecy. With Amphilochus he was credited with having built the Cilician city Mallos, where both the founders perished in a dispute over its possession.

MOQUEGUA, mō-kā′gwȧ. A coast department of Peru, bounded by the Department of Arequipa on the north, Puno on the east, Chile on the south, and the Pacific Ocean on the west (Map: Peru, C 7). Its area is 5549 square miles. It is traversed by the main range of the Andes, whose slopes are the most fertile and populous portions of the department. The coast region is a rainless desert. Vineyards cover large parts of the cultivated areas, and wine and brandy are the chief products. The population was officially estimated at 42,694 in 1896. The capital, Moquegua, is situated in the centre of the province, about 68 miles by rail from the port of Ilo. Founded in 1626, it suffered frequently from destructive earthquakes, and was entirely destroyed by the last upheaval, which occurred in August, 1868. Its population is estimated at 5000.

MOQUI, mō′kē. A tribe of North American Indians. See HOPI.

MOR, mōr (or **MORO**) **VAN DASHORST,** mō′rȯ vȧn däs′hôrst, ANTONIS (1512?-c.1578). A Dutch portrait painter, born at Utrecht. He secured the patronage of Emperor Charles V., and was much employed by the Duke of Alva, at Brussels. About 1568 he settled in Antwerp, where he died between 1576 and 1578. His portraits, which in style much resemble those of Holbein, entitle him to be ranked with the masters of his time. The Madrid Museum contains thirteen specimens from his brush, but the six in the Vienna Museum are the most instructive. Among these are: "Cardinal Granvella" (1549); "Young Man with a Scar" (1564); and a "Young Married Couple" (1575). In the Museum of The Hague there is also a male portrait (1564), and in the Louvre the "Dwarf of Charles V." Portraits of himself are in the Museum at Basel and in the Uffizi at Florence.

MORA, mō′rȧ (Guiana name). Certain species of trees of the genus Dimorphandra of the natural order Leguminosæ. The timber, which is exported as mora wood, is darker than mahogany. It is valued for shipbuilding, and is said to be equal to oak of the finest quality.

MORA′CEÆ (Neo-Lat. nom. pl., from Lat. *morus*, mulberry), or MULBERRY FAMILY. A natural order of dicotyledonous plants, comprising about 800 species of trees, shrubs, or herbs of temperate and tropical climates, and designated by Bentham and Hooker as a suborder of Urticaceæ. The Moraceæ have rough leaves, a milky juice, very small flowers followed by fruits inclosed in a succulent receptacle, or fleshy calyx, or if in a head or spike combined into one. Some are valuable for their fruit, some for the caoutchouc obtained from their milky juice, others for their fibre and timber. Among the species are figs, mulberries, Osage orange, fustic, and contrayerva, hops, hemp, etc. According to Engler the chief genera in the restricted order are: Morus (the mulberry), Maclura (Osage orange), Broussonetia (paper mulberry), Artocarpus (breadfruit), Castilloa (rubber or caoutchouc), Antiaris (upas tree), Ficus (fig), Humulus (hop), and Cannabis (hemp).

MORADABAD, mȯ-rŭd′ȧ-bäd′. A city of British India. See MURADABAD.

MORAES BARROS, mȯ-rĭsh′ bär′rȯs, PRUDENTE (1841-1902). A Brazilian politician, born at Itú, in São Paulo. He studied law, and in 1885 entered the National Legislature, and there became a leader of the Republican Party. After the deposition of Dom Pedro, Moraes Barros was appointed Governor of São Paulo (1889). He became president of the Constitutional Assembly; was defeated for President of the new Republic by Fonseca (1891), but was elected to that post in 1894 by a majority which proved a crushing defeat for the military party. He was forced to retire in November, 1896; was reëlected four months afterwards, but was defeated in 1898 by Campos Salles.

MORAINE (Fr., from It. *mora*, heap of stones, from Bavarian Ger. *mur*, débris). An accumulation of earth and stone carried forward by a glacier. When such materials are heaped up along the margins of a glacier, the lines of débris are called *lateral moraines*. The confluence of glaciers causes a coalescing of the inner lateral moraines, which are then carried forward as *medial moraines*. Débris frozen in the lower part of the glacier and pushed along its bed is called the *ground moraine*. Finally the materials transported in the various ways accumulate at the lower end of the glacier in irregular mounds constituting *terminal moraines*. See GLACIER.

MORALES, mō-rä′lās, Luis de, called El Divino (c.1510-86). A Spanish painter, born at Badajoz. He studied in Valladolid or Toledo, and modeled his style upon that of Michelangelo. His subjects are always religious—hence his sobriquet. His care for detail and clear brilliant colors suggest the early German painters, or the primitive Florentines. The "Mater Dolorosa," "Madonna," "Ecce Homo," "Presentation," "Head of Christ," and "Christian Allegory" are in the Madrid Museum; "Christ Bearing the Cross" is in the Louvre, and an "Ecce Homo" is in the gallery of the Historical Society, New York City.

MORALITY (OF. *moralite,* Fr. *moralité,* from Lat. *moralitas,* morality, character, from *moralis,* relating to manners, from *mos,* custom). The third stage in the development of the modern drama, following upon the mystery and the miracle play (qq.v.). Essentially the morality was an ethical treatise cast in dramatic form. According to the usual plot, various personages, each representing a virtue or a vice, contend for dominion over an abstraction called Mankind. The virtues usually win. The serious character of the play was relieved by comic scenes and buffoonery. The leading Vice, a sort of clown, in time became the centre of attraction, and is thought to have been the origin of the Fool of Shakespeare's plays. Besides the virtues and vices, however, allegorical personages were introduced, such as Riches, Good Deeds, Death; in fact, any human condition or quality. The French moralities adhered less strictly to these purely abstract qualities, and even the later English authors are more apt to use historical characters celebrated for the vice or virtue in question, as Aristides instead of abstract Justice. Later still, as the passions of the Reformation were stirred up, actual men and women were shown under very thin disguises. In other ways the morality was a distinct advance toward the regular drama. There being no prescribed plot as in the mysteries and miracle plays, it was necessary to create one, with a clear end toward which the action of the characters was to lead up. So close, in fact, did the morality come to the regular drama that it did not cease to be acted in England until almost the end of the reign of Elizabeth. In 1902 and 1903 *Everyman,* perhaps the best morality in English, was performed in England and in the United States by a company of English players under Ben Greet. Though this play lacks swiftness of action, its sincerity is unbroken; its moralizing does not fall into platitudes, and various scenes, for instance the appeal to Riches, are poignantly dramatic.

MORAL PHILOSOPHY. See Ethics.

MORAN′, Edward (1829-1901). An American marine painter, born in Bolton, Lancashire, England. He removed with his parents while young to Philadelphia, where he became a pupil of James Hamilton, and of Paul Weber. After 1862 he studied in England and on the Continent, returning to reside in New York in 1869. Among his best works are: "Outward Bound," "Launch of the Life-Boat" (1865); the "Coming Storm in New York Bay;" a "Foggy Morning;" "Melodies of the Sea" (1890); "The South Coast of England" (1900). He also executed a series of historical paintings completed in 1899, representing epochs in United States marine history from the landing of Leif Ericson (1001) to Dewey's Return (1899). He was an associate of the National Academy, and a member of the Society of American Artists and of the Pennsylvania Academy of Fine Arts. He died in New York City, June 9, 1901.

MORAN, Peter (1842—). An American etcher and illustrator, brother of Edward and Thomas Moran, born at Bolton, Lancashire, England, and brought by his parents to Philadelphia, where he studied painting under his brothers, Thomas and Edward. His taste led him to pastoral and quiet scenes in country life, and especially to animal painting. Among his paintings are the "Return of the Herd," which received a medal at the Centennial Exhibition; "Santa Barbara Mission;" "Pueblo of Zia, New Mexico." He received a medal at the Centennial of 1876 for etchings of animals.—His son Percy (1862—) is known as a painter of colonial subjects and modern women. He took the Hallgarten Prize in 1886, and the gold medal of the American Art Association.—Another son, Léon (1864—), likewise a painter, treats genre subjects.

MORAN, Thomas (1837—). An American etcher, illustrator, and landscape painter. He was born at Bolton, Lancashire, January 12, 1837, and came to Philadelphia with his parents. During an apprenticeship to a wood engraver he devoted himself to water-color painting with success. He then studied oil painting under James Hamilton, and later in Paris and Italy. He returned to the United States in 1871 and made sketches of scenes in the Yellowstone, from which he produced the picture of the "Grand Cañon of the Yellowstone," now filling a panel in the Capitol at Washington. In 1873 he joined the United States Exploring Expedition, conducted by Major J. W. Powell, which surveyed the cañons of the Colorado River, and on his return completed a picture of "The Chasm of the Colorado," which was purchased by Congress as a companion of the Yellowstone picture. The following year he visited the Mountain of the Holy Cross in Colorado, and on his return to New York, where he made his residence, he finished a large picture of that mountain. He was elected a member of the National Academy in 1884. Among his smaller pieces are: "The Lost Arrow," "The Conemaugh in Autumn," "The First Ship," "The Track of the Storm," "Ponce de Leon in Florida," "New York from Communipaw," and "After a Thaw." Moran designed the illustrations on wood that adorn the reports of both Hayden's and Powell's explorations. His other illustrations include designs for Longfellow's *Hiawatha* and Whittier's *Mabel Martin.* Moran's style is a strong souvenir of the works of the English painter Turner, in the iridescent play of color of which he is very fond. He paints the momentary and evanescent phases of nature which offer brilliant and striking opportunities for rich, glowing color. Both he and his wife and pupil, Mary Moran (1842—), are etchers, and members of the British Society of Painter-Etchers.

MORAN-OLDEN, mō′rȧn ōl′den, Fanny (1855—). A German soprano singer, born at Cloppenburg. She appeared first in Dresden in 1877; two years afterwards, while the leading soprano at Frankfort, she married the tenor, Karl Moran, and made her début in opera at Leipzig (1884). The remarkable range of her voice enabled her to sing rôles so diverse as Elisabeth in *Tannhäuser* and Ortrud in *Lohengrin,* while she appeared also as Brünnhilde, Isolde, Fidelio, Norma, Donna Anna, and Fides. She visited New York City in 1889, and afterwards taught singing in Berlin.

MORA STONES. A group of stones near Upsala, Sweden, interesting on account of their historical associations. The kings of Sweden on their election anciently swore fidelity to the laws of the land near these stones, after which the judges, on behalf of the people, took the oath of allegiance to the monarch, whose name was then inscribed on one of the stones. In 1770 the remaining ten stones were protected by an inclosing building.

MORAT, mō′rȧ′. A town of about 2400 inhabitants, in the Canton of Fribourg, Switzerland, on the lake of Morat, 8½ miles north by west of Fribourg. It is famous for the victory of the Swiss and their allies, 25,000 in number, over Charles the Bold, Duke of Burgundy (q.v.), with an army of 35,000 men, June 22, 1476.

MORATÍN, mō′rȧ-tēn′, LEANDRO FERNÁNDEZ DE (1760-1828). A Spanish dramatist, born in Madrid, the son of Nicolás Fernández de Moratín. A year spent at Paris had much influence upon the artistic development of the young poet, who was later to make the Molièresque drama successful in Spain. Returning to Madrid in 1778, he gained the favor of the powerful Godoy, and was allowed to have his play in verse, *El viejo y la niña,* produced upon the stage at Madrid in 1790. This drama was followed by a more important piece (in prose), the *Café,* also called the *Comedia nueva* (1792), a sharp satire upon the wretched playwrights of the day. At the expense of the Government, Moratín went abroad to study the foreign stage. From Paris he passed on to London, and after a year in that metropolis, where he began his translation of *Hamlet* (published in 1798), he journeyed through Holland, Flanders, Germany, Switzerland, and Italy. After his return he was for a while a member of the bureau established to reform the theatre. His third comedy, *El Baron,* originally written as a zarzuela or vaudeville, was performed in 1803, and the next year witnessed the appearance of a third comedy in verse, the *Mojigata* (The Female Hypocrite). With the *Sí de las niñas,* the second of his prose comedies, he reached the height of his power and fame. Molière was the guiding star of Moratín the Younger in all his dramatic compositions. Yet Moratín displays originality, for he excellently describes the manners of his time and handles dialogue with skill. Though he adhered to the French system of unities, he also adopted certain peculiarities of the native Spanish stage, dividing his plays into three acts, using the favorite short *romance* verse, and introducing some truly Spanish intrigue into his plots. Taking him for all in all, he was the best dramatist that Spain had had since the *Siglo de Oro.* In 1812 Moratín brought out a successful translation of Molière's *Ecole des maris.* At Barcelona, in 1814, there was a representation of his version of Molière's *Médecin malgré lui.* He was at Bayonne and Bordeaux after 1821, and at Bordeaux he finished his historical account of the Spanish stage, *Orígenes del teatro español.* He died in Paris in 1828. His works may be read in volume ii. of the *Biblioteca de autores españoles.* Consult Ford's edition of the *Sí de las niñas* (Boston, 1899).

MORATÍN, NICOLÁS FERNÁNDEZ DE (1737-80). A Spanish playwright, called the Elder, born in Madrid. He was a teacher as well as a man of letters, and had a chair of poetry in the Imperial College. The chief significance of the work of the elder Moratín lies in the fact that he contributed to the success of the principles of literary art imported from France. Spanish literature had greatly degenerated when this reform movement to which Moratín belonged undertook to improve matters by following the rigid rules of French classicism. Moratín illustrated these rules in a comedy, *Petimetra* (printed in 1762), and a tragedy, *Lucrecia,* neither of which appeared upon the stage. His drama *Hermesinda* and his tragedy *Guzmán el bueno* were performed with some success. Of his other productions there may be mentioned the *Diana,* a short poem on the chase; the narrative, or *epic* poem as he called it, *Las naves de Cortes,* celebrating the burning of his ships by the Conquistador; and his well-known *quintillas* on a bull-fight. Consult his works in volume ii. of the *Biblioteca de autores españoles;* and the poem on the bull-fight in J. D. M. Ford, *A Spanish Anthology* (New York, 1901).

MO′RATO′RIUM (Neo-Lat., neu. sg. of Lat. *moratorius,* relating to delay, from *mora,* delay). An extraordinary act of a government, by which the collection of all debts is suspended for a specified time. A recent instance is the moratorium decreed by Argentina in 1890 at the time of the great financial crisis which led to the suspension of the Barings of London. See INTERNATIONAL LAW.

MORAVA, mō′rȧ-vȧ. The largest river of Servia. It is formed by the union at Stolač, Servia, of the southern and the western Morava, the former rising in the Turkish Vilayet of Kossovo, and the latter on the southwest boundary of Servia (Map: Turkey in Europe, C 2). The united stream enters the Danube 30 miles east of Belgrade. The Morava is about 240 miles long, and is navigable for small boats 50 miles from its mouth.

MORA′VIA (Ger. *Mähren*). A margraviate and crownland of Austria-Hungary, bounded by Prussian Silesia, Austrian Silesia, Hungary, Lower Austria, and Bohemia (Map: Austria, E 2). Area, 8578 square miles. It is traversed along the northern boundary by the Sudetic Mountains, along the eastern boundary by the Carpathians and the White Mountains, and along the western boundary by the Bohemian-Moravian highlands, which descend in terraces toward the valley of the March. Moravia belongs to the basin of the Danube, and is watered by its tributary, the March, which flows through the centre of the country from north to south. The climate is generally mild. The mean annual temperature is 48° at Brünn. The mineral deposits include iron, lignite, coal, graphite, sulphur, lead, and copper. All these are exploited to some extent, the output in 1900 having been valued at $3,242,627. There are a number of sulphur and saline springs.

Agriculture is the principal industry, Moravia being one of the foremost cereal-producing parts of Austria. The principal products are rye, oats, barley, wheat, corn, and flax, sugar beets, clover, hay, and grapes. Stock-raising is carried on extensively. Among manufactures the woolen industry is especially developed. Other manufactures are those of linen, yarn, cotton goods, leather, sugar, spirits, machinery, railway supplies, tobacco products, etc. In 1899 Moravia had over 500,000 persons engaged in manufacturing, of whom nearly 22,000 were employed in the beet-sugar industry. The railways had a total mileage of 1150 miles in 1900.

The Landtag is composed of the Prince-Archbishop of Olmütz, the Bishop of Brünn, 30 representatives of the landed aristocracy, 31 representatives of the towns, 6 representatives of the chambers of commerce and industries of Brünn and Olmütz, and 31 representatives of the rural districts. The representatives of the rural districts are indirectly elected. In the Lower House of the Austrian Reichsrat Moravia is represented by 36 members.

At the head of the administration is the Governor, representing the Crown. The crownland has a system of district courts, and at Brünn a court of second instance, from which appeals can be made to the Supreme Court at Vienna. Moravia is well provided with educational institutions, and over 98 per cent. of its school population attend school. Capital, Brünn (q.v.). The population was 2,276,870 in 1890, and 2,437,706 in 1900. Over 71 per cent. of the population consists of Czechs, Moravians, and Slovaks, and about 28 per cent. of Germans. Over 95 per cent. of the inhabitants are Roman Catholics.

History. Moravia was anciently occupied by the Quadi, who left the country at the time of the great migration of nations. They were succeeded by other Germanic peoples, whose sojourn was temporary, and in the sixth century the region was occupied by Slavs. These peoples took the name of Moravians, from the river Morava. Charles the Great, the ruler of the Franks, brought the people under nominal subjection, and constrained their King, Samoslav, to receive baptism; but Christianity was first formally established in the second half of the ninth century by Cyril and Methodius. The ninth century witnessed repeated wars between the Germans and the Moravians. Svatopluk, who ruled over the Moravians from about 870 to 894, built up an extensive but short-lived realm, which soon after his death was shattered to pieces by the onslaught of the Magyars. From 1029 Moravia was generally united with Bohemia, either as an integral part of that realm or as a fief ruled by margraves. On the death of Louis II., at the battle of Mohács, in 1526, Moravia, with all the other Bohemian lands, passed under the rule of the House of Austria. In 1849 it was formally separated from Bohemia and declared a distinct province and crownland.

Consult: Wolny, *Die Markgrafschaft Mähren topographisch, statistisch und historisch geschildert* (5 vols., Brünn, 1835-40); Dudik, *Mährens allgemeine Geschichte* (12 vols., Brünn, 1860-88), for the early history; Smolle, *Die Markgrafschaft Mähren* (Vienna, 1881); *Die österreichisch-ungarische Monarchie in Wort und Bild. Mähren und Schlesien,* vol. xxii. (Vienna, 1897).

MORAVIANS. Called also The United Brethren (Unitas Fratrum) and The Moravian Church. An evangelical Church which arose in Bohemia and Moravia among followers of John Huss (q.v.); originally known as Bohemian Brethren (q.v.). They secured the episcopacy from the Austrian Waldenses in 1467. Fraternizing with the Reformers of both Germany and Switzerland, they increased rapidly, and after the Schmalkaldic War established a third province in Poland. By 1617 they numbered at least 200,000. With the granting of the Bohemian charter, in 1609, they obtained a legal status, but were systematically suppressed and exiled during and after the Thirty Years' War. Their Polish province, with its centre at Lissa, now acquired importance, and a number of parishes were founded in Hungary. But the Peace of Westphalia excluded Austrian lands from the benefits of religious liberty, and in 1656 Lissa was destroyed in the war between Poland and Sweden. The Polish parishes were gradually absorbed by other Protestant bodies. Meanwhile a 'hidden seed' of the *Unitas Fratrum* remained in Bohemia and Moravia, and their bishop, Johann Amos Comenius (q.v.), republished their history, confession, and discipline, and took steps to perpetuate the episcopate. Hence for about fifty years clergymen who at the same time served parishes of the Reformed Church were consecrated bishops of the *Unitas Fratrum.*

A revival of religious life among the 'hidden seed' in Moravia led the awakened to abandon their homes and secretly flee to Saxony to secure religious liberty. Here, in 1722, they began to build the town of Herrnhut on the estate of Count Zinzendorf (q.v.), who had granted them an asylum. Herrnhut became the rallying place for descendants of the Brethren, several hundred of whom migrated from Austrian lands. They introduced the discipline handed down by Comenius, and in 1735 the episcopate was transmitted from its surviving representatives, Jablonski and Sitkovius. The development of the *Unitas Fratrum* now took a new form. Zinzendorf became the leading bishop, and strove to subordinate denominationalism to the promotion of Christian life. He did not permit the Church to expand, as other churches expand, nor distinctly to sever connection in every respect with the State Church; but established on the Continent, in Britain, and in America an 'exclusive system' by which it was attempted to secure a membership solely of converted men and women. Their culture in spiritual life was promoted by exceedingly close supervision, by an abundant supply of the means of grace—daily services, and services for the several divisions of the congregation distributively—and by an effort to separate them from the rest of the world. The members of the establishments were indefatigable in missions among the heathen, maintained schools for young people not of their communion, and conducted the so-called *Diaspora,* or inner mission, among members of the State churches of Germany, the Baltic Provinces, Scandinavian lands, Holland, and Switzerland, seeking the conversion of individuals without drawing them from their former communion.

Though the 'exclusive system' was wholly abandoned in America in 1856, and practically so in Britain, while in Germany it has been much modified, the three chief forms of activity continue. Missions among the heathen are maintained in Labrador and Alaska, among the Indians of North America, among the negroes of the West Indies, in Nicaragua, British and Dutch Guiana, Cape Colony, German East Africa, Australia, and among Tibetan people of the Western Himalayas. A home for lepers is maintained near Jerusalem. Thirty-three schools are carried on, in addition to colleges and theological seminaries. The mission in Greenland, maintained since 1733, was transferred to the Danish Lutheran Church in 1900.

The Moravian Church now consists of four provinces—the German, the British, and the American, North and South—which are united as one body in regard to doctrine, ritual, discipline, and mission work. Internally each province is independent, its affairs being administered by a synod, which elects a provincial executive board, consisting of bishops and other ministers. This board appoints the ministers to the various congregations. The executive boards of the four provinces constitute the Directing Board of the Unity. Every ten years a general synod convenes, each province and the missions having representatives. This synod takes cognizance of the life, doctrine, and activity of the entire Church, elects the mission board, and to it the mission board is responsible.

The Moravian Church has a complete ritual, including services for the Lord's Day and other forms, but allows of free prayer in public worship; its music, vocal and instrumental, is highly developed. It perpetuates the three orders of the ministry, but its bishops, who alone ordain, do not exercise administrative functions *ipso facto.* It observes the Christian year; admits new converts by confirmation; receives members of other churches by certificate; encourages lay work; and exercises strict discipline. The cardinal points of Moravian teaching are those held in common by all evangelical churches. Eight cardinal points, in regard to which the teaching of Holy Scripture is plain, have been repeatedly reaffirmed by the General Synod in the language of Scripture. As formulated by the General Synod of 1899, these doctrines teach: (a) Total depravity of human nature; (b) the love of God the Father, who has 'chosen us in Christ'; (c) the real Godhead and real humanity of Jesus Christ; (d) reconciliation and justification through the sacrifice of Jesus Christ; (e) the Holy Ghost and the operation of His grace; (f) good works as the fruit of the Spirit; (g) the fellowship of believers; (h) the second coming of Christ and the resurrection. These truths are held not as a rigidly formulated confession, but as the Moravian conception of the main contents of Christian doctrine. The resuscitated Moravian Church has never issued a confession of faith, as such.

The Moravian Church in America. Moravian emigrants went to Georgia in 1735; but five years afterwards they removed to Pennsylvania, where they built the towns of Bethlehem and Nazareth. A form of communism was temporarily adopted, as a quick mode of subduing the wilderness and at the same time promoting missions. The lands were the property of the Church, and the farms and industries were carried on for its benefit; but he who had means of his own retained them; there was no common treasury. This system, 'The Economy,' continued for twenty years. Each member was pledged to devote his time and powers as they might be best applied for the spread of the Gospel, and missionaries went to the Indians of New York, Connecticut, and Pennsylvania, and later Ohio. Though the 'Economy' was of short duration, the American division of the Church was administered from Germany, and the exclusive policy prevailed until 1856. According to statistics compiled in 1902, the American provinces reported 15,873 communicants and a total membership of 23,896. There were 112 congregations, and 109 ministers actively engaged. In the home provinces, including the Bohemian-Moravian mission, there are 38,844 members; in the foreign missions 137 stations and 71 outstations, with 402 missionaries, exclusive of secretaries, etc., 62 native missionaries and 1807 other native agents. The communicant membership of the missions was 34,641, with a total membership of 96,833.

The American Moravians have a theological seminary, founded in 1807, at first as a department added to the academy at Nazareth, begun in 1759, and known as Nazareth Hall. It is situated at Bethlehem since 1858. A collegiate department preparatory to the theological proper was inaugurated at an early period. Buildings have been erected valued at $75,000, exclusive of the ground. The endowment fund is now $118,000. A six years' course of study is pursued, three and one-half years classical and two and one-half theological. Four professors constitute the permanent faculty. The number of students varies from 35 to 40.

Bibliography. For the period prior to 1722, consult: Gindely, *Geschichte der böhmischen Brüder* (Prague, 1856-57); id., *Ueber des Johann Amos Comenius Leben und Wirksamkeit* (2d ed., Znaim, 1893); Schweinitz, *The History of the Unitas Fratrum* (Bethlehem, 1885). For the period since 1722: Cröger, *Geschichte der erneuerten Brüderkirche* (Gnadau, 1852-54); Hamilton, *A History of the Moravian Church During the Eighteenth and Nineteenth Centuries* (Bethlehem, 1900). For the Moravian Church in the United States, consult: Reichel, *The Early History of the Church of the United Brethren in North America* (Nazareth, 1888); Hamilton, *History of the Moravian Church in the United States,* in the "American Church History Series" (New York, 1895). For Moravian missions, consult: Thompson, *Moravian Missions* (New York, 1882); Hamilton, *History of the Missions of the Moravian Church During the Eighteenth and Nineteenth Centuries* (Bethlehem, 1901).

MORAY, mō′râ. Any of a large group (suborder Calocephali, of order Apodes) of eel-like fishes, especially one of the family Murænidæ and genus Muræna. They are degenerate, aberrant eels, distinguished by their small round gill openings and the absence of pectoral fins. They inhabit warm and especially tropical seas, particularly about coral reefs. They are brightly colored, often of large size, and always voracious and pugnacious. Ten or twelve genera are known, embracing about 120 species, among which the true morays (genus Muræna) are characterized by the presence of two pairs of nasal barbules. The muræna of the Romans, or 'murry' (*Muræna Belena*), abounds in the Mediterranean, and is sometimes of large size, four feet or more in length, golden yellow in front and purple toward the tail, beautifully banded and mottled. Its flesh is white and highly esteemed. It prefers salt water, but can accommodate itself to a fresh-water pond. The ancient Romans kept and fed it in vivaria. The story of Vedius Pollio feeding his murænas with offending slaves is well known. Two species of this genus are found in American waters. The common spotted moray or 'hamlet,' the most numerous eel in the West Indies, is *Lycodontis moringa*, and is yellowish in color, thickly spotted and marbled with dark markings. A larger one (five to six feet) is the greenish-black moray or 'morena verde' (*Lycodontis funebris*), the biggest and most ferocious of the eels of the American tropics (both coasts), and one well known about the Florida reefs. The so-called 'conger eel' of California (*Lycodontis mordax*) is a food fish of some local importance. See Plate of Eels, Congers, and Morays.

MORAY, mŭr′rĭ, Earl of. See Murray.

MORAY FIRTH. An arm of the North Sea, extending southwestward into the northeastern part of Scotland (Map: Scotland, E 2). It is 16 miles wide at the entrance, and about 40 miles long. It forms a good harbor, and is navigable for large steamers as far as Inverness. The name is sometimes extended to the whole of the large, triangular indentation between Kinnaird and Duncansby Heads, having a width of 75 miles.

MORAYSHIRE, mŭr′ȧ-shẽr. A maritime county of Scotland. See Elginshire.

MORAZÁN, mō′rȧ-thän′, Francisco (1792-1842). A soldier and statesman of Honduras. He was a member of a French West Indian family, and entered politics when his country became independent of Spain, in 1821. He became Secretary-General, and took part in the organization of the new Government. He also played an important part at the head of the troops in putting down the demonstrations of the various revolutionary factions, and was in 1830 elected President of the Central American Confederation. In this office he became the foremost representative of liberal principles, as opposed to the reactionary policy of the old Spanish party, whose stronghold was Guatemala. He expelled the archbishop and the friars who were inciting the pro-Spanish faction to revolt, and abolished the most important Church privileges. In 1832 he suppressed an insurrection against the Federal Government in Salvador. In 1838 a formidable revolution again broke out, headed by Carrera, leader of the conservatives in Guatemala. Morazán, after defending the Federal Government with courage and ability, felt that the tide was too strong to struggle against; he therefore resigned his office, April 5, 1840, and went to Peru. There he organized a force, and in 1842 invaded Costa Rica, hoping to reorganize the Confederation. He overthrew the Government without difficulty, and was enthusiastically elected Governor. His popularity, however, was short-lived. His advocacy of the Central American Confederation led to another insurrection. He was taken prisoner, court-martialed, and shot, September 15, 1842. Consult Bancroft, *History of Central America*, vol. iii. (San Francisco, 1887).

MORBIHAN, môr′bē′äɴ′. A western department of France, situated along the south coast of the Peninsula of Brittany (Map: France, D 4). It is hilly in the north, very sparsely wooded, and largely occupied by heaths and marshes. Only one-third of its area, which covers 2624 square miles, is cultivated, producing cereals, flax, hemp, and apples. Iron ore is found, but there are no industries or commerce of any importance. Population, in 1891, 544,470; in 1901, 563,468. The capital is Vannes.

MORDANTS (OF., Fr. *mordant*, from Lat. *mordens*, pres. part. of *mordere* (to bite). Substances used in dyeing for the purpose of fixing colors on textile fabrics. The manner in which mordants act has been described under Dyeing (q.v.). It remains to enumerate here the most important mordants employed by the dyer. Among *basic mordants* may be mentioned alum, aluminum sulphate, ferrous acetate, ferrous sulphate, ferric sulphate, ferric acetate, ferric nitrate, stannous chloride ('tin crystals'), stannic chloride (the solution is known commercially as 'cotton spirits'), stannic oxide (produced by soaking cotton in a solution of sodium stannate and then passing it through dilute sulphuric acid), potassium (or sodium) bichromate, chromium acetate, and chrome alum. Among the acid mordants may be mentioned tannic acid and the so-called 'fatty acids.' The latter are applied first in the form of their sodium or potassium salts (soaps) dissolved in water; then the fabric is passed through a solution of aluminum sulphate, which combines with the fatty acids to form in soluble aluminum salts on the fibre; finally when a basic dyestuff is applied, the aluminum salts react with it, their acids combining with it to yield permanent colors. See Dyeing.

MORDAUNT, môr′dŭnt, Charles, Earl of Peterborough. See Peterborough.

MORDAUNT, Frank (1841—). An American actor, born at Burlington, Vt. After playing as an amateur in New York, he joined the theatrical profession in 1859. He supported Mary Anderson in 1878; then Edwin Booth, taking parts like that of the King in *Hamlet* and Kent in *King Lear*. Among his more recent rôles were those of Tommaso in *Mr. Barnes of New York* (1888), Nicholas Vanalstyne in *The Henrietta* (1889), and General Kendrick in *The Heart of Maryland* (1895).

MORDECAI, môr′de-kī, Alfred (1804-87). An American soldier and military writer, born at Warrenton, N. C. He graduated at West Point in 1823, and remained there the two following years as assistant professor of philosophy and of engineering. At the outbreak of the Civil War he resigned from the army. From 1863 to 1866 he was assistant engineer of the Mexico and Pacific Railroad. In 1867 he became secretary and treasurer of the canal and coal companies controlled by the Pennsylvania Railroad. Among his publications are: *A Digest of Military Laws* (1833); *Artillery for the United States Land Service* (1849); and *Ordnance Manual for the Use of the Officers of the United States Army* (2d ed. 1850).

MORD′VINS. A mixed Finno-Turkish people numbering about 1,000,000 living in the heart of Russia between the Volga and Oka. In height they average 1.639 meters, and are brachycephalic (cephalic index, 83.8). They are finely built, and have dark hair—darker in the south than in the north—and blue eyes. Agriculture is their principal occupation, and they are excellent carpenters and woodworkers, selling great quantities of wooden vessels and other objects, and they are noted for bee-keeping. Nominally the Mordvins have accepted Christianity, but many interesting pagan customs are preserved among them. The women especially preserve their old national costume, wearing embroidered jackets and skirts, an elaborate coiffure, large earrings, and necklaces.

MORE, mōr, HANNAH (1745-1833). An English author, born at Stapleton, near Bristol, February 2, 1745. She was well educated, scribbled essays and verse as a girl, and wrote a pastoral drama. She became acquainted with Garrick, Burke, Reynolds, and Dr. Johnson, and was encouraged by Garrick to write two tragedies, *Percy* (1777) and *The Fatal Falsehood* (1779), both of which met with some success. About 1780 she withdrew from society, built a cottage at Cowslip Green, ten miles from Bristol, and began writing moral and religious works. *Sacred Dramas* (1782) were succeeded by the extensively read *Thoughts on the Importance of the Manners of the Great to General Society* (1788). With the aid of her sisters she established Sunday-schools in the neighboring districts. A successful tract called *Village Politics* (1793) led to the famous *Cheap Repository Tracts* (1795-98), of which two millions were circulated the first year. Her religious novel *Cœlebs in Search of a Wife* (1809) ran through eight editions the first year, and was still more popular in the United States. She died at Clifton, September 7, 1833. Consult: *Life of Hannah More*, by W. Roberts (3d ed. 1838), and by H. Thompson (1838); also Marion Harland, *Literary Hearthstones: Hannah More* (New York, 1900).

MORE, HENRY (1614-87). An English theologian. He was born at Grantham, Lincolnshire, of Calvinist parents, but became a warm adherent of the Church of England. After some years at Eton he went to Christ's College, Cambridge, where he pursued the study of philosophy, especially the Platonic writers. About 1639 he took holy orders and lived henceforth a quiet life within the courts of his college, refusing all preferments. His numerous works represent the mysticism of the Cambridge Platonists (q.v.). His poems, including the "Song of the Soul," were collected and published as *Philosophical Poems* (1647). The characteristic principles of his philosophy are to be found in the *Divine Dialogues* (1668). Complete editions of his *Opera Theologica* appeared in 1675, and of his *Opera Philosophica* in 1678. Consult his *Life* by Ward (London, 1710), and an analysis of his life and works in Principal Tulloch's *Rational Theology*, vol. ii. (Edinburgh, 1872).

MORE, NICHOLAS (?-1689). A Chief Justice of Pennsylvania, born in England. He was chairman of the first Provincial Assembly in 1682, Speaker of the Assembly in 1684, and in the same year was appointed Chief Justice. In 1685 he was impeached by the Assembly for exceeding his powers, but he was never tried by the Council. His case is peculiarly interesting as being probably the first instance of impeachment that occurred in America. Consult: Shepherd, *History of Proprietary Government in Pennsylvania* (New York, 1896); vol. vi. of *Columbia University Studies in History, Economics, and Public Law*.

MORE, Sir THOMAS (1478-1535). An English author and statesman. He was born in London and educated first at Saint Anthony's School near his home, but at thirteen was placed in the household of Cardinal Morton. Morton quickly recognized his gifts, and predicted that he would 'prove a marvelous man.' His interest a year or two later sent the boy to Oxford, where he entered at Canterbury Hall, afterwards merged in Christ Church. Here he laid the foundations of the scholarship which made him such an admirable type of the Renaissance learning, under Linacre and Grocyn. Though he left Oxford after two years and studied law at New Inn and Lincoln's Inn, he kept up his literary studies and his friendship with these men and with Erasmus, Colet, and Lilly; with Erasmus, in particular, whom he met in 1497 on his first visit to England, he had a close friendship which was only terminated by death. More at one time thought of becoming a priest, and in these days lived a very austere and ascetic life. He lectured on Saint Augustine's *De Civitate Dei;* and it is possible that his meditations on the City of God may have suggested his own famous conception of an ideal community in the *Utopia*. Though he abandoned his idea of taking orders about 1503, he remained a fine specimen of the devout layman all his life, though a sharp critic of any shortcomings in the clergy.

In 1504 he entered Parliament and soon gained fame by opposing a large grant of money to the King, Henry VII., whose hostility compelled him to retire to private life. His law practice, however, brought him a large income. When Henry VIII. came to the throne, he was made under-sheriff of London, and engaged in a number of important commercial missions, during his absence in Flanders on one of which he began his *Utopia*, published 1516. He was made justice of the peace in 1515, and two years later master of requests, an office which brought him into frequent contact with the King, to whose council he was admitted in the same year. He was knighted in 1521, and continued a prominent figure at Court. Attracting the notice of Wolsey, he was recommended by the Cardinal as Speaker of the House of Commons, and elected in 1523.

Though, like Erasmus and Colet, he had much at heart a reform of the Church in practical matters, he had no sympathy with the violent measures of Luther and his followers, and in 1523 appeared as a champion of his sovereign against the German reformer. Thenceforward until his death he was constantly in the lists against the supporters of the new doctrines. On Wolsey's fall in 1529, More was appointed to succeed him as Chancellor, the holding of the office by any but a great ecclesiastic being an unheard-of innovation. He held the office only two years and a half, and then resigned it, foreseeing that his conscience would bring him to an open struggle with the King, whom he had already opposed at several stages of the gradual breach with Rome.

The inevitable conflict came in the spring of

1534, when subscription was required to the act of succession, including a renunciation of the jurisdiction of 'any foreign potentate.' More flatly refused to take the oath, and was committed to the Tower, where he remained a prisoner until his death. He was brought to trial on a charge of treason, and convicted by the most flagrant perjury and injustice, and sentenced to be hanged at Tyburn. The King commuted the sentence to beheading. On July 6th he was executed in the Tower, retaining the calmness and wit which had marked his life to the last. His execution shocked the whole of Europe, and Charles V. declared that he would rather have lost his best friend than such a counselor. More was beatified by Leo XIII. in 1886, together with other English martyrs.

More is to-day best known as the author of the *Utopia* (q.v.). It was written in Latin, so as to reach the learned world, and is full of dramatic skill and fertile invention. The earliest English version, of which five scholarly reprints were published between 1869 and 1893, appeared in 1551, but earlier than this it had been translated into German, Dutch, and Italian. More's English works, principally of a controversial or devotional character, are marked by forcible, nervous, simple style, and by an abundance of witty illustration. His *History of Richard III.* (first correctly printed in 1557), though incomplete, is notable among the beginnings of modern history in English, and his early biography of Pico della Mirandola (1510) is characteristic of his devotion to the Renaissance ideal. Consult: Bridgett, *Life and Writings of Sir Thomas More* (London, 1891); Hutton, *Sir Thomas More* (ib., 1895); Cooke, *Three Great Lives* (ib., 1884); Seebohm, *The Oxford Reformers* (3d ed., ib., 1887); Nisard, *Renaissance et réforme* (Paris, 1877); Louis, *More und seine Utopia* (Berlin, 1895). See Communism.

MORE'A. The peninsular portion of Greece, connected with the northern half of the country by the narrow Isthmus of Corinth. It was known in ancient times as the Peloponnesus (q.v.), but has been known by its present name since the Middle Ages, if not from as early a period as the fourth century (Map: Greece, D 4). This name is usually said to be derived from *morus*, a mulberry—the outline of the Peninsula bearing a resemblance to the leaf of that tree. Others, however, such as Fallmerayer, trace it back to the Slavic word *more*, the sea, which nearly encircles the Morea. See Greece.

MORÉAS, mȯ′rå̇′å̇′, Jean (1856—). A French poet, born in Athens, his real name being Papadiamantopoulos. In 1877 he settled in Paris, and about 1882 began to publish his verse in some of the newer reviews. His first volume, *Les syrtes* (1884), cleverly parodied by Beauclair under the title *Les déliquescences*, "par Adoré Floupette, poète décadent," brought on his school the title of 'decadent.' In 1886 Moréas published *Les cantilènes.* Moréas repudiated his earlier manner in 1892 for that of the School of Romance, which urged a return to the verbal richness of old French poetry. For such a task the 'grammarian poet' with his thorough knowledge of early French diction and metre was peculiarly fitted. Moréas wrote also: *Le pèlerin passionné* (1891); *Eriphile* (1894); and *Stances* (1899 and 1901).

MOREAU, mȯ′rō̇′, Adrien (1843—). A French painter, born at Troyes, and a pupil of Pils. His spirited genre pictures have won him several mentions, notably a second-class medal in 1876, one at the Paris Exposition of 1889, and the cross of the Legion of Honor in 1892. His "Duchess de Longueville Instigating the People to Rebellion" (1886) was purchased by the Government. He is also a painter in water-color and an illustrator.

MOREAU, Gustave (1826-98). A French painter, born in Paris. He studied under Picot, but was more influenced by Delacroix, and his own friend, Chassériau. When he went to Rome he imitated such painters as Montegna and Signorelli. He exhibited little, and did not become known until toward the end of his life. The only modern painters with whom he can be compared are Burne-Jones and Puvis de Chavannes. He left his eight hundred or more works in water-color and oil to his native city to form the Musée Moreau in the Rue de la Rochefoucauld. The most notable of his paintings are the following: "Jason," "Death and the Young Man" (1865); "Orpheus" (1867, in the Luxembourg); "Prometheus" (1869); "Salome" (1876); "The Sphinx" (1878); "Hesiod and the Muses," and "The Apparition," in the Luxembourg. From 1892 to 1898 he was a professor in the Ecole des Beaux-Arts. He received the cross of the Legion of Honor in 1875. Consult Muther, *A History of Modern Painting* (New York, 1896).

MOREAU, Hégésippe (1810-38). A French poet. He was born in Paris, worked as a typesetter and teacher, and then turned his attention to literature. He suffered the greatest privations, and died in a hospital just as his talent began to be appreciated. His works comprise: *La Voulzie*, elegies, and *Contes à ma sœur*, prose romances reminiscent of Nodier, of which the most notable is "Le gui de chêne." His works appeared under the title of *Myosotis* (1838), and his correspondence in the first volume of his *Œuvres complètes* (1890-91).

MOREAU, Jean Victor (1763-1813). A celebrated French general of the Revolutionary and Napoleonic period. He was born August 11, 1763, at Morlaix, in Brittany, and studied law at Rennes. In 1789 he embraced the cause of the Revolution, and was later chosen to command the battalion of volunteers from his native town. He served under Dumouriez in 1793, and displayed such military talent that in 1794 he was made a general of division. His father was put to death by the guillotine, but Moreau decided that he could not withdraw from the service of his country. When Pichegru (q.v.) fell under suspicion in 1796, the Directory appointed Moreau to the chief command on the Rhine and Moselle. He crossed the Rhine at Kehl, defeated Latour at Rastatt, and the Archduke Charles at Neresheim, and drove the Austrians back to the Danube; but, owing to the defeat of Jourdan at Würzburg, he found himself in danger of being cut off from the Rhine, and was obliged to make a desperate effort to regain that river, which he accomplished in the face of great difficulties, fighting two unsuccessful battles at Emmendingen and Hüningen in October. A suspicion of participation in the plots of Pichegru led to his being deprived of his command in 1797, but in 1799 he succeeded Scherer in the command of the army in Italy. By a retreat conducted with consummate skill he saved the French army from destruction, though defeated April 27, 1799, by Suvaroff at Cassano. The Directory deprived him of the chief command, and gave it to Joubert, but Moreau remained with the army, and after the death of Joubert at Novi, August 15, 1799, again assumed the command, and conducted the troops back to France. The disinterestedness of Moreau's character, his military talent, and his political moderation, brought him great popularity. He assisted Bonaparte on the 18th Brumaire, and receiving the command of the Army of the Rhine, gained victory after victory over the Austrians in the campaign of 1800, and on December 3d won the great and decisive battle of Hohenlinden (q.v.). A strong feeling of mutual distrust now arose between Moreau and Bonaparte, and the former retired to his country seat, which became the gathering place of the discontented. He was accused of participation in the plot of Pichegru and Cadoudal (q.v.) against the life of the First Consul, and was arrested, brought to trial, and found guilty on June 10, 1804, although the evidence against him was worthless. But Bonaparte could not venture to condemn him to death, and a sentence of two years' imprisonment was therefore pronounced, which was commuted into banishment. Moreau went to America, where he settled first in New Jersey, and later at Morrisville, Pa. Regarding with great dissatisfaction the whole of Bonaparte's career, he joined in 1813 the Emperor of Russia and the King of Prussia in the march against Dresden, where, as he stood with the Emperor Alexander on a height at Räcknitz, on August 27th, a French cannon ball broke both his legs. Amputation was performed, but he died at Laun in Bohemia, September 2, 1813, and was buried in Saint Petersburg. Consult: Beauchamp, *Vie politique, militaire et privée du général Moreau* (Paris, 1814; English translation, London, 1814); Chateauneuf, *Histoire du général Moreau* (Paris, 1814).

MOREAU, Mathurin (1822—). A French sculptor, born at Dijon. He was first instructed there by his father, and then in Paris, where he was the pupil of Ramey, the younger, and of Dumont. Prominent among his graceful allegorical and ideal figures and groups are "The Fairy of the Flowers" (1853); "The Spinner" (1861, Luxembourg Museum); "Studiosa" (1866); "Saltarella" (1868); "Phryne" (1878); "Protection of Childhood" (1892), besides which the statues of Gregory the Great and of Saint Jerome, in the Church of the Trinity, Paris, deserve notice.

MOREAU DE SAINT MÉRY, de săɴ mȧ′rē′, Médéric Louis Elie (1750-1819). A French statesman, a native of Martinique. He was a member of the Constituent Assembly in 1790, a Councilor of State in 1800, and administrator of Parma, Piacenza, and Guastalla 1802-06. He fell into disgrace with Napoleon in 1806, and lived in poverty till 1817, when Louis XVIII. pensioned him. During the Reign of Terror and the Directory he lived as a bookseller in Philadelphia. He published *Lois et constitutions des colonies françaises de l'Amérique de 1550 à 1785*, and *Description de Saint Dominique* (Philadelphia, 1796-98).

MORECAMBE, mōr′kăm. A popular watering place in Lancashire, England, on Morecambe Bay, three and a half miles northwest of Lancaster (Map: England, D 2). It has a pier, promenade, aquarium, people's palace, electric lighting plant, etc. Population, in 1891, 6500; in 1901, 11,800.

MORECAMBE BAY. An inlet of the Irish Sea, on the northwest coast of England (Map: England, C 2). It is about 17 miles long, 10 miles in average breadth, and very shallow.

MORÊL, mŏr′ĕl (Fr. *morille*, from OHG. *morhela*, Ger. *Morchel*, mushroom, diminutive of OHG. *morahā*, *morhā*, Ger. *Möhre*, carrot), *Morchella*. A genus of fungi. The species, which have a more or less agreeable smell and taste, appear in the spring or early summer among the grass under or near trees and are most abundant in places that have been burned over. The stalk or stipe when fresh is swollen, white, and covered with fine granulations. The conical top is honeycombed, at first cream-colored, later becoming yellow, and then brownish when old or dried. Morels are reckoned among the best of esculent fungi. The common morel (*Morchella esculenta*), perhaps the best known, is common in America and in many parts of Middle and Southern Europe. Its stalk is only about an inch long, the pileus is roundish, oval, oblong, or conical, yellowish or brown. Fresh or dried it is nutritious, and not difficult to digest, but is chiefly used in sauces and gravies, on account of its pleasant flavor. See Colored Plate of Edible Fungi.

MORELIA, mȯ-rā′lē-ȧ, or Valladolid, vä′lyȧ-ᴅō-lēᴅ′. The capital of the State of Michoacan, Mexico, situated in a mountainous region, 6300 feet above sea-level, and 130 miles west-northwest of Mexico City (Map: Mexico, H 8). The town lies in a fertile valley, and is regularly built with many squares and two paseos or promenades. It has a fine cathedral, completed in 1745, and a State Capitol built of hewn stone in Byzantine style; other notable buildings are the city hall, the court-house, and the public library. It has also a number of educational institutions, the most important being the theological seminary and the Colegio San Nicolas de Hidalgo. A good water supply is obtained by a handsome aqueduct four miles long, which was constructed in 1788. The chief industries of the town are the manufacture of cotton goods and tobacco. Population, 33,900. Morelia was founded under the name Valladolid in 1541, and the present name was given it in honor of Morelos, the priest and insurgent leader in the revolt against Spain, who was a native of the city.

MORELL′, George Webb (1815-83). An American soldier. He was born in Cooperstown, N. Y., graduated first in his class at West Point in 1835, served as assistant engineer from 1835 to 1837, and in June, 1837, resigned from the service. Subsequently he was assistant engineer first of the projected Charleston and Cincinnati Railroad, and then of the Michigan Central Railroad from 1837 to 1839, and from 1842 to 1861 practiced law in New York City. After the outbreak of the Civil War he served for several months as a colonel of New York militia and chief of staff of Major-General Sanford, became a brigadier-general of volunteers in August, 1861, served under McClellan throughout the

Peninsular campaign, and in July, 1862, was appointed major-general of volunteers, though the commission, not being sent to the Senate for confirmation, lapsed in March of the following year. Morell participated in the second battle of Bull Run and in the Maryland campaign of September-October, 1862, and commanded the forces guarding the Upper Potomac from October 30 to December 16, 1862, and the draft rendezvous at Indianapolis, Ind., from December, 1863, to August, 1864. In December, 1864, he was mustered out of service, and afterwards until his death lived as a farmer at Scarborough, N. Y.

MORELL, John Daniel (1816-91). An English philosopher, born at Little Baddow, in Essex. He graduated at Glasgow University in 1840, took his M.A. degree a year later, and then went to Bonn, where he studied theology and philosophy. After his return he became independent minister at Gosport, but three years later (1845) resigned the position. In 1846 he published his *Historical and Critical View of the Speculative Philosophy of Europe in the Nineteenth Century,* which was highly praised and which led Lord Lansdowne to appoint him inspector of schools, an office which he held until 1876. In 1849 appeared his *Philosophy of Religion,* a work that was widely discussed. Among his other publications are: a *Grammar of the English Language* (1857), and *On the Progress of Society in England as Affected by the Advancement of National Education* (1859). In philosophy he was an eclectic, but inclined toward idealism, while in religion he gradually outgrew the narrow limits of his earlier belief until he came into sympathy with all branches of the Christian Church. Consult Theobald, *Memorials of J. D. Morell* (London, 1891).

MORELLA, mȯ-rā′lyȧ. A strongly fortified town of Eastern Spain, in the Province of Castellón, situated among the mountains, 50 miles west of the mouth of the Ebro (Map: Spain, E 2). It is built on a steep hill in the midst of a rough and inaccessible country, and is surrounded by walls and towers, the wall being tripled on one side. The population, in 1900, was 7078.

MORELLET, mô′r'-lå′, André, Abbé (1727-1819). A French author, born in Lyons. After a youth of poverty and hard study, he came into possession of a small annuity, and thenceforth lived in Paris. He was in sympathy with the Encyclopédistes, and was a personal friend of Voltaire. He was made a member of the Academy in 1785, entered the newly established Institute in 1803, and in 1808 was named Deputy from the Seine. He belonged to the school of Turgot in political economy, and was one of the first in France to argue for free trade. His numerous works are more remarkable for eloquence, force, and vivacity of style than for original thought. Among his most powerful pamphlets are: *Théorie du paradoxe* (1785), against Linquet; *Préface de la comédie des philosophes, ou La vision de Charles Palissot* (1760); *Le cri des familles* (1795), a protest against the confiscation of property owned by those condemned by the Revolutionary tribunals; and *Mélanges de littérature et de philosophie au XVIIIème siècle* (1818). His other works include *Mémoires sur le XVIIIème siècle, et la Révolution* (1821). Many of the pamphlets were translated into English.

MORELLI, mȯ-rĕl′lė, Domenico (1826-1901). An Italian painter, born in Naples. He studied at the Naples Academy, and in Rome under Camillo Guerra, and with Overbeck. He was afterwards professor at the Naples Academy with Filippo Palizzi. He belongs, with Michetti, to the realist school of Naples, a development of later nineteenth-century art in Italy, and was in fact the leader in this movement. His most important paintings are: "Tasso Reading His Poem to the Three Eleanoras;" "Bath at Pompeii;" "Temptation of Saint Anthony" (1878); "Christ in the Wilderness;" "The Marys Going to Calvary;" and "An Arab Musician." Consult Ashton, *Sketch of the Life and Work of Domenico Morelli* (Boston, 1895).

MORELLI, Giovanni (1816-91). An Italian art-critic, known under the pseudonym Ivan Lermolieff. He was born in Verona, studied medicine at Munich, Erlangen, and Berlin, and in 1838 went to Neuchâtel, where he assisted Agassiz in his investigations of glaciers. He subsequently devoted himself to art criticism, his method, based upon empiric principles, being embodied in his *Die Werke italienischer Meister in den Galerien von München, Dresden und Berlin* (1880). This was subsequently amplified to *Kunstkritische Studien über italienische Malerei* (1890-93), and translated by Ffoulkes under the title *Italian Painters: Critical Studies* (1892). Morelli was a member of Parliament 1860-70 and was made a Senator in 1873.

MORELLY, mô′r'-lė′. A French socialist of the middle of the eighteenth century. He was born at Vitry-le-Français, taught there, and became an abbé; but of his life nothing more definite is known. His works include: *Le prince* (1751), in which he argues for communism; a poem, *Le naufrage des îles flottantes ou La Basiliade* (1753), which describes an ideal Government ruled by the laws of nature; and *Le code de la nature* (1755-60), a work long attributed to Diderot, and the forerunner of modern communism. Consult Lichtenberger, *Le socialisme au XVIIIème siècle* (Paris, 1895).

MORELOS, mȯ-rā′lōs. One of the smallest States of Mexico, situated in the interior, and bounded by the State of Mexico with the Federal District on the north and west, Guerrero on the west and south, and Puebla on the east (Map: Mexico, J 8). Area, 2773 square miles. The northern part is extremely mountainous and cut up by deep ravines. The land slopes toward the south, where the agricultural land is found. The valleys of the south are extremely fertile and produce corn, rice, wheat, sugar cane, coffee, and fruit. The State is traversed by two railway lines, and has a considerable trade. Population, in 1900, 161,697. Capital, Cuernavaca (q.v.).

MORELOS. A city of Mexico. See Cuatla de Morelos.

MORÉLOS Y PAVÓN, mȯ-rā′lōs ė pȧ-vōn′, José Maria (1765-1815). A Mexican patriot. He was born of very poor parents at Valladolid, the town now known as Morelia, and was thirty years old before he was able to secure a chance to get an education by entering the College of San Nicolas, where Hidalgo (q.v.) was rector. He made rapid progress, entered holy orders, and was curé of two parishes when in 1810 his old rector began the revolt against Spain. By July, 1811, when Hidalgo was shot, Morelos had won considerable reputation as a brave fighter and safe leader. During the following winter he won a series of victories in the south and west, completely paralyzing the Spanish power for a time. From February 19 to May 2, 1812, Morelos with about 5500 men held the town of Cuatla against a greatly superior Spanish force under General Calleja, and finally succeeded in fighting his way out of the town. In October, 1812, he captured Orizaba, and on November 25th took Oaxaca by storm. In August, 1813, he besieged and took Acapulco. Morelos now set about the organization of an independent Mexican Government. He called a congress at Chilpatzingo which abolished slavery, forbade the collection of tithes for religious purposes, and, on November 6, 1813, issued a Declaration of Independence. In December Morelos marched to Valladolid, where he was attacked and defeated by Iturbide (q.v.), who completed the dispersion of the independents by attacking them again at Puruaran on January 15, 1814. Morelos retired to Acapulco and again summoned a congress. The Royalists followed up their advantage, driving the revolutionists from one place to another, until November 5, 1815, when, just as the two parties were preparing for battle near Texmalaca, a traitor named Carranco in the army of Morelos betrayed the latter into the enemy's hands. Morelos was conveyed to the City of Mexico, where he was delivered over to the Inquisition, which condemned him to do penance as "an unconfessed heretic and a traitor to God, the King, and the Pope." He was then handed back to the secular arm, and was shot on the 21st or 22d of December, 1815. His remains at present repose in the Cathedral at Mexico, and his name is revered throughout the country as one of the earliest martyrs, with Hidalgo, of the cause of Mexican independence.

MOREPORK. (1) In Australia, a caprimulgine bird (*Podargus Cuvieri*) of Australia and Tasmania. Like many other nightjars, this bird has a peculiar cry, of two syllables, resembling the words *more pork*, whence the name. It is remarkable for a habit, when alarmed, of stiffening itself in a fixed attitude, sometimes flat on the log, or rock, or fence-rail, where it happens to be, and sometimes erect. Then, as it is dull gray, it looks like an excrescence or projection from the surface, and so escapes casual observation. An extended discourse, illustrated by photographic pictures, will be found upon this example of protective mimicry in Saville-Kent's *Naturalist in Australia* (London, 1897). Several species belong to the genus—all large birds, and remarkable in structure for the possession of a pair of powder-down patches on the back at the base of the tail. See Plate of NIGHTJARS, ETC.

(2) In New Zealand, an owl (*Spiloglaux Novæ-Zealandiæ*).

MORÉRI, mȯ'rȧ'rē', LOUIS (1643-80). A French scholar, born at Bargemont (Provence). He entered the Church, and was made chaplain to the Bishop of Apt in 1673. He published the first edition of his *Grand dictionnaire historique ou le mélange curieux de l'histoire sacrée et profane* at Lyons in 1674. This work is still of importance from a biographical point of view, and has often been translated. The twentieth edition, printed in Paris in 1759, and comprising ten volumes, is considered the best.

MORESNET, môr'nȧ'. A town and neutral territory of about 1½ square miles on the borders of Belgium and Prussia, and under the double protectorate of those countries, about five miles southwest of Aix-la-Chapelle (Map: Belgium, D 4). It was granted an independent constitution after the Vienna Congress of 1815. With a burgomaster alternately appointed by Belgium and Prussia, with self-government, and a polyglot population of German, Flemish, Dutch, and French, Moresnet presents interesting phases of social and political life. Population, estimated at 3000.

MORESQUE (Fr. *moresque*, from It. *moresco*, from ML. *Moriscus*, Moorish, from *morus*, Lat. *Maurus*, Moor). A term applied to the Arabesques of Mohammedan art, which formed the main element of its architectural decoration. The term has come into general use since the extension of the term arabesque to include details of classical and Renaissance decoration. See ARABESQUE; MOHAMMEDAN ART.

MORETON (mōr'ton) **BAY.** A harbor on the east coast of Queensland, Australia, formed inside the islands of Stradbroke and Moreton (Map: Queensland, H 9). It is about 40 miles long by 17 miles wide, and receives several small rivers. Among them is the Brisbane, having the city of Brisbane at its mouth.

MORETON BAY CHESTNUT (*Castanospermum Australe*). An Australian tree of the natural order Leguminosæ, which attains a height of about 100 feet, has wide-spreading branches, pinnate leaves, large racemes of beautiful red and yellow flowers, and pods six or seven inches in length. The seeds, which somewhat resemble chestnuts in size and quality, are soaked for several days in water, dried, roasted, pounded into a coarse meal which is used like flour. The wood, which shrinks greatly in drying, is brown, soft, easily worked, and when well seasoned is adapted to cabinet work.

MORETON BAY PINE. See ARAUCARIA.

MORETO Y CABAÑA, mȯ-rā'tȯ ė kȧ-ʙä'nyȧ, AGUSTIN (c.1618-69). A Spanish dramatist, born at Madrid. He studied at Alcalá de Henares and then went to Madrid, where he found a friend and patron in Calderon. A volume of his plays appeared at Madrid in 1654, and some three or four years later he entered the household of the Cardinal Archbishop of Toledo. Although inferior to Lope de Vega and to Calderon, he yet takes rank as one of the best dramatists of the latter part of the *siglo de oro*, or golden age. He achieved his real success in the category of dramas styled *comedias de capa y espada*—that is, dramas of intrigue. In these he excelled as a delineator of character, and also showed some study of manners. Moreto's masterpiece is the play *El desdén con el desdén* (Scorn for Scorn), which still delights on the stage as it did in the days of the author. Borrowing the idea from Lope's *Milagros del desprecio*, he produced a work better artistically than that of the master, and most brilliant. In his *Princesse d'Elide*, Molière imitated the *Desdén con el desdén*. Another excellent play is *El lindo Don Diego*, in which he admirably depicts the foppish gallant of the period. Of his historical dramas one of the most interesting is the

Rico hombre de Alcalá, dealing with Pedro the Cruel as the justice-loving King. Consult *Comedias escogidas* of Moreto in volume xxxix. of the *Biblioteca de autores españoles*, which also has L. Fernández Guerra y Orbe's essay on him.

MORETTO DA BRESCIA, mȯ-rĕt′tȯ dȧ brĕsh′ȧ (1498-1555). An Italian painter, whose real name was Alessandro Bonvicino. He was born at Brescia in 1498, and obtained his early art education in this city under Fioravante Ferramola. Later he is thought to have received stimulus from the works of Titian. In 1521, when twenty-three years of age, in frescoes executed in the Chapel of San Giovanni Evangelista at Brescia, he showed himself strong in conception and handling of form, and endowed with a genius for color harmony exceptional even in the Venetian school. His works are pervaded by a characteristic silvery tone, which foreshadowed Paul Veronese, but differ from that painter in the gravity of his conception and the reverent religious feeling in his sacred compositions.

Between 1521 and 1544 Moretto executed many paintings in and about Brescia, where his works may best be studied. Among the principal are: the altar-piece of San Clemente, Brescia, representing "Saints with a Choir of Angels;" "The Ascension of Mary," in Santi Nazaro e Celso; and "Mary Appearing to a Shepherd Boy," in the Church of Paitone (Province of Brescia). In 1544 he painted his celebrated "Christ in the House of the Pharisee" for Santa Maria della Pietà, Venice, a work virile in presentation and pleasing in composition. Other important works are contained in the galleries of Italy and Northern Europe. The Staedel Institute, Frankfort, possesses a fine altar-piece representing the "Enthroned Madonna with the Four Doctors;" and the Berlin Museum has "The Glory of Mary and Elizabeth." There are also typical examples in the Imperial Gallery, Vienna, the National Gallery, London, the Brera, Milan, and in the Louvre. Moretto died at Brescia in 1555. Among his pupils, the most important was Giambattista Moroni of Bergamo. Consult Crowe and Cavalcaselle, *History of Painting in the North of Italy* (London, 1891).

MO′REY, Samuel (1762-1843). An American inventor, chiefly remembered for his attempts to solve the problems of steam navigation. He was born in Hebron, Conn., and lived in Orford, N. H., and Fairlee, Vt. In 1793, after several years of experimenting, he succeeded in constructing a small steamboat, which was moved by a wheel at its prow. It was exhibited on both the Connecticut River and the Hudson, and it is said that Chancellor Livingston made Morey an offer of $7000 for the use of the invention about New York, but that Morey refused. In 1795 Morey patented a crank-motion steam-engine for use in boats. Two years afterwards he built at Bordentown, N. J., a boat with paddle wheels on each side, and operated it successfully on the Delaware. He seemed, in fact, to have had the problems of steam navigation practically solved; but misfortunes prevented him from following up his success, and to Robert Fulton went the honor that might otherwise have been Morey's.

MOREY FORGERY. In American political history, the forgery, during the Presidential campaign of 1880, of the name of James A. Garfield, the Republican candidate for the Presidency, to a letter which was widely used for campaign purposes. The letter, which favored Chinese immigration and purported to be addressed to "H. L. Morey, Lynn, Mass.," was made public in *Truth*, a New York paper, on October 20, 1880; and on the 22d what purported to be a fac-simile of the letter was published in the same paper. Garfield immediately denounced the letter as a forgery, but extensive use was made of it by the Democratic campaign managers, and many votes were supposed to have been turned by it from the Republican ticket. Consult Davenport, *History of The Morey Letter* (New York, 1884).

MOR′FILL, William Richard (c.1830—). An English Slavic scholar. He was educated at Oriel College, Oxford, where he graduated with a first-class in classics in 1855, and in 1889 became reader of Russian. He became professor of Slavonic languages, and was appointed curator of the Taylor Institute. His excellent works on Slavic literature, language, and history include: grammars of Polish (1884), Serbian (1887), Russian (1889), and Czech (1898); *Russia* (1881); *Slavonic Literature* (1883); *Story of Russia* (1891); *Story of Poland* (1893); and a *History of Russia from the Birth of Peter the Great to Nicholas II.* (1902).

MORGAGNI, môr-gä′nyė, Giovanni Battista (1682-1771). A celebrated Italian pathological anatomist, born at Forli in Romagna. He studied at Bologna, graduating in both medicine and philosophy in 1701. In his twenty-third year he assumed the presidency of an independent medical school. In 1715 he was appointed to fill the chair of anatomy at Padua, where he remained and performed his life work as a pathologist. He is generally regarded as the founder of pathological anatomy, and his book on the *Seats and Causes of Disease* has remained a classic. Morgagni became known wherever the art of medicine was known and practiced. He was made a fellow of the Royal Society of London in 1724; of the French Academy of Science in 1731; of the Imperial Academy of Saint Petersburg in 1735; and of the Academy of Berlin in 1754. His more important works are: *Adversaria Anatomica*, published in six parts, the first at Bologna and Padua (1706-19; Leyden, 1741); *In Aurelium Celsum et Quintum Serenum* (Padua, 1704 and 1721); *Opuscula Miscellanea* (Leyden, 1763); *De Sedibus et Causis Morborum per Anatomen Indagatis* (Bassano, 1761). His *Opera Omnia* appeared at Bassano in 1765.

MOR′GAN, the Fay. An important figure in mediæval romance, whose origin is probably to be traced to Celtic mythology. In the *Vita Merlini*, ascribed to Geoffrey of Monmouth, she is mentioned as the eldest of nine sisters who inhabit the fortunate 'Insula Pomorum.' She is said to be very learned in the art of healing, and to be endowed besides with the mysterious powers of changing shape and of flying like a bird. To her, according to the same account, the wounded Arthur was borne after the battle of Camlan. Morgan played a similar part in romances of other cycles. Thus, in the story of "Ogier le Danois," she receives the aged Ogier in the island of Avalon and restores him to youth; and in the "Orlando Innamorato" of Boiardo there is a long account of her splendid abode at the bottom of a lake. In Italy, her name has been popularly applied to a form of mirage. (See FATA MORGANA.) In the Celtic romances she is said to be a sister of King Arthur. The origin of her name and character is uncertain. It has been proposed to identify the nine sisters of the "Insula Pomorum" with the nine priestesses of Sena described in the ancient account of Pomponius Mela. From a different point of view Morgan has been connected with the Irish *Muirgen,* better known by the name *Liban. Morgan,* like *Muirgen,* may mean 'sea-born,' and both persons have something to do with the world beneath the waves. But this theory (proposed by Professor Rhys) will not account for all the features of the story. The whole subject has recently been investigated in an elaborate study by Dr. L. A. Paton, who holds that Morgan's name and part, at least, of her characteristics are derived from the Irish *Morrigu,* a kind of battle-goddess. Consult Miss Paton's dissertation, *Studies in the Fairy Mythology of Arthurian Romance,* a Radcliffe College monograph (Boston, 1903). For Rhys's view consult his *Arthurian Legend* (London, 1887).

MORGAN, CONWAY LLOYD (1852—). A British zoölogist, born in London. He was educated at the Royal Grammar School and the Royal College of Science. From 1878 to 1884 he was lecturer in English and physical science in the Diocesan College, Rondesbosch, Cape Colony, and in the latter year became professor of zoology and geology in University College, Bristol. In 1887 he was made principal of University College, and became widely known as a lecturer in Great Britain and the United States. His publications include: *Animal Biology* (1887); *Animal Life and Intelligence* (1890); *Animal Sketches* (1891); *Psychology for Teachers* (1895); *Habit and Instinct* (1896); *Animal Behavior* (1900); *Introduction to Comparative Psychology* (1901).

MORGAN, DANIEL (1736-1802). An American soldier prominent in the Revolutionary War. He was born in Hunterdon County, N. J., removed to Virginia in 1753, served as a teamster under Braddock in 1755, and during an Indian campaign three years later was seriously wounded. He moved to Winchester in 1762 and occupied himself with farming and stock-raising, but served as a lieutenant in Pontiac's War and as a captain in Lord Dunmore's War. In 1775 he was put in command of a company of Virginia riflemen, with whom he joined Washington at Cambridge in July. Accompanying Arnold's expedition against Quebec, he served with great efficiency and gallantry, both on the march and in the attack of December 31, 1775, when he was captured by the enemy. He was regularly exchanged before the close of 1776; was appointed colonel of a Virginia regiment, and in 1777 played a most important part in the campaign against Burgoyne. In 1778 he served in New Jersey under Washington, and in June, 1779, dissatisfied with the policy of Congress as regards promotions, he resigned: though in September, 1780, he joined Gates at Hillsboro', N. C., as a brigadier-general. He was conspicuous for his ability and energy throughout the Southern campaign, and was in chief command at the battle of Cowpens (q.v.), where he defeated Tarleton; but, owing to bodily infirmities, he was forced to withdraw from the army in August, 1781. After the war he devoted himself chiefly to farming, though in 1794 for a time, during the Whisky Insurrection, he served as a major-general, and in 1796 he was elected to Congress. He died at Winchester, Va., July 6, 1802. Consult: Graham, *Life of General Daniel Morgan of the Virginia Line* (New York, 1856); and McConkey, *The Hero of Cowpens* (New York, 2d ed., 1885).

MORGAN, EDWIN DENNISON (1811-83). An American politician, Governor of New York from 1859 to 1863. He was born at Washington, Berkshire County, Mass.; at seventeen he removed to Hartford, Conn., and in 1836 he settled in New York City, where he met with great success as a merchant. From 1849 to 1853 he was a member of the State Senate. He was a delegate to the first national convention of the Republican Party at Philadelphia, and was one of the vice-presidents of that assembly. His high standing as a business man led to his being chosen chairman of the Republican National Committee. He retained the position until 1864, and ably managed the first three national campaigns in which the party participated. In 1858 he was elected Governor of New York, and was reëlected in 1860. In the latter term it fell to him to supervise and control the sending of New York's quota of troops to the front in defense of the Union, and when he left office in 1863 more than 223,000 volunteers had been enlisted in the Federal service. In 1861, in order that he might better carry out the Administration's desires, New York State was made a military district, and he was placed in command with rank of major-general. From 1863 to 1869 he was a member of the United States Senate, and in 1872 he was again made chairman of the Republican National Committee.

MORGAN, FORT. See FORT MORGAN.

MORGAN, Sir GEORGE OSBORNE (1826-97). An English lawyer and Liberal politician. He was born at Gothenburg, Sweden; studied at Oxford, where he won the Newdigate Prize in 1846; graduated at Worcester in 1848, and was civil-law fellow at University College, Oxford, where he was intimate with Arthur Penrhyn Stanley, Sellar, and Clough. Morgan was called to the bar in 1853. He was elected to the House of Commons in 1868, and zealously befriended ecclesiastical and educational reform and the amendment of English land laws. In 1880 he was appointed to Gladstone's Cabinet as judge advocate, and in this post carried an army discipline bill which did away with flogging (1881). He became Under Secretary for the Colonies in 1886, remained in the House of Commons until his death, and held the leadership of the Welsh party. He was made a baronet in 1892.

MORGAN, GEORGE WASHBOURNE (1822-92). An English-American organist, born in Gloucester, England. He was a pupil of John Arnott, organist of Gloucester Cathedral, where from 1834 to 1844 he was the assistant organist. After other services he removed to New York City in 1853, and was there organist successively of Saint Thomas's (1854-55), Grace Church (1855-68), Saint Ann's Roman Catholic (1868-69), and Saint Stephen's Roman Catholic (1869-70). In 1870-82 he was organist of the Brooklyn Tabernacle (Dr. Talmage's church), in 1886-88 of the Marble Collegiate Church of New York. His works include music for pianoforte and for the organ, ninety-seven vocal compositions, and an anthem for quartet, chorus, and orchestra (1851).

MORGAN, George Washington (1820-93). An American soldier, born in Washington County, Pa. In 1841 he entered West Point, but left it before graduating, and began the practice of law in Mount Vernon, Ohio. Upon the breaking out of the Mexican War he was appointed colonel of the Second Ohio Volunteers, and later became colonel of the Fifteenth United States Infantry. For gallantry at Contreras and Churubusco the Ohio Legislature on his return brevetted him brigadier-general and gave him a vote of thanks. He was appointed United States consul to Marseilles in 1856, and from 1858 to 1861 was United States Minister to Portugal. Returning home upon the breaking out of the Civil War, he was made brigadier-general of volunteers, and served for a time under General Buell. He was then put in command of the Seventh Division of the Army of the Ohio; was with Sherman at Vicksburg, and later led the expedition that captured Fort Hindman in Arkansas. Owing to ill health, he resigned from the army in 1863. He was elected to Congress in 1868 and 1870 by the Democrats.

MORGAN, Sir Henry (c.1635-88). The most famous of English buccaneers, born at Llanrhymny, Glamorganshire, Wales. He is said to have been kidnaped at Bristol when a boy, and sold as a servant in Barbadoes, whence after a time he worked his way to Jamaica. There he joined the buccaneers, participated in several of their expeditions, and by 1663 was in command of a privateer of his own. In 1668 Morgan was sent by Modyford, Lieutenant-Governor of Jamaica, to Cuba. He took and sacked Puerto Príncipe, and then sailed to Puerto Bello, Panama, which he captured after a brilliant attack. After levying a heavy ransom Morgan sailed for Jamaica. Later in the year he led an expedition which ravaged the entire Cuban coast, and in January, 1669, with a fleet of eight ships, he started on his famous expedition against Maracaibo. The capture and sack of the town was followed by the greatest excesses on the part of the buccaneers, who were surprised in their orgies by the arrival of three Spanish ships of war. Morgan assembled his half-drunken comrades, manned his ships, and after parleying with the Spanish commander suddenly attacked him, totally defeated him, and escaped. Returning to Jamaica, he was lightly reproved by Modyford, and was at once commissioned 'commander-in-chief of all the ships of war in Jamaica.' In August, 1670, he ravaged the Cuban and mainland coasts, and in January, 1671, he captured and plundered the city of Panama, one of the richest in Spanish America. On February 14th Morgan withdrew and embarked for Jamaica. The attack had been made after a peace had been arranged between England and Spain, and in April, 1672, Morgan was sent to England on a British frigate; but he took enough gold along with him to secure his vindication, eventually receiving knighthood and high favors from the King, and in December, 1674, was sent back to Jamaica with Lord Vaughan, the new Governor, as Lieutenant-Governor and commander-in-chief of his Majesty's forces in the colony. There he spent the remainder of his life in comparative quiet, and at two different periods served as Acting Governor.

Consult: Esquemeling, *Buccaneers of America* (1684), an interesting contemporary account by one of Morgan's lieutenants, reprinted in the "Adventure Series" (London, 1891); Burney, *History of Buccaneers in America* (London, 1816; reprinted 1902); Hutcheson, *Sir Henry Morgan* (1890); Howard Pyle, *Buccaneers of America* (1891); Frank R. Stockton, *Buccaneers and Pirates of Our Coast* (1898).

MORGAN, Henry James (1842—). A Canadian writer, born in Quebec. He was educated at Morrin College, in his native city, and during the administration of the Earl of Elgin entered the public service as keeper of the State records. Afterwards he became chief clerk in the Department of State, and in 1895 retired on a pension. Among his publications are the *Canadian Parliamentary Companion* (1862); the *Dominion Annual Register and Review* (1878); *Tour of H. R. H. the Prince of Wales in Canada and the United States* (1860); *Sketches of Celebrated Canadians* (1862); *The Industrial Politics of America* (1864); *The Bench and Bar of Canada* (1878); and *Canadian Men and Women of the Times* (1898).

MORGAN, môr′gäɴ′, Jacques de (1857—). A French archæologist, born at Huisseau sur Cosson, Loir-et-Cher. He was educated at the Paris Ecole des Mines, and after a trip in the Indies (1882) and an expedition through the peninsula of Malacca (1884), he spent three years in Southern Russia, the Caucasus, and Turkey. In 1891 he was sent to Egypt as director-general of the French antiquarian service. There he made valuable discoveries at Ombos and Karnak. Transferred to Persia in 1897, he explored the Pushti Kuh range and Mesopotamia. His works include: *Recherches sur les origines des peuples du Caucase* (1889); *Description du temple d'Ombos* (1894); *Fouilles à Dahchoûr* (1895); *Recherches sur l'origine de l'Egypte* (1896-97); and *Une mission en Perse* (1892-1900).

MOR′GAN, James Appleton (1850—). An American lawyer and author, born in Portland, Maine. He graduated in arts at Racine College, Wisconsin (1867), and in law at Columbia (1869), and practiced from 1871 in New York City, where he founded the Shakespeare Society (1885), of which he was continuously elected president. He edited its publication in twenty volumes of the *Bankside Shakespeare* (1888-92), wherein the oldest versions of the text are compared with a view to showing how the plays as they now stand have grown from Shakespeare's time, and that he was merely the most potent factor in their evolution. In defense of this theory Morgan had already published *The Shakespearean Myth* (1881), *Some Shakespearean Commentators* (1882), and *Shakespeare in Fact and Criticism* (1887). He also published: *Selections of Macaronic Poetry* (1870): *The Law of Literature* (1874); *Legal Maxims* (1877); *The People and the Railways* (1888); and other legal treatises. As a lawyer he became associated with various railroads.

MORGAN, John Hunt (1825-64). An American soldier, prominent on the Confederate side in the Civil War. He was born at Huntsville, Ala. About five years later his father removed to a farm near Lexington, Ky. During the

Mexican War Morgan became first lieutenant of Colonel Marshall's Kentucky regiment of cavalry, but saw little active service. Though he had a prosperous manufacturing business, in 1861 he abandoned it and escaped to the Confederate lines with about two hundred men and the guns of the militia company of which he was captain. At first he did irregular duty, chiefly scouting, but was later made captain and placed in command of three companies of cavalry called Morgan's Squadron. With these he did duty in Kentucky and Tennessee, and to some extent in Alabama. He organized the Second Cavalry at Chattanooga, in April, 1862, becoming colonel. During the summer he served with General Bragg in Tennessee, and captured Lexington, Ky. His success in daring and unexpected raids was so great that he was placed in charge of a cavalry brigade, and after promotion to brigadier-general made the 'Christmas Raid' into Kentucky, for which he was thanked by the Confederate Congress. In June, 1863, he was ordered to attempt to draw off Rosecrans from Tennessee by an expedition into Kentucky. He exceeded his orders, and with about 2500 men crossed the Ohio River into Indiana and swept around Cincinnati, closely pursued by Generals Hobson and Shackelford, and opposed everywhere by the militia. A sudden rise in the Ohio River allowed gunboats to reach Buffington Island and prevented him from recrossing the river. Here about 700 of his men were taken prisoners, two companies succeeded in crossing the river, and he with the remainder set out toward the Pennsylvania border to join General Lee. After an exciting chase he was captured, and was afterwards confined in the Ohio State Prison at Columbus. On November 27th, with a few companions, he escaped, and reached the Confederate lines in safety. In January, 1864, he was authorized to reorganize his cavalry, and was assigned to the Department of Southwest Virginia. When relieved he resumed his independent command, and captured Mount Sterling and Cynthiana in Kentucky in June, but was badly defeated by General Burbridge. On September 4th, in Greenville, Tenn., he was betrayed by an inmate of the house in which he was sleeping, and was shot while attempting to escape. General Morgan cared little for formal military tactics; but in ability to strike silently and unexpectedly and escape before an alarm could be raised, he has been excelled by few leaders of cavalry. While he destroyed public property, burned bridges, and usually took the best horses in the country, the outrages committed by him have been much exaggerated. Consult: Duke, *History of Morgan's Cavalry* (Cincinnati, 1867), and Johnson and Buel (eds.), *The Battles and Leaders of the Civil War* (New York, 1887).

MORGAN, John Pierpont (1837—). An American banker and financier, the son of J. S. Morgan (q.v.), a well-known banker. He was born at Hartford, Conn., and was educated at the English High School, Boston, and at the University of Göttingen, Germany. In 1857 he returned to America, and entered the banking house of Duncan, Sherman & Co., in New York City. In 1860 he became an American agent for George Peabody & Co., of London, and in 1864 became a partner in the firm of Dabney, Morgan & Co., dealers in investment securities. In 1871 he entered as a partner the banking firm of Drexel, Morgan & Co., which later was changed to the firm of J. P. Morgan & Co. Shortly after the organization of the Peabody Educational Fund he was chosen treasurer and financial adviser of the trustees. As a financier he signalized himself particularly in the line of reorganization and combination. The United States Steel Corporation, the Northern Securities Company, and the Atlantic shipping combination are examples of his genius in that direction. In 1895 he organized the syndicate that took up the United States bonds issued to increase the gold reserve. He made munificent gifts to hospitals and other institutions in New York City, and to the Harvard Medical School.

MORGAN, John Tyler (1824—). An American politician, born at Athens, Tenn. He was educated in Alabama, whither he removed with his parents in 1833. There he studied law, and in 1845 was admitted to the bar. He early won wide repute as a lawyer and campaign speaker, and in 1861 was a delegate from Dallas County to the Alabama State Convention which passed the ordinance of secession, and in May of the same year he enlisted as a private in the Fifth Alabama Infantry, of which he ultimately became lieutenant-colonel. In 1862 he recruited the Fifty-first Alabama Regiment and became its colonel. In the next year he was promoted to be brigadier-general, and in this capacity served with considerable distinction. After the war he resumed his law practice at Selma, Ala., and again entered politics in 1876 as an elector-at-large on the Tilden ticket. In 1877 he was elected to the United States Senate, of which body he remained a member, receiving his fifth reëlection in November, 1900. For many years one of the leaders of the Democratic Party in the debates in the Upper House of Congress, he showed himself particularly interested in foreign relations, and served for some time as chairman of the Senate Committee on Foreign Affairs. He was a vigorous and persistent advocate of the Nicaraguan canal route in preference to the route across Panama.

MORGAN, Junius Spenser (1813-90). An American financier, born at Holyoke, Mass.; father of John Pierpont Morgan. After some years in the dry-goods business he became, in 1854, a partner in the English firm of George Peabody & Co. Ten years later he succeeded Peabody as head of the firm, and changed its name to J. S. Morgan & Co. Under his direction it became one of the leading banking houses of the world. Morgan left a fortune of nearly $10,000,000. He was a munificent church member, and donated largely to Trinity College.

MORGAN, Lady (Sydney Owenson) (?1783-1859). A novelist, daughter of Robert Owenson, a theatrical manager, and of his wife, Jane Mill. She was born in Dublin, on Christmas Day, 1785, if we are to believe her. Croker mischievously alleged that she was born on the Dublin packet in 1775. For a while she mingled with theatrical people, or with the variegated society frequented by her father in Dublin. Her father's affairs becoming involved, the clever girl resolved to support the family, first as governess and then as author. In 1812 she married Thomas Charles Morgan, a distinguished surgeon, who was knighted on the occasion. Though the Morgans lived for the most part in Dublin, they made two Continental tours, and often visited London, where they settled in 1839. For her services to literature Lady Morgan was granted a Government pension in 1837. She died April 14, 1859. Throughout her life Lady Morgan was widely known in society for her wit and her affectations. Her works, comprising novels, comic operas, travels, and biographies, were savagely attacked by the reviewers, but they brought her about £25,000. They were indeed ephemeral. Among her novels are: *Saint Clair, or the Heiress of Desmond* (1804), a sorry imitation of Goethe's *Sorrows of Werther; The Wild Irish Girl,* a silly rhapsodical book not without descriptive power (1806); *Florence M'Carthy* (1816); and *The O'Briens and the O'Flaherties* (1827). Of her travels, *France* (1817) was much read and criticised. Her main right to consideration is that she wrote English words for Irish melodies, an example soon followed to their great advantage by Thomas Moore (q.v.) and Stevenson. Consult: Fitzpatrick, *Lady Morgan* (London, 1860), and *Memoirs of Lady Morgan* (an autobiography), edited by Dixon (London, 1862).

MORGAN, Lewis Henry (1818-81). An American ethnologist, born near Aurora, N. Y., November 21, 1818. He was graduated from Union College, New York, in 1840, and after a course in law, completed in 1844, he formed a successful partnership with his classmate, afterwards Judge George F. Danforth, in the city of Rochester. No sooner had he left college than he organized a society of young men in Aurora to be styled 'The Grand Order of the Iroquois.' The limits of the Grand Order were to be the territory anciently occupied by the Iroquois, and branch societies were to be established wherever an Iroquois tribe was known to have lived, with chapters standing for the Indian gentes. To show his profound interest in the organization, young Morgan went and lived among the existing tribes, in order to master their social organizations and forms of government. Morgan's scientific interests assumed a more substantial form in the now celebrated work, *The League of the Iroquois* (1851), in which the author, unconscious of the immense diffusion of the system, traced the social organization, government, daily occupations, and customs of this wonderful league. During this early period Morgan also studied and described the Iroquois art products and implements of daily life in the cabinet of natural history in Albany.

In 1856 Morgan made the acquaintance of Henry and Agassiz, who warmly urged him to continue his studies. In 1858, during a visit to Marquette on business, Morgan discovered, in visiting a camp of Ojibwa, that their system of kinship, list of gentes, and gentile organization were essentially the same as among the Iroquois. This was the revelation that determined Morgan's enduring fame. In 1869 the Smithsonian Institution published the result of eight years' uninterrupted research, travel, and correspondence, his *System of Consanguinity and Affinity of the Human Family,* a work essential to all studies on primitive sociology. His *Ancient Society* (1877) was a comprehensive and philosophical work, the result of twenty years' pursuit of a unique and engrossing inquiry. The author in this work divides on certain classific concepts the progress of culture into seven stages—Lower Savagery, Middle Savagery, Upper Savagery, Lower Barbarism, Middle Barbarism, Upper Barbarism, and Civilization.

MORGAN, Matthew Somerville (1839-90). An American artist, born in London, England. He was originally a scene painter, but afterwards became artist and correspondent for the *Illustrated London News,* and subsequently editor and proprietor of the *Tomahawk.* Many of his best comic drawings were done for this journal. Morgan, Burnand, Gilbert, and others founded *Fun,* to which Morgan contributed a number of cartoons on the American Civil War. Meanwhile he had not given up his theatrical interests, and after he came to this country in 1870, as special artist for Frank Leslie, the publisher, he was theatrical manager in New York City for several years. He also managed a lithograph concern in Cincinnati (1880-85), and while in that city established the Matt Morgan Pottery Company, and formed the Art Students' League. He removed to New York City in 1888.

MORGAN, Thomas Hunt (1866—). An American embryologist, born in Lexington, Ky. He graduated at the State College of Kentucky in 1886, received his Ph.D. degree at Johns Hopkins in 1891, and was Bruce fellow there in 1891-92. In 1892 he was appointed professor of biology at Bryn Mawr. His work includes highly important researches in the field of embryology and regeneration, published in various monographs, and in such books as *The Development of the Frog's Egg* (1897), and *Regeneration* (1901).

MORGAN, William (c.1775-c.1826). An American Mason, whose disappearance under peculiar circumstances in 1826 caused the organization of the Anti-Masonic Party. He was born probably in Culpeper County, Va., and is said to have served under General Jackson in the defense of New Orleans, and afterwards settled in York, Upper Canada, removing thence to Batavia, N. Y. In 1826, shortly after news had spread abroad that he intended, in conjunction with one David C. Miller, to publish a book exposing the secrets of Freemasonry, he suddenly disappeared, and, despite much search, was never seen again. It was charged that he had been kidnaped and murdered by Masons, but whether this was true is not known certainly to this day. He was traced with some degree of certainty to Fort Niagara, whither he was said to have been conveyed by Masons in a closed carriage and where he was said to have been imprisoned for a time. It was alleged that, refusing to withdraw his book or to give an oath of secrecy, Morgan was finally drowned by his abductors in Lake Ontario. A body found near Fort Niagara was for some time supposed to be his, but was later shown to be that of another man. It was in reference to this body that Thurlow Weed, recognizing the political value of the anti-Masonic excitement, remarked that it was "a good enough Morgan until after election"—a phrase which has since been frequently used in American politics. Morgan's disappearance caused profound excitement throughout the North, and resulted in the formation of an Anti-Masonic Party. Morgan's book, *Illustrations of Freemasonry, by One of the Fraternity Who Has Devoted Thirty Years to the Subject,* was published in 1826, and was republished at various times thereafter, sometimes under the title *Freemasonry Exposed and Explained.* Much has been written concerning his disappearance. Consult: Morris, *History of the Morgan Affair* (1852); Greene, *The Broken Seal, or Morgan's Abduction and Murder* (1870); O'Reilly, *American Political Anti-Masonry* (1879); Mackey and Singleton, *History of Freemasonry,* vol. vi. (New York, 1898). See ANTI-MASONS.

MORGAN, Sir WILLIAM (1829-83). An Australian statesman, born in Wilshampstead. He went to Australia in 1848, made some money in the Bendigo gold diggings in 1851, and then settled at Adelaide as a merchant. An independent politician, he was elected to the Legislative Council in 1869, and in 1875 represented the Cabinet in that body. After the defeat of the Colton Ministry in 1877, which was largely due to Morgan's efforts, he was Chief Secretary under Boucaut, and from 1878 to 1881 was Premier, showing much ability and honesty. He was styled the 'Cobden of South Australia.'

MORGANATIC MARRIAGE (ML. *morganaticus,* relating to the morning, from OHG. *morgan,* Ger. *Morgen.* AS. *morgen,* morning; perhaps connected with OChurch Slav. *mĭrknati,* to become dark, *mrakŭ,* darkness, or with Lith. *merkti,* to blink, Gk. μαρμαίρειν, *marmairein,* to shine). When a member of a reigning house, who by law can contract a perfect marriage only with a woman of equal rank (*ebenbürtig*), wishes to marry a woman of inferior rank, he may contract what is called a morganatic marriage. In Germany those families that were reigning families at the close of the eighteenth century and that have retained their rank in spite of the loss of political power—the so-called 'mediatized houses' or 'high nobility' (*hoher Adel*)— are similarly restricted in the matter of marriage; and members of these families may also contract morganatic marriages.

A morganatic marriage is not a mere concubinage, nor may it exist simultaneously with a perfect marriage. From the ecclesiastical point of view, and from certain legal points of view, it is a perfect marriage. It is defective chiefly in public law. The morganatic wife does not acquire and the children do not inherit the rank of the husband and father, although, when the husband is a reigning prince, it is usual to give to the morganatic wife and her children titles of nobility. The children do not succeed to the father's public position, nor to property which goes with that position, nor to family property (entailed estates). In some States neither the morganatic wife nor her children have rights of succession even in the private property of the husband and father, except by testamentary provision or by ante-nuptial settlements.

The roots of the morganatic marriage go back to early German law. A perfect marriage was concluded only when the husband bought the *mundium* or marital authority over his wife, at first by a payment to the father or guardian, later by a settlement upon the wife, which was frequently described as 'widowhood.' A further gift or settlement upon the wife might be made in the form of a 'morning gift' (*Morgengabe, dos morganatica*). In the case of an imperfect marriage without *mundium* only the morning-gift was made. The Church, however, treated the imperfect marriage as a marriage, although it was unable to determine its civil results. When an ecclesiastical ceremony took place it was not unusual for the man to give the bride his left hand, whence the name 'left-hand marriage.' For the history of the morganatic marriage, consult Schröder, *Deutsche Rechtsgeschichte* (1889), pp. 293, 294, and works there cited. For modern law, Niebelschütz, *De Matrimoniis ad Morganaticam* (1851).

MORGAN CITY. A city and port of entry in Saint Mary's Parish, La., about 75 miles west by south of New Orleans, on the Southern Pacific Railroad. It is on the Atchafalaya Bayou, navigable for vessels of light draught, which extends from Grand Lake to the Gulf of Mexico, 20 miles distant; has regular steamship communication with important Gulf ports, and has extensive sugar, fish and oyster, and truck gardening interests. The city contains an interesting geological and botanical garden in Oneonta Park. Morgan City was formerly known as Brashear City. Here, on June 23, 1863, Richard Taylor, with about 3000 Confederates, captured the Federal garrison of about 1000, secured property worth about $2,000,000, and recaptured a large number of refugee blacks. Brashear was soon afterwards abandoned by the Confederates and reoccupied by the Federals. Population, in 1890, 2291; in 1900, 2332.

MOR'GANFIELD. A city and the county-seat of Union County, Ky., 25 miles southwest of Henderson, on the Illinois Central Railroad (Map: Kentucky, D 3). It has tobacco stemmeries, and manufactories of carriages and wagons, brick, flour, etc. Saint Vincent's Academy (Roman Catholic) is here. The waterworks are owned and operated by the city. Population, in 1890, 1094; in 1900, 2046.

MORGANTE MAGGIORE, môr-gän'tȧ mȧ-jō'rȧ, IL. A metrical romance by Luigi Pulci (q.v.).

MOR'GANTON. A town and the county-seat of Burke County, N. C., 79 miles west of Salisbury, on the Southern Railroad (Map: North Carolina, A 2). It is the seat of the State Hospital for the Insane and of the North Carolina School for the Deaf and Dumb, and has considerable reputation as a health resort. Among the principal manufactories are cotton mills, tanneries, lumber mills, and machine shops. There are gold deposits in the vicinity. Population, in 1890, 1557; in 1900, 1938.

MOR'GANTOWN. A city and the county-seat of Monongalia County, W. Va., 102 miles south of Pittsburg, Pa., on the Monongahela River, which is navigable to this point, and on the Baltimore and Ohio Railroad (Map: West Virginia, E 2). It has a fine court house, and is the seat of the West Virginia University (q.v.), established in 1868. There are glass works, furniture factories, woolen, planing, and flour mills, and brick and tile works. The city is in a rich agricultural, timber, natural gas, and mineral country—coal, iron, limestone, clay, and glass sand being found in paying quantities. Population, in 1890, 1011; in 1900, 1895.

MORGARTEN, môr'gär-ten. A mountain slope on the boundary of the cantons of Schwytz and Zug, Switzerland, celebrated as the scene of a great victory won by the Swiss forest cantons over a numerically superior force of Austrians, November 15, 1315. In January, 1314, the farmers of Schwytz had seized the Abbey of Einsiedeln, robbed it of its treasures, and driven out the monks. Frederick the Fair, head of the House of Hapsburg, who was the protector of Einsiedeln, ordered his brother, Duke Leopold, to punish the guilty ones. The battle was the result.

MORGEN, môr′gen, KURT (1858—). A German soldier and explorer, born at Neisse (Silesia), Prussia. He was educated for the army at Wahlstatt and Berlin, and in 1889 took charge of an expedition for the exploration of Kamerun. On November 5 he left Kribi on the coast of Batanga. He discovered the Mbam River, the principal tributary of the Sanaga, and proceeded along the Sanaga as far as Malimba. On June 2, 1890, he again set out from Kribi. During this second expedition he penetrated to Tibati, and thence to Ibi on the Benue, from which point he descended the river to Akassa, on the coast. In 1896-97 he fought with the English army against the Mahdi, and in the latter year witnessed the Græco-Turkish War from the headquarters of the Ottoman army. He attained the rank of major in 1898.

MORGENSTERN, môr′gen-stĕrn, CHRISTIAN (1805-67). A German landscape painter, born in Hamburg. He studied in his native city and at the Academy of Copenhagen, settled in 1830 at Munich, and acquired a reputation with his romantic views of the Bavarian and Austrian Alps. From a later period date the moonlight and storm scenes which constitute the most admired portion of his work, representative examples of which are a "Mill in Sainte Marie Valley, Alsace" (1836, Hamburg Gallery); "April Day on Lake Starnberg" (1853, Leipzig Museum); "Storm at Sea" (1839) and "Alsatian Landscape" (both in New Pinakothek, Munich).

MORGENSTERN, LINA (1830—). A German philanthropist and author, née Bauer, born in Breslau. In 1854 she removed to Berlin, where she became prominent as a reformer. She was interested in the formation of 'people's kitchens,' of technical and domestic schools for women, and of schools for the reform of wayward young girls. She edited *Deutsche Hausfrauenzeitung* (1874 sqq.), and *Für junge Mädchen* (1888-94), and wrote *Friedrich Fröbel* (1882); *Die Frauen des neunzehnten Jahrhunderts* (1888); and *Frauenarbeit in Deutschland* (1893).

MORGHEN, môr′gĕn, RAFFAELLO (1758-1833). An Italian line engraver. He was born at Florence, June 19, 1758, the son and pupil of Filippo Morghen, and was also instructed by his uncle, Giovanni Elia Morghen. When twelve years old he engraved a good plate after the "Prophets" of Bandinelli, and at twenty he showed remarkable proficiency. He studied at Rome under Volpato, whose daughter he married in 1781. In the same year he engraved Raphael's "Poetry" and "Theology," then worked in conjunction with his father-in-law, assisting him in his "Parnassus," after Raphael. He was appointed professor at the Academy in Florence in 1793, became a member of the French Institute in 1803, and visited Paris in 1812, at the invitation of Napoleon, who conferred many honors upon him. His best known works include the "Aurora," after Guido Reni; the "Mass of Bolsena," "Madonna della Sedia," and "Transfiguration," after Raphael; "Diana Hunting," after Domenichino; the "Madonna del Sacco," after Andrea del Sarto; the "Dance of the Seasons," after Poussin; and the "Last Supper," after Leonardo, generally considered his masterpiece. Of high finish and special interest are also his portraits of Dante, Petrarch, Boccaccio, Ariosto, Tasso, Alfieri, Raphael, etc. He died in Florence, April 8, 1833. His life and all his works, comprising 252 plates, have been fully described by his pupil Palmerini, in *Catalogo delle opere d'intaglio di Raffaello Morghen* (Florence, 1824).

MOR′GIA′NA. A female slave, belonging to Cassius and then to his brother, in "Ali Baba and the Forty Thieves," a story in the *Arabian Nights Entertainments.* She outwitted the thieves' attempts to find the discoverer of their cave first by duplicating their mark on Ali's house, then by scalding the Forty with hot oil in the jars in which they were smuggled into the house; and at last when the captain, disguised as a merchant, dined with Ali, she first danced for him and then stabbed him with his own dagger. Ali freed her and married her to his son.

MORGUE (Fr., originally the inner wicket of a prison, where prisoners were kept for some time, that the jailers and turnkeys might view them at their leisure, so as to be able to recognize them when occasion required, from *morguer,* to look at solemnly or sourly, to defy). The name of a certain building in Paris, situated on the *Quai du Marché neuf,* where the dead bodies of persons unknown, found either in the river (Seine) or in the streets, are exposed to public view for three days. The corpses are put under a glass case, on a sloping slab of black marble. The clothes are hung on the wall above. When a corpse is recognized it is handed over to the relatives or friends of the deceased, on payment of costs and dues—otherwise it is interred at the expense of the city. The number of bodies yearly exposed in the *Morgue* is about 300, of which five-sixths are those of males. Morgues have been established in Berlin and in the principal American cities: in New York in 1866, in Boston in 1851, in Brooklyn in 1870, in Chicago in 1872, in Saint Louis in 1874.

MORI, mō′rê. The name of the Lords of Choshu in Japan. The chief of the clan was foremost in the anti-foreign agitation which sought to close Japan again to the world (1858-67), after the demand for admission made by Commodore Perry, and in 1863 became known through his action in firing upon Dutch and American merchantmen passing through the Straits of Shimonoseki. In consequence, a squadron was formed and the town of Shimonoseki was bombarded. This helped to convince the Japanese that resistance was impossible and that the ancient policy of seclusion must be reversed. Mori continued the agitation, however, directing it against the Government of the *Shogun,* and was one of the chief factors in the restoration of the Emperor to supreme power. Since the revolution of 1868, the clansmen of Choshu have been highly influential in the Government, and as active in the adoption of Western civilization as they had been previously in opposition to its introduction.

MORI, mō'rē, Arinori (1848-89). A native of Satsuma, Japan, and one of the group of young samurai who were prominent in advocating the thorough modernization of the Empire after the restoration of the Emperor. Educated in England, he adopted modern manners in life and thought, and broke completely with the past. He held various high positions in the diplomatic and civil services, and became finally Minister of Education. He was raised to the peerage in 1889, with the title viscount. When the Constitution of Japan was promulgated, giving the Empire its place among progressive peoples, he was assassinated in his own house by a Shinto fanatic, who charged him with violating the sanctity of the shrine in Ise by lifting the curtain before the holy place with his cane.

MORI'AH. The name of the land whither Abraham was commanded to go to sacrifice his son Isaac upon a mountain, according to Gen. xxii. 2, and of the mountain upon which Solomon built the temple, acording to II. Chron. iii. 1. It is possible that the chronicler understood the passage in Genesis as affirming that Abraham's sacrifice was made in Jerusalem. He no doubt found 'the mountain of Moriah' as a designation of Zion, and it may already in his time have been popularly interpreted to mean 'the mountain of vision,' as it was by the Samaritan translator, Symmachus, and by Jerome. Originally it may have been pronounced *moreh Yah* and signified 'Yahweh is an oracle-giver,' or 'the Moriah' may have meant 'the oracle.' How old this name of the temple-mountain is cannot be determined. The Elohist in Gen. xxii. 2 refers to one of the mountains 'in the land of Moriah.' This particular shrine is called *Yahweh yireh*, 'Yahweh sees,' or *Yahweh yereh*, 'Yahweh gives oracles.' Bacon and Cheyne look for this sanctuary in the Negeb or Southern Palestine, and Gunkel thinks that it is identical with the Jeruel near Tekoa mentioned in II. Chron. xx. 16, though he admits that the distance from Beersheba does not preclude the identification with Jerusalem, and regards Ariel, a name of Jerusalem, as a corruption of Jeruel. It is possible that *Yahweh yereh* is an explanation of the meaning of Moriah, or that 'the Moriah,' 'the oracle,' is an appellative designation of a sanctuary also known by the kindred name Jeruel. But it is not certain that 'the land of Moriah' in Gen. xxii. 2 has anything to do with this sacred place. The Syriac version suggests that the original reading was 'the land of the Amorites.' 'Amorites' is the name of the pre-Israelitish inhabitants of Palestine used by the Elohist. It corresponded to the Assyrian Amurru or Martu, and the dropping of the prosthetic aleph can be easily accounted for. This explanation has the advantage of being based on very excellent ancient testimony to the pre-Massoretic text. Wellhausen thinks of 'the Hamorites' who lived in Shechem, in the neighborhood of which there was an *elon moreh* or 'sacred tree of the oracle-giver.' It is indeed doubtful whether the Ephraimitish writer would have made Jerusalem the great sanctuary where animal offerings were substituted for human sacrifices, and the change to 'Hamorites' is not necessary, since Shechem certainly was in the land of the Amorites. From the Jerahmeelite Negeb Shechem might be reached on the third day, though not so easily as Jerusalem. The question of the site of the sacred mountain must therefore be left open. Consult: Dillmann, *Die Genesis* (6th ed., Leipzig, 1892); Gunkel, *Genesis* (Göttingen, 1901); Cheyne, article "Moriah," in *Encyclopædia Biblica*, vol. iii. (London, 1902).

MORIER, mō'rĭ-ēr, James Justinian (c.1780-1849). A British diplomat, author, and traveler, born at Smyrna. He was educated at Harrow, and in 1807 became private secretary in Sir Harford Jones's mission to the Persian Court. On May 7, 1809, three months after his arrival at Teheran, he was sent home with dispatches and performed the famous journey of which he afterwards published an account under the title *A Journey Through Persia, Armenia, and Asia Minor to Constantinople in the Years 1808 and 1809* (1812). This book enjoyed a great vogue in Great Britain, and was translated into French (1813) and German (1815). In 1810 he went back to Teheran as Secretary of Legation under Sir Gore Ouseley, and after the latter's return to England in 1814 Morier acted for a time as British representative at the Court of Persia. He was recalled in 1815. In 1817 he was pensioned by the Government, and devoted most of his time thenceforth to literature, in which pursuit he attained such success that Sir Walter Scott styled him the best novelist of the day. His best works are: *The Adventures of Hajji Baba of Ispahan* (1824); *Zohrab the Hostage* (1832); and *Ayesha, the Maid of Kars* (1834).

MORIER, Sir Robert Burnett David (1826-93). An English diplomatist, born in Paris (where his father was consul-general), and educated at Balliol College, Oxford. After holding several other diplomatic offices, he was appointed chargé d'affaires at Stuttgart in 1871, and at Munich in 1872, whence he was transferred to Lisbon as English Minister (1876). When Morier was Ambassador to Saint Petersburg (1884-91) he and Bismarck were bitter enemies, and in 1888 Count Herbert Bismarck charged Morier with furnishing information to Bazaine at the outbreak of the Franco-Prussian War. Time showed that Morier had been innocent, and that French spies had gained the information in question. In 1891 he was transferred to Rome, but was forced by urgent business to remain in Russia.

MÖRIKE, mē'rĭ-ke, Eduard (1804-75). A German poet. He was born at Ludwigsburg, and studied theology at Tübingen, where from 1826 to 1843 he served as a clergyman. From 1851 to 1866 he was professor of German literature in a seminary at Stuttgart. One of the most prominent members of the Swabian school, he first appeared in 1832 with the fantastic tale *Maler Nolten* (revised in 1872, third edition 1890), which revealed his imaginative power. His collected *Gedichte* (1838, eleventh edition 1894) are marked not only by the idyllic cast common to the Swabian group, but by a delicate humor and a classical severity of form peculiarly their own. The exquisitely wrought novelette *Mozart auf der Reise nach Prag* (1856) has frequently been accounted his finest achievement. His further work includes the *Idylle vom Bodensee* (1846) and the caprice *Das Stutt-*

garter Hutzelmännlein (1855). Many of the poems are to-day established folk-songs. Consult the biographies by Notter (Stuttgart, 1875), Klaiber (ib., 1876), Mayne (ib., 1901), and Fischer (Berlin, 1901).

MÖRIKOFER, mē'rĭ-kō'fēr, Johann Kaspar (1799-1877). A Swiss literary and ecclesiastical historian, born at Frauenfeld. He studied at Zurich, taught in his birthplace, and was pastor at Gottlieben from 1851 to 1869. His historical works have scientific value and literary charm; they include *Die schweizerische Mundart im Verhältnis zur hochdeutschen Schriftsprache* (1838); *Klopstock in Zürich* (1851); *Die schweizerische Litteratur des achtzehnten Jahrhunderts* (1861); *Ulrich Zwingli* (1867-69); and *Geschichte der evangelischen Flüchtlinge in der Schweiz* (1876).

MORILLO, mō-rē'lyō, Pablo, Count of Cartagena and Marquis de la Puerta (1777-1838). A Spanish soldier. He was born in Fuentes de Malsa, in the Province of Toro, and entered the Spanish navy in 1793. During the war against Napoleon he raised a guerrilla corps, at the head of which he soon acquired fame, and became lieutenant-general. In 1815 he was placed in command of 12,000 men and sent to South America to conquer the insurgent provinces of Venezuela and New Granada. He speedily captured Caracas, Cartagena, and Bogotá, but met reverses later and was compelled to sign the armistice of Truxillo with Bolivar (1820). He returned to Spain, joined the Court party, and was believed to be one of the authors of an insurrection of the Guards in 1822. After this he went over to the patriots, obtained command of an army corps, changed back again, and submitted to the French (1823). Exiled by Ferdinand, he was recalled in 1832 and led an army against the Carlists. He published his *Mémoires* at Paris in 1826.

MORIN, mō'răN', Arthur Jules (1795-1880). A French mathematician, born in Paris. He studied at the Ecole Polytechnique and at the Ecole d'Application in Metz, and in 1819 was commissioned lieutenant in an engineer battalion. He was professor at the Conservatoire des Arts et Métiers, and after 1847 its director. He devoted his attention to mechanics, and by his researches and inventions contributed materially to the progress of that science. The results of his labors are embodied in memoirs which he contributed to the *Comptes rendus de l'Académie des sciences de Paris*, and in a number of separate publications, among which are: *Aide-mémoire de mécanique pratique* (1838); *Salubrité des habitations* (2d ed. 1874); and *Fundamental Ideas of Mechanics and Experimental Data*, . . . translated by J. Bennet (New York, 1860).

MORIN, mō-rēn', Enrico Constantino (1841—). An Italian naval officer and statesman, born in Genoa. He rose through successive grades to that of vice-admiral (1893). In 1886 he was elected from Florence to the Chamber of Deputies, from 1888 to 1891 was Under-Secretary of State in the Ministry of Marine, in which post he urged an increase of the navy, and from 1893 to 1896 was Minister of Marine. He was appointed Senator in 1900, and in the same year again became Minister of Marine.

MORINUS, mō'rē'nụ', Johannes, or Jean Morin (1591-1695). A French Catholic theologian and Orientalist, born at Blois of Protestant parents. He was educated at Leyden and at Paris, where he entered the Catholic Church, and in 1618 joined the Oratorians. He was head of the College of Angers, and in 1640 was summoned to Rome by Urban VIII. to assist in discussing the union of the Eastern and Western churches. He was suddenly recalled by Richelieu, who possibly feared that Morin would speak ill of him at Rome. Besides his works on Church history, and more important, Morin wrote on text criticism: *Exercitationes Ecclesiasticæ et Biblicæ* (1686, containing two earlier works of 1631 and 1639), which urges the priority and superiority of the Samaritan Pentateuch; *Opuscula Hebræo-Samaritica* (1657), with grammar and lexicon; and in Le Jay's *Polyglotte*, an edition of the Samaritan Pentateuch.

MORIOKA, mō'rē-ō'kȧ. The capital of the Prefecture of Iwate, Japan, situated in a mountainous district in the northern part of Hondo, about 40 miles from the coast (Map: Japan, G 4). It is celebrated for its kettles, silk goods, fruits, and vegetables. Population, in 1898, 32,989.

MORIORI, mō'rē-ō'rē. The aborigines of the Chatham Islands, linguistically and somatically close kinsmen of the Maori (q.v.). Their crania are distinctly more Polynesian than Melanesian, and some authorities see traces of race mixture in certain osteological peculiarities. Some anthropologists regard the Moriori as only a branch of the Maori, who reached the Chatham Islands before tattooing had come into general use or the carving and ornamentation of the New Zealand Maori had taken on their characteristic development. Tradition, supported by other indications, suggests two migrations to these islands, one before and the other after Maori art had become matured. The flat stone clubs of the Chatham Islanders are supposed to go back to the dark people who preceded them. The best stone axes of the Moriori exceed in fineness of polish those of the Maori. The general conclusion is that the culture of the Chatham Islanders is an outspur of that of New Zealand. Such marked peculiarities as exist are due to the poverty and limitations of the group. The influence of the antecedent 'dark race' is more marked there than in New Zealand itself. In 1831 they are said to have numbered 1200 to 1500; but the inroads of Maori from the Taranaki District of New Zealand in 1832-35 led almost to their extermination, and there were but 200 left in 1868. In 1889 the islands were reported to contain 27 pure-blooded Moriori, 5 half-bloods, 250 Maori, and a few Europeans. In 1896 their number was estimated at 30 to 50; but Schauinsland, who visited them in 1897, thought it not over 16 to 25.

MORISCOS, mō-rē'skōs (Sp., Moorish men). The name given in Spain after 1492 to those Moors who through intimidation or force were brought over to Christianity. See Moors; Spain.

MOR'ISON, James (1816-93). A Scotch clergyman, founder of the Evangelical Union. He was born at Bathgate, Linlithgowshire, February 14, 1816. He was educated at Edinburgh, and licensed to preach as a minister of the United Secession Church in 1839. In 1841 he was deposed for holding and advocating 'universal atonement.' With three other ministers of like views and their followers, he formed the Evangelical Union (q.v.). At the same time he established a theological academy, of which he continued principal till his death. He was pastor first of Kilmarnock, and from 1853 to 1884 in Glasgow, where he died, November 13, 1893. Consult his *Life* by A. Adamson (London, 1898).

MORISON, James Augustus Cotter (1832-88). An English author, born in London. His childhood was spent in Paris (1834-40), and he gained an intimate knowledge of French. An Oxford graduate (1859), he wrote for the *Saturday Review,* and in 1863 brought out a *Life of Saint Bernard,* followed by sketches of *Gibbon* (1878), *Macaulay* (1882), and *Mme. de Maintenon* (1885), while his last work, *The Service of Man: An Essay Towards the Religion of the Future* (1886), was the outcome of his Positivist beliefs. Morison was a founder and joint owner of the *Fortnightly Review.*

MORISON, Robert (1620-83). A British botanist, born at Aberdeen. He graduated at the university of his native city in 1638, but the next year, having taken up arms in the Royalist cause, he was compelled to flee to France. There he studied anatomy, zoölogy, botany, mineralogy, and chemistry, and in 1648 took the degree of M.D. at Angers. A year or two later Gaston, Duke of Orleans, appointed him one of his physicians, a position which he held until the Duke's death in 1660, and in which he made such a reputation that after the Restoration Charles II. appointed him his senior physician, King's botanist, and superintendent of all the royal gardens. In 1669 he became professor of botany at Oxford. His great service to botany was in classification, in which connection Franchet says of him that his works make an epoch in botanical literature. Among these are: *Præludia Botanica* (1669); *Plantarum Umbelliferarum Distributio Nova* (1672); and *Plantarum Historiæ Universalis Oxoniensis, Pars Secunda* (1680). Consult: Pulteney, *Sketches of the Progress of Botany* (London, 1790); Tournefort, *Eléments de botanique* (Lyons, 1797; in Latin, Paris, 1700); and Franchet, *Flore de Loir-et-Cher.*

MORITZ, mō′rĭts, Karl Philipp (1756-93). A German author, prominent in the Sturm-und-Drang period. He was born at Hameln, of poor parents. He taught for a short time at Dessau (1777), then at a military orphanage at Potsdam (1778), and soon after in Berlin. In 1786 he went to Italy, and in Rome became acquainted with Goethe, who recommended him to Duke Karl August, by whose influence Moritz was elected to the Berlin Academy, and in 1789 became professor of antiquities in the Academy of Art in Berlin. His adventurous life can to a great degree be reconstructed from the semi-biographical novels, *Anton Reiser* (1785-90) and *Andreas Hartknopf* (1786). He wrote, besides: *Versuch einer deutschen Prosodie* (1786); *Ueber die bildende Nachahmung des Schönen* (1788); *Götterlehre* (1791); *Reisen eines Deutschen in England* (1783); and *Reisen eines Deutschen in Italien* (1792-93). Consult Dessoir, *Moritz als Aesthetiker* (Berlin, 1889).

MORLACCHI, môr-läk′kē, Francesco (1784-1841). An Italian composer, famous for his advanced style of composition, which has been described as a classical blending of Italian vivacity and methods with German contrapuntal profundity. He studied under Mazzetti, Caruso, Padre, Martini, and Zingarelli. His compositions include a coronation cantata, considerable church music, organ pieces, songs, chamber music, masses, and grand operas. In 1810 he became kapellmeister of the Italian opera at Dresden, where he is said to have composed his best work. His oratorios, *Isacco* (1817) and *La morte di Abele* (1821), are representative. He died at Innsbruck.

MORLAIX, môr′lā′. The capital of an arrondissement and a seaport in the Department of Finistère, France, on the estuary of the Dossen, 6½ miles from the sea, and 38 miles east-northeast of Brest (Map: France, C 3). The estuary is spanned by a fine railway viaduct 934 feet long and 190 feet high. The town has a mediæval aspect, with its fifteenth-century church of Saint Mélaine, its narrow winding streets, and its quaintly gabled timbered houses. The port is accessible to ships of 400 tons burden. A considerable coastwise trade is carried on in horses, agricultural produce, leather, and paper. The industrial establishments include paper mills and an important Government tobacco factory. Population, in 1900, 16,086. Morlaix dates from the Roman occupation. In 1187 it was besieged and captured by Henry II. of England. In 1522 it was taken by the troops of Henry VIII. of England, but recaptured by the French in a night attack, when 600 Englishmen were killed.

MOR′LAKS. A Slavonic people belonging to the southern branch, and living along the coast of Dalmatia, Austria-Hungary. They settled in this locality during the great southern migration of the Serbs from the Carpathian region in the sixth and seventh centuries. They are a hardy, seafaring people, who furnish the best material for the Austrian Navy, and are prominent in the commerce of the Adriatic. They are generally classed with the Dalmatians. See Dalmatia.

MOR′LAND, George (1763-1804). An English genre, animal, and landscape painter, born in London. He inherited talent from his father, Henry Morland (1712-97), painter, engraver, and picture dealer, who gave him a good training. At sixteen he exhibited at the Royal Academy, and at seventeen he had attained a reputation as a copyist, especially of the Dutch and Flemish masters. After a rupture with his father he set up on his own account in 1784 or 1785, and dashed into a career of dissipation and prodigality, supporting himself by the sale of his pictures, painted with marvelous rapidity and cleverness. He lived with a picture dealer, and became the companion of hostlers, pot-boys, jockeys, pawnbrokers, and pugilists. In 1786 he married the sister of the engraver William Ward, and for a time reformed. At this period he painted many moralities in the style of Hogarth; but he soon returned to his profligate life, and produced his masterpiece, the "Interior of a Stable" (1791), now in the National Gallery, London. He became popular, and dealers flocked to him. Sometimes he painted two pictures a day, and once a large landscape with six figures in six hours. Every demand for money, tavern score, or bill was paid by a picture worth twice the charge. His subjects were scenes in humble life in town and country—cottages, stables, inn-yards, pastoral scenes, and domestic animals, especially pigs. Altogether he painted 4000 pictures, 250 of which were engraved. He died in a sponging-house in Holborn, October 27, 1804. His epitaph on himself was, "Here lies a drunken dog." He was generous, good-natured, and industrious despite his faults.

After a period of neglect Morland is now ranked among the best masters of genre and animals, not far below the Dutch artists on whom he modeled his style. He was a fine brushman; his color is rich, and his treatment, if light, is skillful. His representation is realistic and true to life. In the South Kensington Museum are six of his paintings, the best known of which is "The Reckoning." The Museum of Glasgow contains a "River Scene" and three seacoast landscapes. In the New York Historical Society are his "Old English Sportsman" and "Dogs Fighting;" in the Metropolitan Museum, "Midday Meal" and "Weary Wayfarers." His autoportrait is in the National Portrait Gallery, London. Consult: His *Life*, by George Dawe (London, 1807); his *Memoirs*, by Blogdon and Hassel (ib., 1806); William Collins, *Memoirs of a Picture* (London, 1803).

MORLAND, Sir SAMUEL (1625-95). An English diplomat and inventor. He was born in Sulhampstead, Berkshire, and studied at Winchester School and at Magdalene College, Cambridge. His first mission of importance was to the Duke of Savoy in 1655, to protest against the massacre of the Waldensians. Morland brought back with him materials, mostly clumsy forgeries, for a history of this sect, which he published in 1658. After the Restoration Morland received the title of baronet and many empty promises from the King. He devoted himself more and more to the study of mathematics and mechanics, and invented a speaking trumpet and some calculating machines. But his more important work was in hydrostatics, and especially in devising a steam pump.

MOR'LEY. A municipal borough in the West Riding of Yorkshire, England, four miles south-southwest of Leeds (Map: England, E 3). The new town-hall is a handsome building, and the municipality owns its waterworks, gas and electric lighting plants, maintains public baths, parks, and recreation grounds. It has important manufactures of woolens and mill machinery. There are coal mines and stone quarries. Morley is mentioned in *Domesday*, and in a tax list of Richard II. It was incorporated in 1885. Population, in 1891, 21,000; in 1901, 23,600. Consult Smith, *Morley, Ancient and Modern* (London, 1886).

MORLEY, EDWARD WILLIAMS (1838—). An American chemist, born at Newark, N. J. He graduated from Williams College in 1860, and in 1869 became professor of chemistry at Western Reserve College (afterwards Adelbert College). With this post he also held (1873-88) a chair of chemistry at the Cleveland Medical College. He was associated with A. A. Michelson in researches on the relative motion of ether and matter, and also in the determination of the meter in terms of the wave length of light. He was president of the American Association for the Advancement of Science (1895) and of the American Chemical Society (1899), and was elected a member of the National Academy of Sciences and associate of the American Academy of Science. In the proceedings of the latter academy for 1880 he first described his valuable apparatus for gas analysis; he also wrote *Atomic Weight of Oxygen* (1895).

MORLEY, HENRY (1822-94). An English author, born in London, September 15, 1822. He was educated at a Moravian school at Neuwied on the Rhine, and at King's College, London (1838-43); practiced medicine at Madeley, in Shropshire (1844-48); and, having been fleeced by a colleague, he started a school on Moravian methods at Manchester, but after two years he started it afresh at Liverpool. A series of ironical essays entitled *How to Make Home Unhealthy* attracted the attention of Dickens, and eventually led to Morley's settling in London and taking a hand in *Household Words* and *All the Year Round* (1850-65). He also became connected with the *Examiner* as sub-editor and then as editor (1856-64). Meanwhile he was appointed lecturer in English at King's College (1857-65), and then professor of English at University College, London (1865-89). He died May 14, 1894. Chief among Morley's works are: *A Defence of Ignorance* (1851), a bit of irony; *Lives* of Palissy the Potter (1852), Jerome Cardan (1854), and Cornelius Agrippa (1856); *Memoirs of Bartholomew Fair* (1857); two volumes of fairy tales (1859-60); *English Writers,* to Dunbar (1864-67), rewritten and brought down to the seventeenth century (11 vols., 1887-95); *A First Sketch of English Literature* (1873; rev. 1886); and *English Literature in the Reign of Victoria* (1881). He also edited a *Library of English Literature* (5 vols., 1875-81); *Universal Library* (63 vols., 1883-88); *Cassell's National Library* (214 vols., 1886-90); and the *Carisbrooke Library,* a series of reprints (14 vols., 1889-91). Though Morley was not a critic and editor of the first rank, he had catholic tastes, a talent for finding the best in things, and he performed a most valuable service in making easily accessible the treasures of English literature.

MORLEY, JOHN (1838—). An English statesman and author, born at Blackburn, in Lancashire, December 24, 1838. Having taken his degree at Lincoln College, Oxford (1859), he went to London to engage in literature. He soon became editor of the *Literary Gazette,* at that time in such a state of decrepitude that Morley, with all his energy and talent, could not quicken it to new life. His writings soon showed the influence of Auguste Comte, and he became known as an agnostic philosopher. From 1868 to 1870 he edited for a little while the daily *Morning Star.* In 1867 he succeeded Lewes as editor of the *Fortnightly Review,* which he conducted brilliantly till 1883, becoming, in that year, editor of *Macmillan's Magazine.* Under his guidance the Macmillans had issued since 1878 the "English Men of Letters Series," to which Morley contributed a short but excellent *Life of Edmund Burke* (1879). His *Burke,* an historical study, had appeared in 1867. In 1880 he began ably to edit the *Pall Mall Gazette;* in 1881 he published his *Life of Cobden;* and in 1883, after two failures, he was at a by-election returned to Parliament for Newcastle-upon-Tyne. He soon became prominent, and in 1886 he was made Secretary for Ireland under Gladstone, thus getting an insight into Gladstonian politics and character to be shown later in his *Life of Gladstone* (1903). Morley sympathized with the Irish Nationalists, but, unlike Gladstone, he was unhampered by pledges and opinions. On the defeat of the Gladstonians in 1886 he was half in politics, half in letters, till Gladstone's return to power restored him to his former office. Morley's anti-imperialistic views helped to lose him his seat in 1895, but he was soon reelected from the Montrose Burghs, Scotland. In 1898 and afterwards he upheld the Boers. Besides the books already mentioned, Morley is the author of monographs on *Voltaire* (1872), *Rousseau* (1873), one of the most sympathetic biographies ever written, *Diderot and the Encyclopædists* (1878), and *Walpole* (1889). In *Cromwell* (1900) he added something to historical knowledge, though his work is mainly a revision of Gardiner. In 1902 Andrew Carnegie presented to him the rich historical collection of Lord Acton, recently deceased, and Morley in turn presented it to Oxford University.

MORLEY, Mrs. The name adopted by Queen Anne in her correspondence with the Duchess of Marlborough. See Freeman, Mrs.

MORLEY, Thomas (1557-c.1604). An English musician and composer. The place of his birth cannot be definitely fixed, but it is supposed that he was born in London and educated at Saint Paul's Cathedral. According to his own statement he also studied under Bird. In 1588 he became bachelor of music at Oxford and in 1591 was deputy chorister at Saint Paul's, taking his regular turn of duty as organist. In 1592 he was made epistler of the Chapel Royal. He strove hard during his entire career for the advancement of English music, and devoted himself exclusively to the development of vocal music. His principal work and that upon which his reputation is chiefly based was *A Plaine and Easie Introduction to Practicall Musicke*, published in 1597. It was the first practical work on music issued in England; was translated into German and published throughout the German States by Trost of Halberstadt about 1660. In England it remained an authority up to so late a period as 1770. He wrote many compositions for the Church, none of them, however, being printed in his lifetime. Tallis's monopoly of music-printing expired in 1596 and two years later Morley obtained a similar one, and under his license "William Barley, Thomas Est, *alias* Snodham, Peter Short, John Windet, and others," printed several books as the "assigne of Thomas Morley." He resigned from the Chapel Royal in 1602. That he was an excellent musician his ballets and madrigals prove. He was also superior in melodic invention to any of his predecessors, and is generally credited with having disentangled music from the fettered condition in which he found it, and to have broken away from the slavish adherence to the 'Modes' which had characterized other composers. From his time forward composers designedly wrote melodies meant to express the emotional content of the text.

MOR'MOLUCOI'DES (Neo-Lat. nom. pl., from *mormoluca*, glowworm, from Gk. *μορμολύκειον*, *mormolykeion*, *μορμολύκιον*, *mormolykion*, hobgoblin, from *μορμολύττεσθαι*, *mormolyttesthai*, to frighten, from *μορμώ*, *mormō*, bugbear + *εἶδος*, *eīdos*, form). The oldest known fossil insect larva, found in the shale of the Newark formation of the Jura-Triassic system in New Jersey, Connecticut, and Massachusetts. In general appearance it resembles the larva of the modern firefly, though it is considerably larger, being quite three-quarters of an inch in length. It is considered to be the young of a neuropteran insect allied to the modern dobsons (*Sialidæ*).

MORMON CRICKET. Either of the wingless migratory crickets, *Anabrus simplex* and *Anabrus purpurescens*. These are large, peculiarly shaped crickets, which occasionally multiply so greatly in their native home in the foothills of the Rocky Mountains that they migrate to the plains below, and destroy all cultivated crops. As they are wingless, they move but slowly, and may often be checked by ditches. A plowed field in their course forms a difficult barrier, and an approaching army may be destroyed by means of heavy rollers. They are pugnacious and will fight among themselves, and are to a certain extent carnivorous, devouring their injured comrades. For many years they have been especially abundant and injurious in portions of Montana and Idaho.

MORMONS, or more properly The Church of Jesus Christ of Latter Day Saints. A religious sect of the United States. The early history of the Mormons is that of their founder, Joseph Smith, Jr., who was born at Sharon, Windsor County, Vt., December 23, 1805. Joseph's paternal grandfather was a man of distorted religious views; his maternal grandfather, Solomon Mack, was an infirm beggar, and superstitious to a high degree. Joseph's mother believed in cures by faith and in dreams as heavenly admonitions. The Prophet's father, after failing as a farmer, a storekeeper, and a root-digger in Vermont and New Hampshire, took up a land claim in Ontario County, N. Y., in 1815. Like his son, he was a confessed believer in witchcraft and demon possession.

When the youthful Prophet's parents moved to central New York, the land was still called the Western Wilderness, and schoolhouses were opened only three months in the year. The local saying that "none of them Smith boys ever went to school when he could get out of it" was borne out by Joseph's assertion that he was 'a rough stone' and desired 'the learning of heaven alone.' His mother said of him that in his nineteenth year he had never read the Bible through.

The 'conversion' of Joseph took place in 1820 near Palmyra. It was a time of great local excitement on the subject of religion. Joseph had retired to a solitary place and knelt in prayer to God. He fell into a trance, and was seized with a feeling of great depression and terror. "Just at this moment of great alarm," he continues in his description of the event. "I saw a pillar of light exactly over my head, above the brightness of the sun, which descended gradually until it fell upon me. When the light rested upon me, I saw two personages whose brightness and glory defy all description, standing above me in the air. One of them spake unto me. . . . When I came to myself again I found myself lying on my back, looking up into heaven." The second of the 'visions of Joseph' took place on September 21, 1823, when the heavenly messenger disclosed the hiding place of the gold plates upon which the *Book of Mormon* was asserted to be engraved. There was a series of seven visions in all, extending over as many years, and bearing marks of epileptic seizures.

Connected with these abnormal trances is the so-called "transcription of the gold plates." As a money-digger among Indian mounds young Smith made use of a 'peek-stone,' presumably a quartz crystal picked up from the glacial drift. This became the famous 'Urim and Thummim,' whereby "Joseph the Seer translated the reformed Egyptian of the plates of Nephi." Recent investigation of the original document with its sprawling superscription 'Caractors' shows that it is analogous to the automatic writing of the semi-hypnotized crystal gazer. Smith's later methods of 'translating' bear out this supposition of a sub-conscious activity. Hidden behind a blanket and throwing himself into a condition of revery by gazing into his 'interpreters,' he dictated to his scribes communications of supernatural origin. Of these writings the first was the *Book of Mormon*, begun in September, 1827, at Manchester, N. Y., continued at Harmony, Pa., and finished at Fayette, N. Y., June, 1829. The original manuscript has disappeared. There remains only a duplicate made by Smith's principal scribe, the schoolmaster Oliver Cowdery. This Cowdery copy is of value as containing the author's preface with its original erasures and misspellings, solecisms, and improprieties. The first edition was printed at Palmyra in 1830. Two other editions were published within ten years. The fifteen books of this "Sacred History of Ancient America from the Earliest Ages After the Flood to the Beginning of the Fifth Century of the Christian Era" Smith himself thus summarized: "The history of America is unfolded from its first settlement by a colony that came from the Tower of Babel to the beginning of the fifth century of the Christian Era. We are informed by these records that America, in ancient times, has been inhabited by two distinct races of people. The first were called Jaredites, and came directly from the Tower of Babel. The second race came directly from the city of Jerusalem, about six hundred years before Christ. The Jaredites were destroyed about the time that the Israelites came from Jerusalem. The principal nation of the second race fell in battle toward the close of the fourth century. The remnant are the Indians. This book also tells us that our Saviour made His appearance upon this continent after His resurrection; that He planted the Gospel here in all its fullness and richness and power and blessing; that they had apostles, prophets, pastors, teachers, and evangelists; the same order, the same priesthood, the same ordinances, gifts, powers, and blessing, as was enjoyed on the Eastern Continent; that the people were cut off in consequence of their transgressions; that the last of their prophets who existed among them was commanded to write an abridgment of their prophecies, history, etc., and to hide it up in the earth."

To dismiss the *Book of Mormon* as a mere hodge-podge of petty information, gross anachronisms, and biblical borrowings is to miss its significance both as a cryptic biography and as a characteristic bit of provincial Americana. In addition to private affairs inadvertently incorporated there are water marks of some historic interest to be found in the document. There appear, in Scriptural paraphrase, descriptions of the current agitations against Romanism, infidelity, and Freemasonry, and even references to the so-called Washingtonian movement for total abstinence. The widely prevalent theory that the Indians were the lost ten tribes of Israel is also embodied. The Nephites were not merely the modern red men in disguise, but in their mental habits they intimately resembled local sectarians. The speech of Nephi contains quotations from the Westminster Confession of Faith, and the speech of Lehi reflects the heretical tenets charged against the Presbytery of Geneva, in whose bounds Joseph himself lived. The book is filled with the catchwords of the Methodist camp-meeting exhorter. The last section of the *Book of Mormon*, being an imitation of a Methodist book of discipline and a perfect storehouse of mixed proof texts, is final proof of the writer's dependence on local theology.

The anti-Mormon contention against the authenticity of the work is untenable. The ideas in the book were within the young author's ken. His Calvinism need not have been formally derived from the *New England Primer*, nor his arguments on Deism from Thomas Paine's *Age of Reason*, since the backwoods pulpit and the political gossip of the taverns supplied these notions. If the internal evidence makes the *Book of Mormon* indigenous, the external evidence is equally against a foreign authorship as presented in the ordinary Spaulding-Rigdon theory. This is, briefly, that a romance of prehistoric America, written in Ohio in 1812 by a Congregational minister, Solomon Spaulding, was the 'source, root, and inspiration' by which Smith's associate, Sidney Rigdon, concocted the scheme of a Golden Bible. The recovery in 1885 of the alleged original of Spaulding's "Manuscript Story" has been to the Mormons conclusive proof of its non-connection with the *Book of Mormon*, for there is no real resemblance between the two. The theory is further invalidated by the fact that it is impossible to show how, when, or through whom Smith could have obtained one of the two copies of the Spaulding manuscript.

The day of the founding of the Mormon Church was April 6, 1830. On that day Smith claimed to have received a revelation beginning: "Thou shalt be called a seer, a translator, a prophet, an apostle." This is a characteristic sentence from the second half of the Mormon canon, the *Book of Commandments*. This rarest of original Mormon sources is in part a book of discipline, containing the "Articles and Covenants of the Church of Christ." To add to the confusion of contents, this pamphlet of 55 chapters has its biographical side. Like its enlargement, the revamped *Book of Doctrine and Covenants*, it comprises "revelations to Joseph Smith, Jr., for the building up of the Kingdom of God in the last days." There are also many oracles which are of a strictly business nature. Smith's first scribe, Martin Harris, is told to 'pay the printer's debt,' while the Prophet's wife is thus addressed: "Emma, thou art an elect lady and thou needest not fear, for thy husband shall support thee from the Church." Concerning the origin of these vaticinations, David Whitmer, the third witness of the gold plates, asserted that the revelations were given through the stone through which the *Book of Mormon* was translated, and

Parley P. Pratt described how "each sentence was uttered slowly and very distinctly." Smith himself was more cautious as to the divine origin of his messages, saying, "We never inquire for special revelation only in case of there being no previous revelation to suit the case."

The reception of the illiterate Smith as 'prophet, seer, and revelator' is not inexplicable if the mental calibre of his first adherents and the religious primitiveness of the times be considered. The local hankering after the predictive and oracular is manifest by the success of other leaders in the occult in these parts. Jemima Wilkinson prophesied at Crooked Lake; William Miller predicted the end of the world at Rochester, and the Fox Sisters started Spiritualism only ten miles from Joseph's home. The return of apostolic gifts was hoped for by the local Quakers, primitive Baptists, and Restorationists. A half-year later, during the revivalistic meetings of the Mormons at Kirtland, Ohio, various spasms, trances, and prostrations were attributed to communication of the Holy Ghost by the laying on of hands. When the convulsions got beyond the chief exorcist's control, he asserted that they were caused by the creeping in of false spirits.

The Kirtland revival was the turning point in the life of the infant Church. Because of it there came a "revelation to the churches in New York, commanding them to remove to Ohio." It was now that Sidney Rigdon played his part in the Latter-Day movement. He had been a Baptist preacher in Pittsburg, and a minister of the Disciples' Church in Ohio. He organized at Kirtland a branch of Saints of one hundred members, and in February, 1831, Smith betook himself thither. David Whitmer asserts that Rigdon soon obtained more influence over Smith than any other man living. In exchange for the home-made Mormon Bible, Rigdon gave a foreign framework to the Mormon Church. He got hold of some of the transplanted ideas of Fourier (q.v.), the French collectivist. Nineteen families in Rigdon's neighborhood had already formed themselves into a common stock company. A revelation of February, 1831, runs: "Thou shalt consecrate all thy properties which thou hast to impart unto me with a covenant and a deed which cannot be broken; the bishop shall appoint every man a steward over his own property, inasmuch as is sufficient for himself and family; the residue shall be kept in my storehouse, to administer to the poor and needy, and for the purpose of purchasing lands, and the building up of the New Jerusalem."

The recital of Smith's Ohio business enterprises betrays a great lack of financial ability. He first opened a general store at Hiram, which failed. Land speculation also brought loss. Three farms at Kirtland, costing over $11,000, were to be turned into a permanent city of Zion with 32 streets. Like the Church tannery and the Church sawmill, this paper city had no financial foundation. At the same time a $40,000 temple was begun (the corner-stone was laid July 23, 1833), and although most of the Saints gave one-seventh of their time to its building without pay, a debt of from $15,000 to $20,000 was left upon it. Meanwhile an attempt was made to prevent financial disaster by establishing the Kirtland Safety Society Bank. Reorganized in 1837 as the Kirtland Society Anti-Banking Company and uttering at least $200,000 of its notes, the crash came within ten months, and Secretary Rigdon and Treasurer Smith fled to Missouri.

As president of the Church in Ohio, Smith's communistic ambitions were mingled with hierarchical schemes. Besides the United Firm and the Safety Bank, in 1833 he dedicated to the Lord the printing office of the *Latter-Day Saints' Messenger and Advocate*. In 1834 he organized the First High Council of the Church of Christ, with himself, Rigdon, and Williams as the First Presidency. In 1835 he chose the Twelve Apostles, among whom were Brigham Young, the Lion of the Lord; Parley Pratt, the Archer of Paradise; and Lyman Wright, the Wild Ram of the Mountain. In 1836 Smith instituted the several quorums or executive bodies of the Church, first the Presidency, then the Twelve, and the Seventy, also the counselors of Kirtland and Zion. In 1837 he set apart Apostles Kimball and Hyde to go on a mission to England, the first foreign mission of the Church.

In 1832, as a prophet of woe urging the Saints to sell all they had and flee from the wrath to come, Smith brought the mob upon himself and Rigdon at the town of Hiram. In the great apostasy of 1836 the Church lost some of its pillars. The three witnesses to the *Book of Mormon* were soon cut off. In the bull of excommunication David Whitmer, the anti-polygamist, was compared to Balaam's ass; Martin Harris was called a negro with a white skin, while all the "dissenters," says the Prophet, "are so far beneath my contempt that to notice any of them would be too great a sacrifice for a gentleman to make."

While the Saints were yet in Ohio there is evidence that polygamy was both practiced and sanctioned by those highest in authority. The Reorganized Church of Latter-Day Saints under the leadership of the Prophet's son, Joseph Smith, 3d, has claimed that the doctrine of 'spiritual wifery' was introduced, not by the Prophet, but by the older men, notably Hurlburt, Bennett, and Rigdon. The real acts of these scapegoats may never be known, for their testimony as to Smith's implication in their practices was declared unprintable. Hence what remains of the evidence against the Prophet is merely circumstantial, and is to be counterbalanced by his early attempts at ostensible suppression. In October, 1831, Smith admonished William E. McLellin through a revelation: "Commit not adultery, a temptation with which thou hast been troubled." In July, 1833, Smith wrote to the brethren in Zion to "guard against evils which may arise from accounts given of women." In 1835 the *Book of Doctrine and Covenants* declared: "Inasmuch as this Church of Christ has been reproached with the crime of fornication, and polygamy: we declare that we believe, that one man should have one wife; and one woman but one husband."

The third place of settlement by the Saints was Missouri. Smith's order to Oliver Cowdery to go and establish the Church among the Lamanites brought four Mormon missionaries to Jackson County as early as 1831. The town of Independence was declared the new city of Zion and a site for a temple was chosen there in August. The converts poured in from the Middle Atlantic States and Canada with such rapidity that the non-Mormons were somewhat alarmed. The printing of the *Book of Commandments* with its revelations to the Saints calling Missouri "the land of your inheritance, which is now the land of your enemies," led to acts of hostility from the citizens of Jackson County. The burning of barns and the shooting into Mormon houses at night was followed by demands for the removal of the Mormons from the country within a reasonable time, and for the prohibition of future Mormon settlement therein. The element of border ruffianism was doubtless responsible for the speedy destruction of the Church printing office, and for the tarring and feathering of Bishop Partridge, yet the Saints themselves were not without fault. Their agreement to depart within eight months was written, as they alleged, "supposing that before the time arrived the mob would see their error and stop the violence." Since Governor Dunklin was loath to call out the militia, the mob drove at least fifteen hundred Mormons across the Missouri, the women and children suffering terrible hardships in the November storms. The negotiations for financial redress proved fruitless, for, as the Governor himself confessed, conviction for any violence committed against a Mormon could not be had in Jackson County. Until 1838 the town of Far West was materially prosperous and on good terms with its neighbors, but upon the Prophet's arrival in that year there arose dissensions within and without. The Presidency was deposed on a charge of misappropriating trust funds and Oliver Cowdery expelled for counterfeiting. With the further defection of Thomas B. Marsh, president of the Twelve, and Orson Hyde, one of the original Apostles, there came the establishing of an organization called ultimately the Danite Band, and known popularly as the Avenging Angels. Bound to secrecy by blood oaths, obeying any behest of the Church against property or life, this American variety of thugs owed its origin to Smith's revelation of August 6, 1833—"Thine enemy is in thine hands, and if thou reward him according to his works thou art justified; if he has sought thy life, and thy life is endangered by him, thine enemy is in thine hands and thou art justified." The year 1838 also saw the establishment of the tithing system. Forty years afterwards the annual tithing revenues were estimated at a million dollars, appropriated, according to Brigham Young, to church erection, emigration, and poor relief.

The beginning of civil strife in Missouri dates from Rigdon's 'salt sermon,' a Fourth of July oration (1838), in which there was officially predicted a war of extermination between Saints and Gentiles. After the State election in August, it was reported to Governor Boggs that the Mormons were so numerous and well armed that the judicial power of Daviess and Caldwell counties was wholly unable to execute any civil or criminal process against a Mormon. A regiment of militia was thereupon called out, but General Doniphan, fearing that much blood would be spilled, disbanded most of his force. At the Prophet's suggestion the organization of the 'Fur Company' let loose foraging bands over the country. Then followed the killing of the Danite leader, 'Fear Not' Patten, the defeat of the Missouri Captain Bogart, and the retaliation upon the Mormons in the infamous Hawn's Mill Massacre. On October 27th the Governor issued orders that the Mormons must be treated as enemies, and must be exterminated or driven from the State. There ensued a determined campaign against the Mormons. The final terms of surrender, offered at Far West by General Lucas, included the payment of debts and the expulsion from the State of all the Mormons except the leaders, who were subject to trial. In the trial of Joseph and Hyrum Smith, Rigdon, and others at Liberty, testimony was given that the members of the Danite Band considered themselves as much bound to obey the heads of the Church as to obey God, and that Smith advised the people to spoil the Gentiles. The Prophet was confined in Liberty until April, 1839.

The fourth place of removal of the Saints was Illinois, and here their experience was but a repetition of their last migration. Friction was sure to arise because of the lawless squatters and timber thieves in the northern counties and because of the politicians at Quincy and their toadying for the Mormon vote. Smith purchased the city of Commerce on the banks of the Mississippi for about $70,000; the name of the town was changed to Nauvoo, supposedly derived from a Hebrew word meaning beautiful. The rapid growth of Nauvoo was largely due to the religious propaganda. At home, proselyting was extended from Maine to Michigan, while mass meetings were called in the Eastern cities to express sympathy with the Mormons as oppressed by the enemies of the freedom of religious opinion. Abroad, the press knew even less of Latter-Day ambitions, since the Mormon appeals in England were directed to the illiterate and superstitious. At Liverpool, Orson Pratt published his *Discovery of Ancient American Records* and the Mormon organ, the *Millennial Star,* advertised "Bones set through faith in Christ." But that which appealed most strongly to English weaver, Scotch miner, and Welsh peasant was the prospect of owning a farm in the land of Missouri, where "the Lord had been raining down manna in rich profusion." The success of the Mormon missionaries in Great Britain is evinced by the growth of the system of chartering ships for emigrants, from one vessel and 200 passengers in 1840, to 8 vessels and 1614 passengers in 1842.

In the meantime Mormondom in America was flourishing both financially and politically. Through efficient lobbying the Illinois Legislature granted charters for the city of Nauvoo, the Nauvoo Legion, and the University of the City of Nauvoo. Three-fourths of the university faculty was drawn from local talent, being composed of Orson Pratt, Orson Spencer, and Sidney Rigdon, with James Keeley, a graduate of Trinity College, Dublin, as president. An army officer, in 1842, praised the Nauvoo Legion, but expressed his fear of the growth of a Mormon corps filled with religious enthusiasm and led on by ambitious officers. This fear was justified by the attempted assassination of Governor Boggs, of Missouri, by O. P. Rockwell, a Mormon living at Nauvoo. The Prophet, having called Boggs a 'knave, butcher, and murderer,' was indicted as instigator of the plot. He was then released by his own municipal court. Smith's ability to swing votes led to an enlargement of his political ambitions. He called on President Van Buren with a claim for Mormon losses amounting to $1,381,044.55½. Failing to obtain redress from Congress, he addressed letters of appeal to Henry Clay and John C. Calhoun. On receiving non-committal answers from these rival Presidential candidates, he ran for President himself.

Smith was assassinated in jail at Carthage, Ill., June 27, 1844. The causes leading up to his death were not merely political, but also financial and social. He secured relief from his Kirtland creditors only by taking advantage of the bankruptcy act, and the numerous thefts around Nauvoo were laid to the Mormons. Smith was also in trouble with his associates; in 1843 he deposed Rigdon as his adviser. On July 12, 1843, there came the famous "Revelation on the Eternity of the Marriage Covenant, including Plurality of Wives. Given through Joseph, the Seer, in Nauvoo, Hancock County, Ill." This document was not promulgated until 1852; its authenticity is, however, proved by its similarity in style with the *Book of Mormon.* In this document the authority for polygamy is derived from the example of the Old Testament patriarchs, but the Mormon harem is confined to ten virgins. The Prophet's ideas on 'spiritual wifeism,' like his early gospel, appear to have been 'plain and simple' and without any philosophic basis. Whatever Smith taught on the 'mysteries of the kingdom' is derivable from the writings of the two Pratts, who excogitated a system of metaphysics justifying plurality of wives. According to Orson, called the Gauge of Philosophy, "celestial marriage opens the way for all women who wish to marry to fill the measure of their creation. . . . It shows how the innumerable creations of God [i.e. this world and other planets] may be peopled with intelligences. . . . Woman without man and man without woman cannot be saved. The larger the progeny a man has, the greater will be the fullness of his eternal glory." These were the esoteric teachings of the Saints, whispered as early as 1840. Smith's plural wives numbered over a score, most of whom were taken by the Apostles Kimball and Young after the Prophet's death. Outward proof of the practice of polygamy in the forties is to be sought in such virulent persecutions as caused the expulsion of fifteen thousand Saints from Missouri, and in such publications as the *Times and Seasons*' 'extract from a letter from the vicinity of Nauvoo,' which says, "The excitement on both sides of the river against the Mormons is increasing very fast. The conduct of Joseph Smith and the other leaders is such that no community of *white men* can tolerate." Turmoil now arose in the Mormon camp itself. Three well-informed men, Dr. Foster and the two Laws, started a paper called the *Expositor*, which, besides advocating 'disobedience to political revelations,' sought to 'explode the vicious principles of Joseph Smith.' The first and only number condemned the Church appropriation of property without accounting, the preaching of the doctrine of plural gods, sealing, and the plurality of wives. The wanton destruction of the *Expositor* press and property on June 10th under the order of Joseph Smith, as lieutenant-general of the Nauvoo Legion, was succeeded by great commotion among non-Mormons. Outlying counties raised men and money for a 'war' against the Saints, for Nauvoo was now declared under martial law. On June 22d the Prophet and a few others started to flee to the Rocky Mountains, but upon Governor Ford's promise of protection, Smith surrendered himself at Carthage on the 24th. The first arrest was made on a charge of riot, the second on a charge of treason in levying war against the State. In appointing the Carthage Grays, who were the avowed enemies of the Smiths, as a guard over the jail, the Governor made a fatal blunder. On June 27th, with the evident collusion of the guard, a band of disguised assailants, presumably from the Warsaw regiment, brutally murdered the Prophet and his brother Hyrum.

With the death of Smith rival claims to the prophetic successorship arose between Brigham Young, J. J. Strang, and Smith's own son. The 'Strangites' disappeared with the killing of their leader in 1856 because of his polygamous practices. The 'Young Josephites,' however, founded in 1852 the *Reorganized Church of Jesus Christ of Latter-Day Saints*, and the body still exists under the presidency of Joseph Smith, 3d. It claims to be the continuation of the original Church of Latter-Day Saints, and has been recognized as such by the courts. It maintains that the doctrines of plurality and community of wives are heresies. The headquarters of the Church are at Lamoni, Iowa. It has a publishing house, and issues two weekly papers (*Zion's Hope*, for Sunday-schools, and the *Saints' Herald*, a general religious weekly and the official organ), a monthly magazine (*Autumn Leaves*) for young people, and books and tracts. It maintains Graceland College and a home for the aged poor. There is another establishment at Independence, Mo., with a printing press, whence are issued *Zion's Ensign*, a weekly paper, books, and tracts. The Church has about 45,000 members.

The logical successor of Smith was Brigham Young. Young joined the Mormon Church in New York State on April 14, 1832, and in the same year was sent by the Prophet from Kirtland on a missionary tour in Canada. Returning to Ohio with a band of converts in 1834, he went with the 'Army of Zion' to Missouri as one of the 'captains of tens.' In 1835 he was appointed one of the original Quorum of Twelve. Young assisted Smith in his flight to Missouri in 1838, and two years after sailed to Liverpool on a mission. The Prophet was fond of him, and Young's faithfulness to the cause is shown by his being left President of the Twelve upon Smith's assassination.

The Prophet's tragic death was of no avail against the domestic enemies of the Church. In January, 1845, the Nauvoo charter was repealed. The situation being recognized as intolerable, Young officially arranged to leave the country in the spring, a delegation having previously been sent out to investigate locations in California and Oregon. The final choice of Utah was due to a chance meeting with some trappers from the Great Salt Lake Valley. The organization of the Mormon exodus was in many respects remarkable. A pioneer company of young men was first sent ahead to plant crops, which the following companies should reap. Meanwhile Nauvoo had been turned into a vast wagon shop, so that the first company comprised a train of one thousand wagons. This 'Camp of Israel,' which included President Young and the Twelve Apostles, was subdivided into companies of from fifty to sixty wagons in charge of captains of fifties, captains of tens, and contracting commissaries. The versatility of the American pioneer was displayed in the establishment of way stations, with various repair shops and with a flouring mill built by Young himself. The largest company, which started from Elk Horn River on July 4th, included 1553 persons, with 566 wagons. By 1848 all the Mormons had crossed the plains except a few left on the Missouri as forwarding agents for emigrants from the Eastern States and Europe.

By March, 1848, the population of Salt Lake City numbered 1671, with 423 houses built. In spite of the failure of the crops and the consequent suffering of the first winter, glowing accounts of the new Zion were sent to England, with the result that within two years the English immigrants included men of many professions and trades. Young early projected cotton, woolen, and glass factories, for there were no sources for manufactured goods nearer than one thousand miles. In all this the aim of the leaders was to establish a State entirely self-supporting. But the balance sheet in 1852 showed a deficit. Young undertook to retrench expenses by giving less assistance to immigrants, but this policy turned out disastrously. The economic salvation of Mormondom was not due to the financial abilities of the body, but to outside causes. Abundance of money was brought to Salt Lake City by those who were hastening to California for gold, and by the building of the Pacific Railroad.

The political success of Mormonism was equally fortuitous. The war with Mexico having transferred the sovereignty of this region to the United States Government, on March 4, 1849, a convention at Salt Lake City adopted a constitution for the State of Deseret. The confusion of the Mormon political ideas was manifested in calling Deseret a State and at the same time in dispatching a Territorial delegate to Washington. Babbitt's application was rejected largely because of the hostility of the Illinois Democrats.

The growth of Young's dictatorship depended on mixed personal and religious reasons. He was known as hard-working Brigham Young; and his word was counted the word of God to his people. The power of the head of the Church was also increased by the issuance of paper money, by the strict application of the tithing system, and by the order that no man should hoard up his property. Young's addresses in the temple show that, with the development of his despotism, there came a loss of personal liberty among the laity. In connection with the School of the Prophets he appointed Church confessors to go among all families. In 1856 occurred the so-called 'Reformation,' in which the discontented were weeded out. After the murder of the would-be apostate, William R. Parrish, a deed instigated by Young himself, there came the organization of four hundred 'Wolf Hunters,' whose object was to prevent such rare escapes as that of Frederick Loba and his wife. By 1856 the doctrine of blood atonement was in operation. Apostasy was practically declared a capital crime to be atoned for only by having the blood spilled upon the ground, and Rosmos Anderson, who wanted to marry his stepdaughter against the wishes of the ward bishop, had his throat cut by the ecclesiastical executioners, so that his blood might run into his freshly dug grave.

The murder of the Aikin party in 1857 came under Young's policy of keeping the Gentiles out of Utah. Six men from San Francisco, with an outfit valued at $25,000, were shot while being 'escorted' by 'Bill' Hickman, who was known as 'Brigham's Destroying Angel.' In the same year occurred the most wholesale of these affairs, the Mountain Meadow Massacre (q.v.).

Chief among the reasons for governmental neglect of the Mormons were the appointment of mere party hacks as Territorial officers and judges and the impotence of the Federal Government at the approach of the Civil War. Furthermore, the authorities were ignorant concerning Mormon practices and ambitions. Upon the establishment of the Territory of Utah, in 1851, Brigham Young was appointed Governor. When the Federal appointee, Judge Brocchus, ventured to criticise polygamy, Young publicly called him a coward and asked him to "apologize to the satisfaction of the ladies." President Pierce's offer of the Governorship to Lieutenant-Colonel Steptoe led Young to threaten vengeance for this 'infringement' upon his individual rights and privileges. By 1856 the political parties began to make capital out of the Mormon situation. Stephen A. Douglas asserted that it was the duty of the President to remove Brigham Young and all his followers from office. In his message of 1857, President Buchanan declared that there was no longer any government in Utah but Brigham Young. All this was declared to be a Democratic scheme to blind the North regarding the pending slavery issue. However, a force of 1500 troops was dispatched under General Scott, whereupon Young announced that he "would ask no odds of Uncle Sam or the devil." The Nauvoo Legion was recruited from all able-bodied males between eighteen and forty-five, martial law was declared in the Territory, and the Mormons harassed the Federal column by setting fire to the grass, stampeding their cattle, and burning the supply trains. An advance by winter into the Salt Lake Valley being deemed out of the question, Colonels Johnstone and Alexander joined forces near Fort Bridger. Meanwhile Young, determined upon being the civil as really as he was the ecclesiastical head, commissioned Col. T. L. Kane as lobbyist at Washington. Taken with the pro-Mormon report of Governor Cumming, the result was a full and free pardon offered by President Buchanan to the very leaders whom Judge Eckles had charged with adultery. The attitude of the Church being considered treasonable during the Civil War, in May, 1862, Utah was put under military supervision. Colonel Connor's plans to overawe Young were frustrated by Lincoln's let-alone policy, and it was not until the lapse of a generation that the Mormon leaders unwillingly traded polygamy for Statehood.

The anti-polygamy legislation began with the Morrill bill of February, 1860. The severest punishment being merely the statutory penalty for bigamy, the measure was ineffective. The Cullom bill of 1869 was fought by Delegate Hooper on the ground that the Mormon views of the marriage relation were an essential part of their religious faith and therefore constitutionally guaranteed. Convictions under the Poland bill of 1874 being appealed, the United States Supreme Court ruled that religious belief cannot be accepted as a justification for an overt act made criminal by the law of the land. President Hayes, in his message of December, 1879, struck at the root of the matter by declaring that polygamy could only be suppressed by taking away the political power of the sect which encouraged and sustained it. Like remarks of Presidents Garfield and Arthur, in 1881, led to the Edmunds bill of 1882, which provided that no polygamist should be entitled to vote in any Territory or to hold office under the United States. Within two years 12,000 voters were disfranchised by this act, and within eight years 468 persons, mostly in the rural districts, were convicted for polygamy or unlawful cohabitation. When in 1890 the courts declared the ecclesiastical property confiscated because the Mormon Church was an organized rebellion, Young's successor, President Wilford Woodruff, issued a manifesto in which he advised the Latter-Day Saints to "refrain from contracting any marriage forbidden by the law of the land." The difficulties of obtaining Statehood and the unseating of Congressman Roberts in 1899 led the Church to so modify its views of political dominion as to declare that the Mormons "form not a rival power as against the Union, but an apostolic ministry to it, and their political gospel is State rights and self-government." A late estimate places the number of Mormons in the United States, exclusive of the Reorganized Church, at about 300.000. They are no longer receiving large accessions from foreign propaganda among Teutonic races.

According to the present official handbook, the religion of the Latter-Day Saints consists of doctrines, commandments, ordinances, and rites revealed from God to the present age. The first principle is faith in God and in Jesus Christ; the next is repentance from all sin, then follows baptism for the remission of sin, as a preparation for the gift of the Holy Ghost, bestowed by the laying on of hands. Obedience to these principles is necessary to membership in the Church of Jesus Christ of Latter-Day Saints. Faith in God is the beginning of religion, and confers spiritual gifts such as healings, miracles, tongues, the interpretation of tongues, discernment, visions, dreams, prophecy, and revelation. Authority to administer in the name of the Deity must of necessity come from God. This involves revelation. There having been no communication with heaven for hundreds of years, the world was without divine authority to administer gospel ordinances until Joseph Smith. By John the Baptist he was ordained to the lesser or Aaronic priesthood, and by Peter, James, and John to the higher or Melchisedek priesthood, receiving the Holy Apostleship and the keys of the kingdom with power to seal on earth so that it might be sealed in heaven. The religion of the Latter-Day Saints is progressive. It cannot be defined in a written creed. It is added to by the revelations of God as the capacities of the Saints enlarge and the needs of the Church increase. Every member of the Church is entitled to the blessings of divine communion and revelation for his or her own comfort and guidance. Revelations for the whole Church are only given through its President, who is its earthly head and holds the keys of the kingdom. Among the later revelations to the Church are the doctrines of baptism for the dead and of celestial marriage. As there was no authority among men to administer the ordinances of the gospel from the days of the early Apostles or shortly after, to the time of the restoration of the priesthood to Joseph Smith the Prophet, all the baptisms during the intervening period were void. The friends of the dead, however, are permitted to take their names and be baptized in their stead, the ceremony being duly witnessed and recorded on earth and accepted and ratified in heaven. Other ordinances may also be admitted by proxy, the living in behalf of the dead.

Celestial marriage is marriage unto all eternity. According to the revelation on this subject all the marriages entered into without divine authority are dissolved by death. Celestial marriage is entered into by those who have obeyed the gospel and become the sons and daughters of God by adoption. The woman is given to the man and they become one flesh. That which is thus sealed on earth is sealed in heaven, and is as valid as though performed in person by the Deity. If a wife thus sealed to her husband should precede him in death, it would be his privilege to wed another. The second wife, or third, if the second should die, would be sealed to him in the same manner as the first. They would all be his equally. In the resurrection he would have three wives, with their children, belonging to him in the everlasting covenant. The revelation on celestial marriage declares that if given to man in the everlasting covenant in the way appointed of God, he is not under condemnation, but is justified in receiving more wives than one. They are sealed to him and become his, and he cannot commit adultery with them because they are his and his alone. None of them are concubines or mistresses, or mere ministers of lust. Celestial marriage in its fullness is ordained of God. It is an establishment of religion. It is ecclesiastical in its nature and government. It is therefore outside the domain of constitutional law. Being within the pale of the Church, its free exercise cannot of right be prohibited.

The Mormon system of proselyting is simple. Twice each year, at the annual and semi-annual conferences held in Salt Lake City, a number of the faithful elders of the Church are selected by the authorities and 'called' by the assembled saints to visit the home or the foreign field. They travel at their own charges. Each mission is presided over by some elder selected by the general authorities of the Church, and the minor divisions of branches and conferences have their proper officers. The Utah missionaries remain in their fields of labor from two to four years and until released by competent authority to return home. Mormon missionaries have gone to every State and Territory of the Union, also to Canada, Mexico, the Antilles, Brazil and Peru, Great Britain, Germany, Switzerland, France, Italy, Denmark, Sweden, Norway, Iceland, Finland, South Africa, India, the East Indies, China, Australia, New Zealand, the Society Islands, and the Hawaiian Islands. The Church has an organization known as the Perpetual Emigration Fund Company, which makes advances of money to assist the faithful to Utah and adjoining districts.

The Mormon hierarchy is complicated. Joseph Smith and Oliver Cowdery were the first two elders and apostles in the Church. Smith, who bore the title of Prophet, Seer, and Revelator, stood at the head of the Melchisedek priesthood, of which three presiding High Priests, chosen by the body, form a quorum of the Presidency of the Church. The President of the Church and his two counselors form the First Presidency, and the three together represent the Trinity. The Twelve Apostles form a quorum equal in authority and power to the three Presidents previously mentioned. The Twelve are a traveling presiding High Council, under the direction of the Presidency of the Church, to build up the Church and regulate its affairs in all nations. The Seventies are also called to preach the gospel and form a quorum equal in authority to that of the Twelve. The Seventy Elders have seven presidents to preside over them, chosen out of the number of the Seventy. There are now over 120 of these Seventies. In addition to these the officers of the Melchisedek priesthood are high priests and elders. The officers of the Aaronic or lesser priesthood are priests, teachers, and deacons. There are twenty-one Stakes of Zion in Utah. Over each stake there is a presidency consisting of a president and two counselors, who are high priests. This presidency bears the same relation to the stake that the First Presidency bears to the whole Church. A high council in each stake, consisting of twelve members, who are also high priests, act for the stake as the traveling presiding High Council act for the Church in all the world. It is the province of the high priests to preside, while the special calling of the Seventy is to travel and preach the gospel and build up the Church.

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MORMYR'IDÆ (Neo-Lat. nom. pl., from *Mormyrus*, from Gk. μορμύρος, sort of sea-fish). A family of malacopterous fishes, allied to the pike family, but according to Cope forming a separate group, Scyphophori, having rather long, compressed bodies, and a slender tail, swelling out at the origin of the caudal fin. The skin of the head is naked, envelops the gill-covers and gill-rays, and leaves only a slit for gill-opening, and the color is dark. The mouth is small. All the dozen or more species inhabit the rivers of Northern Africa and are nocturnal in their activities. The beaked or sharp-nosed mormyrus (*Mormyrus Petersi*) is regarded as one of the best fishes of the Nile, and is distinguished by the production of the lower jaw into an elongated fleshy appendage. It is caught by lines baited with worms, and is represented on many Egyptian monuments.

MORNAY, môr'nā', Philippe de. A Huguenot statesman. See Du Plessis-Mornay, Philippe.

MORNING-GLORY. Various species of *Ipomœa*, especially *Ipomœa purpurea*, cultivated for their large funnel-shaped, diversely colored flowers, which open in the early morning, and close during the heat of the day. The garden varieties are propagated from seeds sown in sunny situations in ordinary garden soil. Their large and abundant, roundish heart-shaped leaves make an excellent screen, the vines often attaining a height of ten feet or more by midsummer. See Plate of Dicotyledons.

MORNY, môr'nē', Charles Auguste Louis Joseph de, Duke (1811-65). A noted French politician of the second Empire. He was the illegitimate son of Queen Hortense and of the Comte de Flahault, and consequently half-brother to Louis Napoleon (later Napoleon III). He was born in Paris, October 23, 1811. The secret of his parentage was well kept for a time and the Comte de Morny received 800,000 francs to adopt him; but he was educated by his 'grandmother,' Madame de Souza-Flahault; and Queen

Hortense left him at her death, in 1837, an annuity of 40,000 francs. Morny took a nominal part in the Revolution of July, 1830, and entered the army in 1832 as a sublieutenant. He served with some distinction in Algeria, being made a Chevalier of the Legion of Honor; but he soon abandoned military life, and in 1838 made his appearance as a manufacturer of beet-root sugar, and published a pamphlet on the subject. From that time he was involved in all sorts of commercial and financial speculations. Chosen a Deputy in 1842, he became the leader of fashion at Paris, but his financial schemes began to go wrong, and after the Revolution of 1848 he attached himself to the cause of his half-brother and was one of the prime instigators of the subtle and treasonable policy which culminated in the coup d'état of 1851. The morning after the deed was done Morny was made Minister of the Interior. This office he soon resigned, however, and in 1854 he became President of the Corps Législatif, and was Ambassador to Russia during 1856-57, where he married the rich and handsome Princess Troubetzkoi. Morny was created a duke in 1862, and continued his gay and extravagant life up to the time of his death on March 10, 1865. His character was sketched by Alphonse Daudet as the Duc de Mora in *Le Nabab*. An extract from his memoirs appeared under the title, *Une ambassade en Russie* (1856). Consult: Castille, *M. de Morny* (Paris, 1859); De la Guerronière, *Etudes et portraits politiques* (Paris, 1856); Imbert de Saint Armand, *The Court of Napoleon III. and the Second Empire* (Eng. trans., New York, 1890).

MORO, mō′rô. A general designation for Mohammedan Malay peoples, with infusion of Semitic blood, living in the southern portions of the Philippines, chiefly in the Sulu Archipelago and the adjoining portions of Mindanao. In the fourteenth century Islam, with Mohammedan culture, reached the islands from Borneo, and its influence was still extending when the Spaniards arrived in 1521. Subdivisions are named Ilano, Joloano, Maguindanao, Samale, etc. See PHILIPPINE ISLANDS.

MOROCCO, or **MAROCCO**, mô-rŏk′ô, called by the natives *Maghrib-el-Aksa*, 'the extreme west,' or briefly *Maghrib*. An empire or sultanate in the northwest of Africa, bounded on the east by Algeria and on the north and west by the Mediterranean Sea, the Strait of Gibraltar, and the Atlantic Ocean. It extends southward into the Sahara, but the boundary in that direction is not exactly determined (Map: Africa, D 1). The Sultan has considerable influence as far south as the Sakiet-el-Hamra, south of Cape Juby; and the whole of the Dra territory, Tafilelt and Tekna, but not Tuat, are conceded to be parts of Morocco. The latest estimate of the area of Morocco is 234,000 square miles.

TOPOGRAPHY. The country is generally mountainous, the Atlas (q.v.) range, which attains an elevation of nearly 15,000 feet, traversing it in several parallel chains from southwest to northeast, and sending out numerous spurs to both the coast-country and the desert. There are, however, many level tracts, especially at the western and eastern extremities, and on the borders of the desert. Through the heart of Northern Morocco extending east and west is a depression, passing just north of Fez, the northern capital, to Oran, Algeria. The central range of the Atlas forms the water-parting separating the streams which flow into the Atlantic and Mediterranean from those which run southward to the desert. The former rivers have the shorter course and less volume, but they are perennial; while the latter become dry in summer, and even when running are lost in the sands of the Sahara. The chief river is the Muluya, with its tributary the Sharef, which drains the northeast of the country, and falls into the Mediterranean after a course of 400 miles. The Muluya is an old waterway of much commercial importance. The Sebu is the most important river of Northwest Morocco draining to the Atlantic. The Kus, Bu-Regreg, Um-er-Rebia, Tensift, Sus, and Assaka drain the central and western districts, and fall into the Atlantic; the Dra, Ziz, Ghir, and other streams irrigate the dry plains of Tafilelt, the first mentioned emptying into the Atlantic Ocean. The other rivers are lost in the desert. All the rivers flowing to the sea are obstructed at their mouths by sandbars, which only small vessels can cross at high tide.

CLIMATE. The climate between the central range of the Atlas and the sea is temperate, the thermometer seldom falling lower than 40° F., or rising above 90° F., owing partly to the regulating influence of the sea breeze, and the shelter afforded by the mountains from the scorching winds of the desert; but in the southeastern districts extremes of heat and cold prevail, and rain is there unknown. The entire country is very healthful. Malaria, the pest of the other Atlas lands, is almost unknown. Along the Atlantic coast the winter precipitation is so large that good pasturage is found as far south as Cape Juby. But dryness prevails throughout the Atlas region, though the winter precipitation covers the mountain-tops with snow; this fact, together with the infrequence of wide valleys, makes the mountain region unfavorable for a large population; the settlement among the mountains is confined to the valleys where irrigation is possible, and to the lower slopes. In the Saharan steppes cultivation is impossible, excepting where streams, fed by the mountain snows, bring surface or underground supplies of water.

FLORA. The flora is richer in flowers and shrubs than in trees. The forests that once covered Western Barbary have disappeared and Morocco is largely a treeless country, though some well-wooded valleys are found among the northern ranges. The cedar, walnut, and cork-oak are the principal trees. The date and oil palms, the fig tree, pomegranate, oranges and lemons, apricots, peaches, the almond, and other varities of fruit and nut trees are all important.

FAUNA. The wild animals include the leopard, bear, hyena, and wild hog. The bustard, partridge, and water fowl abound. The domestic animals comprise the dromedary and the horse, both bred extensively, and mules, asses, cattle, fat-tailed sheep, and goats.

MINERAL RESOURCES. The country is rich in deposits of copper, iron ore, antimony, and rock salt (north of Fez), and gold and silver are reported. The exploitation of all this mineral wealth, however, is hardly to be thought of under the existing conditions on account of the deep aversion of the official classes to foreigners.

Agriculture. Agriculture and stock-raising are almost the only industries. The alluvial soil of the wide plains of the west and east is especially adapted to the cultivation of cereals, and could be brought to a high degree of productiveness by the application of modern agricultural methods. But the strict prohibition of the exportation of grain prevents the natives from utilizing the natural resources of the country and large tracts of fertile land remain idle. Agriculture is also greatly hindered by the general misrule prevailing in the country, and especially the corrupt system of taxation. The chief agricultural products, besides wheat, barley, and other cereals, are olives, dates, oranges, figs, and other kinds of southern fruit, as well as numerous varieties of vegetables. Cotton and sugarcane, once extensively cultivated, have now entirely disappeared, and the cultivation of tobacco is greatly hindered by the adverse sentiment toward its use. The manufacturing industries of Morocco are chiefly devoted to the production of leather, pottery, textiles, including carpets, metal goods of copper and brass, and silver filigree. Fezes are chiefly imported from Austria.

Commerce. The chief exports are beans, skins and hides, fruits, olive oil, and wool. The export of grain, horses, cattle, and many other articles is forbidden. Imports include metal products, cotton, sugar, and tea. Purchases of clothing stuffs and metal wares from Europe are constantly increasing. The commerce with Europe is carried on through the ports of Tangier, Tetuan, Larash, Rabat, Mogador, Mazagan, and Safi, all of them, with the exception of Tetuan, situated on the Atlantic. Fez in the north and the city of Morocco in the south are the centres of the interior caravan trade. The commercial statistics of the country are very incomplete, but from the partial returns of most of the Moroccan ports it is estimated that the imports amount to about $6,000,000 and the exports to about $5,000,000 a year. The trade would be much smaller were it not that the European Powers have used their joint influence to keep the Atlantic ports open to commerce. Great Britain leads in the trade, with France, Germany, Belgium, and Spain following in the order named. As wagon roads and bridges are unknown, commodities can be moved only at large expense.

Government. In its form of government Morocco presents an example of perfect absolutism. The Sultan is in unrestricted control of both the secular and the religious affairs, but his Cabinet of six ministers has considerable influence in the management of the State. The country is divided into provinces administered by Governors, or 'Kaids,' whose sway is as absolute in the respective provinces as that of the Sultan. In some of these provinces, particularly among the Rif Mountains of the Mediterranean coast, the rule of the Sultan is hardly recognized. The revenue (for which no reliable statistics are available) is derived from monopolies, taxes, tithes, and gifts. The receipts from the tariff on foreign commerce at the seaports are from $1,500,000 to $2,000,000 a year. Taxes are collected without any system or control, each taxgatherer being obliged to deliver a certain sum regardless of the amount actually collected. Any reluctance to pay taxes is usually followed by bloody punitive expeditions not infrequently under the personal direction of the Sultan. An impartial and well-regulated system of administration of justice is naturally out of the question. The evidence of a Jew or a Christian against a Mohammedan is considered invalid by the native judges. Persons who are under the protection of foreign consuls are exempted from the jurisdiction of native judges. The army of the Sultan consists of about 12,000 drilled men, of whom about 10,000 are infantry. Most of them are usually stationed at that one of the three capitals (Fez, Morocco, or Mekinez) where the Sultan is in residence; European officers are used to drill the army. The militia forces number about 18,000 men, and the number of men available in case of emergency is estimated at about 40,000.

Population. The number of inhabitants is believed to be about 8,000,000. The population consists of Berbers (about 4,000,000), Arabs and Moors (about 3,600,000), Jews (about 150,000), and negroes and mixed blood (about 250,000). The number of Europeans is between 4000 and 5000. The natives, with the exception of the Jews, are Mohammedans of the most fanatical stripe. The capitals are Fez (140,000 estimated), Morocco (50,000), and Mekinez (25,000). The population of Tangier, an important commercial centre and the seat of the foreign consuls, is estimated at 30,000.

History. Morocco was the Roman Province of Mauretania Tingitana, and shared in the vicissitudes of the other Roman provinces of Northern Africa during the decline of the Empire. It was reached by the tide of Arabian Mohammedan invasion in 698 and was reduced to submission and to Mohammedanism after a spirited resistance. Its people participated in the conquest of Spain. For a number of centuries its history is the rise and fall of successive dynasties, of which the most celebrated were the Almoravides and the Almohades (qq.v.), who passed over into Spain and established their power in that country. In fact, during the later Middle Ages Morocco was the source whence new reënforcements were constantly drawn for the declining power of the Moors in Spain. After the fall of Granada in 1492 the population of Morocco was reënforced by Moors expelled from the Peninsula. In 1546 the sherifs of Tafilelt conquered both Morocco proper and Fez, and united the whole country under one government. This is the present ruling dynasty, claiming direct descent from Ali, son-in-law of Mohammed. In the sixteenth century Morocco was compelled to meet attacks by Spain and Portugal. In 1578 Sebastian, King of Portugal, was defeated and slain in the battle of Kasr-el-Kebir (Alcazarquivir). In the middle of the seventeenth century the Empire of Morocco embraced part of the present Algeria, and extended south as far as Guinea. From that time, however, its decline has been almost unchecked. Morocco has had as little as possible to do with the outside world. Since the commencement of the nineteenth century the rebellion of the wild mountain tribes, the wars of the French in Algeria, and difficulties with foreign States, caused by the aggressions of the Rif pirates, have occupied the attention of the sultans. In 1814, under pressure from the Christian nations, the slavery of Christians was abolished; and in 1817 piracy was prohibited throughout Morocco. The Sultan Abderrahman, having espoused the cause of Abd-el-Kader, sustained a crushing defeat at the hands of the French at Isly in 1844. Mogador was bombarded and peace soon followed. In 1859 a Spanish force under Marshal O'Donnell invaded Morocco. Two battles were fought, several ports were bombarded, and Tetuan was taken. A treaty was signed April 27, 1860, by which the Sultan ceded some portions of his territory and granted commercial privileges to Spanish merchants. Since that time the history of Morocco has been externally uneventful; but the steady weakening of the Sultan's power has made future complications with foreign States not unlikely. Local revolts in 1892 nearly led to the intervention of the Powers, but mutual distrust still keeps them in check. Mulai Hassan, who became Sultan in 1873, died in 1894, and was succeeded by his son, Mulai Abd-el-Aziz, born February 24, 1878. The young Sultan was the son of a Circassian slave and had received an excellent education, which served to imbue him with a fondness for Western civilization. The Government, however, was in the hands of the powerful Grand Vizier, Sidi-Ahmed ibn-Musa, who left little opportunity for the Sultan to put his ideas into effect. After the Vizier's death, in May, 1900, Mulai Abd-el-Aziz assumed personal charge of the Government, and almost immediately entered upon a series of reforms looking toward the reconstruction of Morocco on something of a European basis. The improvement of the State prisons, which had become mere plague spots where atrocious cruelties were practiced on the prisoners, first received his attention. He also set about reducing the onerous customs duties which were levied on goods, especially food products, carried from port to port within the Empire. European influence was welcomed at the capital, British interests being especially favored. The mass of the population regarded the progressive policy of their sovereign with great dissatisfaction, and the introduction of such Western innovations as the railway and the automobile aroused profound disgust. A growing spirit of hatred for foreigners speedily asserted itself. In October, 1902, an English missionary was murdered by a fanatic in Fez and on the murderer's seeking refuge in a mosque, the Sultan caused him to be seized and punished, an act which was regarded by the Moslems as a breach of sanctuary and served to stir up further dissatisfaction. A formidable insurrection among the Berber tribes broke out late in 1902 under the leadership of one Omar Zarabuni, known also as Bu Hamara or Son of the She Ass. He proclaimed himself an elder brother of the Sultan and succeeded in rallying around him the tribes between Fez and Mekinez. Unchecked by several reverses, he succeeded finally in defeating the royal troops under a brother of the Sultan (November 29th), and toward the end of December made himself master of the country around Fez. In January, 1903, the capital was invested by the forces of Bu Hamara.

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MOROCCO, or **MAROCCO**. One of the capitals of the Sultanate of Morocco. It is situated on the north slope of the Great Atlas Range, 90 miles from the Atlantic coast and 250 miles southwest of Fez (Map: Africa, D 1). Its location is very favorable. The city has a healthful climate, but is in a very backward and dilapidated condition. It covers a large area, surrounded by high walls, now more or less in ruins. A large part of the space within is occupied by gardens, open areas, and market places, but in the built-up portions the streets are narrow, crooked, and dirty, and the houses are ill-kept, one-storied, lime-and-earth buildings, with unglazed window-openings. There are nineteen mosques in the city. The Imperial Palace comprises an irregular conglomeration of buildings and gardens in the southern part of the city, covering 180 acres, and surrounded by a wall. Of late years it is but seldom visited by the Sultan. The industries of the city are unimportant. There is still considerable local trade carried on with the surrounding country and with the port of Mogador (q.v.). Traffic is largely in the hands of the Jews, who number about 7000, but live under repressive conditions in a separate quarter of the city. The entire population is estimated at 50,000 to 60,000. There are no permanent European residents. Morocco was founded about 1072. It reached the height of its prosperity in the thirteenth and fourteenth centuries, when its population is said to have been 700,000. It was then a famous Mohammedan seat of learning. Its decline was brought about by several centuries of civil wars and rebellions.

MORÓN, or MORÓN DE LA FRONTERA, mō̇′rōn′ dȧ lȧ frōn-tā′rȧ. A town of Southern Spain, in the Province of Seville, 32 miles southeast of the city of that name, on the Guadaira (Map: Spain, C 4). On one of the high and steep hills surrounding the town are the remains of a once almost impregnable castle erected by the Moors on Roman foundations, and surrounded by triple walls and towers. The castle was occupied by the French in 1810, and was blown up by them on their departure. The inhabitants are engaged in the production of olive oil, and in the vicinity are marble quarries and mines of red hematite. Population, in 1900, 14,459.

MÓRONG. A town of Central Luzon, Philippines, in the Province of Rizal (Map: Philippine Islands, F 5). It is situated on the north shore of the Laguna de Bay, 17 miles east-southeast of

Manila, and has a population of 9430. It was the capital of the former Province of Mórong.

MORONG, Thomas (1827-94). An American botanist, born at Cahaba, Ala. The family removed to Massachusetts while he was a boy, and he graduated at Amherst in 1848. He studied law, but later entered Andover Theological Seminary, and completed his studies in 1853. During his early life he was devoted to botany as an amateur; and in 1888 he undertook an extended voyage of exploration and botanical collection in South America, and visited Argentina, Paraguay, and Chile. Upon his return, in 1890, he was made curator of the herbarium of Columbia College, in New York City. In conjunction with Dr. N. L. Britton he published *An Enumeration of the Plants Collected by Dr. Thomas Morong in Paraguay, 1888-90*. He was one of the contributors to the *International Encyclopædia*.

MORONI, mȯ-rō′nė, or **MORONE,** Giambattista (c.1525-78). An Italian portrait painter, born at Albino, near Bergamo. He was a pupil of Moretto, and became one of the most noted portraitists of the Venetian school. He passed his life in and about Bergamo. In the Uffizi Gallery in Florence there are five portraits by him, including one of himself. The National Gallery in London has several of his works, including his masterpiece, the portrait of a tailor. His altarpieces are of less value.

MOROSINI, mō′rô-sē′nê, originally Morosi. A family of Venetian nobles, dating from the eighth century. Four of the family became doges and many of them occupied other public positions. The first celebrated member of the family was Domenico Morosini, who was Doge from 1148 to 1156.—Marino Morosini, who was Doge from 1249 to 1252, introduced the Inquisition into Venice.—Michele Morosini was Doge for less than a year (1382). He was celebrated as a financier.—Andrea Morosini (1558-1618) became historiographer of the Republic (1598), and held several public offices, besides being one of the Council of Ten. He wrote a history of Venice from 1521 to 1615, first published in 1623, and *Imprese ed espedizioni di Terra Santa e l'acquisto fatto dell' imperio di Constantinopoli dalla republica di Venezia* (1627), a history of the Fourth Crusade. His other works have not been edited.—Francesco Morosini (1618-94) gallantly but unsuccessfully defended the fortress of Candia against the Turks in 1667-69. About 20 years later he conquered nearly all of the Morea, which gained him the surname of Il Peloponnesiaco. He was elected Doge in 1688. Consult: Morosini, *Francesco Morosini il Peloponnesiaco* (Venice, 1885); Bruzzo, *F. Morosini nella guerra di Candia e nella conquista di Morea* (Forli, 1890).

MOROT, mȯ′rȯ′, Aimé Nicolas (1850—). A French painter, born at Nancy. He studied under Cabanel, and at the Ecole des Beaux-Arts, where he was awarded the Prix de Rome in 1873. His pictures, mainly historical subjects and portraits, are notable in color and composition. One of the best of them, "La bataille de Reichshofen" (1887), is in the Luxembourg.

MOROTOCO, mō′rȯ-tō′kȯ. One of a group of sedentary agricultural tribes residing about the Oxuquis River, on the border of the Chaco region, in Southeastern Bolivia. The entire group constitutes a distinct linguistic stock, the *Samucuan*. Their language is singularly musical. The Morotoco are remarkable in being apparently ruled by the women. The men do the household drudgery, although they are tall and robust, and daring hunters. The women refuse to have more than two children, strangling any born above that number.

MOR′PETH. A market-town and municipal borough in Northumberland, England, on the Wansbeck, 15 miles north of Newcastle (Map: England, E 1). The principal buildings are the parish church, the free grammar school of Edward VI., founded in 1552, and the town hall, erected by Sir John Vanbrugh. The town owns remunerative property, the markets, and provides a free water supply. It has flannel manufactures, iron foundries, collieries, and quarries. There are remains of a castle and gateway. Morpeth was a Saxon town of importance before the Conquest, and was granted corporate privileges by Charles II. Population, in 1891, 5200; in 1901, 6150.

MORPHEUS, môr′fūs (Lat., from Gk. μορφεύς, shaper, fashioner). In classic mythology, the son of Somnus (Sleep), because he shapes or molds the dreams that visit the sleeper. He is first mentioned by Ovid, and is represented as an old man with wings, pouring somniferous vapor out of a horn.

MORPHINE, or **MORPHIA** (from Lat. *Morpheus*, god of dreams), $C_{17}H_{19}NO_3 + H_2O_1$. The most important of the eighteen alkaloids existing in opium, of which it constitutes one-eighth to one-sixteenth by weight. It was first isolated in 1816 by Sertürner, a chemist of Hanover. It occurs in combination with meconic and sometimes sulphuric acid, as colorless, shining, prismatic crystals, odorless, and having a bitter taste. It is soluble in 1000 parts of cold and in 400 parts of boiling water; in 20 parts of cold and in 13 parts of boiling alcohol. It is less soluble in ether and chloroform. The following are the ordinary tests for morphine: Concentrated nitric acid when applied to morphine or its salts gives an orange color, changing to yellow; when it is mixed with iodic acid iodine is liberated, which may be recognized by the well-known starch test; a neutral solution of a morphine salt produces a blue color with a neutral solution of ferric chloride.

Morphine is the only opium alkaloid soluble in lime water, and this property affords one of the best means of extracting it. Morphine combines with acids to form crystallizable salts, which are readily soluble in water and alcohol. Of these the sulphate hydrochlorate (or muriate) and acetate are used in medicine. Apomorphine (q.v.), a powerful emetic, is prepared by heating morphine for some hours with an excess of hydrochloric acid.

The therapeutic uses of morphine and its salts are similar to those of opium (q.v.), but morphine acts more certainly and quickly and is more readily absorbed than opium, is more suitable for hypodermic use, and is less apt to constipate and cause gastric disturbances. The ordinary dose for an adult is from one-eighth to one-half a grain.

The habitual taking of morphine is not uncommon. Those addicted to this habit become dependent for a comfortable existence on the drug, and gradually increase the dose until enormous amounts are taken. Their wills become utterly destroyed and their moral sense, especially in regard to truth, lost. The bodily functions are depressed, digestion disordered, and the individual becomes pale, sallow, and emaciated. Finally there is obstinate sleeplessness, a violent diarrhœa, and cramps in the muscles. The habit can be effectually treated only in institutions where the patient can be kept under constant surveillance. See Opium.

MOR'PHOGEN'ESIS (Neo-Lat., from Gk. *μορφή*, *morphē*, form + *γένεσις*, *genesis*, origin, from *γίγνεσθαι*, *gignesthai*, to become). A term proposed by Haeckel, who divides morphology into the two coördinateed branches of anatomy and morphogenesis or morphogeny. Morphogenesis is the equivalent of embryology or developmental history. It takes into account the gradual development and building up of the form of the adult; i.e. the series of changes and the mode by which the body and its organs become shaped. Haeckel further subdivides morphogenesis into ontogeny (q.v.) and phylogeny (q.v.). Consult Haeckel, *Generelle Morphologie* (Berlin, 1866).

MORPHOL'OGY (from Gk. *μορφή*, *morphē*, form + -*λογία*, -*logia*, account, from *λέγειν*, *legein*, to say). In zoölogy, the science of form and structure of animals. It is based on comparative anatomy and embryology, and lays the foundation for physiology. We cannot well understand the structure or anatomy of the fully grown animal unless we have the history of the development of the organism as a whole, and of the separate organs. The morphologist, whose methods of study are based on observation and comparison, must not only be a comparative anatomist, but also an embryologist. He should not only be acquainted with the individual development (ontogeny, q.v.), but also that of the class or phylum to which the organism belongs (phylogeny, q.v.). Moreover, as the existing living beings are the descendants of long lines of ancestry, the morphologist should have at his command all the available facts as to the fossil relatives of existing forms. Though we owe the word 'morphology' to Goethe, it was first brought into its present extended use by the zoölogists J. Müller and Leuckart. But long before the middle of the last century the general morphology of organisms was in part discussed by Oken, Carus, Goethe, Geoffroy Saint Hilaire, Lamarck, Cuvier, Savigny, Owen, and Agassiz. For example, Goethe compared the flowering plant to an axis bearing modified or metamorphosed parts or leaves; Savigny discovered that the mouth-parts or appendages of the heads of insects were modified legs; and Carus, Audouin, and Strauss-Durckheim perceived that their head was composed of a number of segments. Goethe, and also Oken, discovered the segmental nature of the vertebrate skull, a problem still earnestly discussed by morphologists. That portion of the history of zoölogy called the Period of Morphology was signalized by the brilliant results in developmental work of Von Baer, Pander, J. Müller, Rathke, followed by the later researches of Schwann, Schleiden, Koelliker, Huxley, Vogt, Gegenbaur, Haeckel, and their followers. As the result we see numerous morphological problems either solved or in a fair way of solution. See Symmetry.

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MORPHOLOGY (in Plants). The study which treats of the origin and structure of plants and their organs. The aims of plant morphology are in all respects the same as those of animal morphology. (See Botany.) The best conception of the present condition of plant morphology may be obtained by reading the general articles on Bryophytes; Pteridophytes; Spermatophytes; Thallophytes; and the more special articles on Algæ; Angiosperms; Equisetum; Fern; Fungi; Gymnosperms; Hepaticæ; Lycopodiales; and Musci. A still more detailed account of plant structures may be obtained from the separate titles which deal with the prominent phenomena and organs, such as Alternation of Generations; Antheridium; Archegonium; Heterospory; Leaf; Root; Seed; Spore; Stem.

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MORPHOT'ROPISM (from Gk. *μορφή*, *morphē*, form + *τροπή*, *tropē*, a turning, from *τρέπειν*, *trepein*, to turn). The study of the exact rôle which each chemical constituent or each atomic (radical) group of a substance plays in modifying the form of its crystals. By comparing the crystal forms of a series of closely related substances, the part played by each constituent substance may be inferred, especially when the substitution methods of organic chemistry are applied to substances having very large chemical molecules. See Crystallography.

MOR'PHY, Paul Charles (1837-84). An American chess player, born in New Orleans, La. He was remarkably precocious, especially as a chess player, and before he was thirteen had defeated many well-known amateurs. He studied law for several years at the College of South Carolina, playing chess only occasionally. At the first American Chess Congress, which assembled in New York in 1857, Morphy defeated with ease the best players that could be brought to meet him. He visited Europe in 1858, and in England beat Löwenthal, Boden, and Bird, and performed the most astonishing feats in simultaneous games without the board. In Paris he won five out of eight games with Harrwitz, and continued his exhibitions of blindfold playing. After his return to the United States, in 1859, he won seven out of eleven games with the visiting German expert Anderssen. He was admitted to the bar, and began the practice of law in New Orleans. The strain occasioned by his blindfold contests, however, had been too great for his mental faculties, and, though he abandoned chess altogether, he was soon forced to relinquish all mental occupation, and died in retirement. During the comparatively short period of his activity Morphy displayed a skill that was inexplicable. He was at no time a close student of chess and he played without preparation and with little hesitation; but an analysis of his games reveals combinations remarkable for finesse, depth, elegance, and soundness. These qualities, combined with a wonderful memory, made him perhaps the most remarkable chess player in modern times. Consult Löwenthal, *Morphy's Games of Chess* (London, 1860).

MOR'RILL, Justin Smith (1810-98). An eminent American legislator and political leader. He was born in Strafford, Vt., received a common school education, became a clerk in a country store at the age of fifteen, and until 1855 was largely engaged in mercantile pursuits, though he devoted much of his time to private study. He entered the National House of Representatives in 1854, was five times reëlected, was transferred to the Senate in 1867, and retained his seat continuously until his death, having at that time served in Congress for a longer consecutive period than any other man in the history of the United States. During the latter part of his service in the House, he was the leading member of the Committee on Ways and Means, and chairman of the Sub-Committee on Tariff and Taxation, and in the Senate he was a member after 1867 and chairman for many years of the Committee on Finance, and was also at various times a member of the Committee on Public Buildings and Grounds, on Education and Labor, on the Census, and on Revolutionary Claims. He made many able speeches which attracted wide attention, and had much influence both in and out of Congress, but he will be remembered chiefly for his connection with two significant and important measures. In 1857 he introduced a bill for the establishment, through the aid of public land grants, of State colleges throughout the country primarily for the purpose of teaching agriculture and the mechanic arts, other subjects, however, not to be excluded. This bill was passed by both House and Senate, but was vetoed by President Buchanan. In 1861 it was again introduced by Morrill, was again passed, and this time became a law through the signature of President Lincoln. In 1890 Senator Morrill introduced a bill providing an additional grant for this purpose, which also was passed by both Houses and signed by the President. By virtue of these enactments there had been established by 1899, in the various States, sixty-four institutions giving instruction to 36,000 students. Morrill framed and introduced in the House the famous Morrill Tariff Act of 1861, which, with the enactments of 1862 and 1864, in the passage of which he also took a prominent part, modified the tariff system of the United States. (See Tariff.) Morrill was also conspicuous as an energetic opponent of Government paper money and especially of the Legal Tender Act of 1861-62, and of the annexation to the United States of outlying territory, such as San Domingo, Saint Thomas, Hawaii, Porto Rico, and the Philippines. He published *The Self-Consciousness of Noted Men* (Boston, 1886).

MORRILL, Lot Myrick (1813-83). An American legislator and Cabinet officer, born at Belgrade, Maine. He entered Waterville College (now Colby University) in 1833, but left before graduating to enter a law office at Readfield. In 1837 he was admitted to the bar, and for several years practiced in partnership with Timothy O. Howe. In 1841 he removed to Augusta, where he won wide distinction as a lawyer and public speaker. Although strongly opposed to the extension of slavery, he was in all other matters in perfect agreement with the Democratic Party, and became one of the leaders of the Maine Democracy. In 1853 and 1854 he was elected to the Lower House of the State Legislature, and in 1856 was elected to the State Senate. After Buchanan's nomination, disapproving of his party's platform, he resigned from the Democratic State Committee, and allied himself with the Republican Party. He was elected Governor of the State by that party in 1857, and was reëlected in 1858 and 1859. In 1861 he was chosen United States Senator to succeed Hannibal Hamlin (q.v.). Reëlected for a full term in 1863, he was defeated by a single vote in 1868 by Hamlin, but in the following year was elected to succeed William P. Fessenden. In 1876 he resigned to enter the Cabinet of President Grant as Secretary of the Treasury. This portfolio he held until after the inauguration of President Hayes, when he became Collector of Customs at Portland, Maine.

MOR'RILLTON. A city and the county-seat of Conway County, Ark., 50 miles northwest of Little Rock; on the Arkansas River, and on a branch of the Saint Louis, Iron Mountain and Southern Railroad (Map: Arkansas, C 2). It has a trade in cotton and live stock, and manufactures of cottonseed oil, woolens, machine shop products, lumber, furniture, etc. Population, in 1890, 1644; in 1900, 1707.

MOR'RIS. A city and the county-seat of Grundy County, Ill., 62 miles southwest of Chicago; on the Illinois River, the Illinois and Michigan Canal, and the Chicago, Rock Island and Pacific Railroad (Map: Illinois, D 2). It has Saint Angela's Academy, a Roman Catholic institution for women. The city is the centre of a considerable trade in grain and cattle, and there are mines of bituminous coal, and manufactories of oatmeal, hardware, paper car wheels, leather, bricks, and tile. The water-works are owned by the municipality. Morris was settled in 1834 and incorporated first in 1857. Population, in 1890, 3653; in 1900, 4273.

MORRIS. A village and the county-seat of Stevens County, Minn., 157 miles west by north of Saint Paul; on the Northern Pacific and the Great Northern railroads (Map: Minnesota, C 5). It is near the Pomme de Terre River, which furnishes good water power. It is in a fertile agricultural region, and has several grain elevators and flour mills. There is a public library. Population, in 1890, 1266; in 1900, 1934.

MORRIS, Alexander (1826-90). A Canadian statesman, born at Perth, Ontario. He studied in Scotland at Saint Andrew's and Glasgow University, graduated at McGill University, Montreal, and was called to the bar in 1851. In 1861 he was elected Conservative member from South Lanark, in 1869 was made Minister of Inland Revenue, and later was Chief Justice of the Court of Queen's Bench in Manitoba (1872-77). He was elected to the Ontario Legislature (1878) as member for East Toronto. He was a strong advocate of the confederation of the provinces, and the author of *Treaties of Canada with the Indians of the Northwest* (1880); *Nova Britannia* (1884); and *Canada and Her Resources* (1885).

MORRIS, Benjamin Wistar (1819—). An American clergyman. He was born at Wellsboro, Pa., graduated from the General Theological Seminary in 1846, receiving that year the ordination of deacon of the Protestant Episcopal Church, and the following year was ordained priest. He was stationed as rector at Sunbury, Manayunk, and Germantown, all in Pennsylvania. In 1868 he was consecrated Bishop of Oregon and Washington, his diocese subsequently being restricted to the former State. During his incumbency he has actively advanced the educational and philanthropical interests of his diocese, being instrumental in establishing Saint Helen's Hall, a boarding and day school for girls, the Bishop Scott Academy, and the Good Samaritan Hospital in Portland. He is the author of *Presbyterian, Baptist, and Methodist Testimony to Confirmation.*

MORRIS, Charles (1745-1838). An English song-writer of Welsh origin. He was reared by his mother, went to America in the 17th foot in 1764, and on his return to England he was for many years punch-maker and bard of the famous Beef Steak Club, a convivial society founded in 1735. He associated with the party of Fox, for which he wrote many political songs, as "Billy Pitt and the Farmer." Neglected by his Whig friends, he composed the lament, "The Old Whig Poet to His Buff Waistcoat." The French song-writer Béranger (q.v.) also wrote a charming ditty on an old coat of his, but quite unlike that by Morris. Morris met the Prince of Wales and was a frequent guest at Carlton House, where he was known as "The Sun of the Table." Among his best known pieces are: "The Town and the Country;" "A Reason Fair to Fill My Glass;" "The Triumph of Venus;" and "Ad Poculum." The Prince granted him an annuity of £200; and the Beef Steak Club gave him a villa near Dorking, where he passed his last years, living to be ninety-three. His songs were gathered under the title *Lyra Urbanica* (1840; 2d ed. 1844).

MORRIS, Charles (1784-1856). An American naval officer, born in Woodstock, Conn. He entered the United States Navy in 1799, took an active part in the war with Tripoli, and in the famous recapture of the *Philadelphia* (1804) in the harbor of Tripoli was the first of the boarders to reach the deck of that vessel. When the War of 1812 broke out he was executive officer of the *Constitution*, and in the engagement between that vessel and the *Guerrière* was wounded. He was given command of the frigate *John Adams*, and after a successful cruise was blockaded in the Penobscot River by an English fleet and forced to destroy his vessel to prevent her capture. He commanded the *Congress* in the war with Algiers, and in 1825 carried Lafayette back to France in the *Brandywine*. He was for years naval commissioner, for a considerable time supervisor of the Naval Academy at Annapolis, and at his death, in 1856, was chief of the Bureau of Ordnance and Hydrography. Consult his *Autobiography* (Annapolis, 1880).

MORRIS, Charles d'Urban (1827-86). An American classical philologist and educator, born in Charmouth, Dorset. His grandmother was Mary Philipse Morris (q.v.). He was educated at Worcester College, Oxford, and after three years as a scholar at Lincoln College, was a fellow of Oriel (1851-54). In 1853 he came to New York, was rector of Trinity School until 1856, and then founded the Mohegan School, near Peekskill. From the University of New York he went in 1876 to Johns Hopkins as collegiate professor of Latin and Greek. His publications, which are marked by many original pedagogical methods, are: *A Compendious Grammar of Attic Greek* (1869; 4th ed. 1876); a *Latin Grammar* (1870; 4th ed. 1876); and several Latin and Greek primers and readers.

MORRIS, Clara (1849?—). An American actress, especially noted for her success in the interpretation of 'emotional' rôles. She was born in Toronto, Canada (her real name being Morrison), but was reared in Cleveland, Ohio, where at the Academy of Music she became a member of the ballet and afterwards leading actress. Later she played in Cincinnati. She came to New York in 1870 as a member of Daly's company. In 1872 she made a sensation in *L'Article 47*. Conspicuous among her subsequent successes were those won in *Alixe* (1873), *Camille* (1874), and *Miss Multon* (Union Square Theatre, 1876), and she soon became well known as a star whose acting was distinguished for spontaneity and naturalness. She was married to F. C. Harriott in 1874. About 1885 she began to devote herself mainly to literary work, among her publications being: *Little Jim Crow, and Other Stories of Children* (1899); *A Silent Singer* (1899); *Life on the Stage: My Personal Experiences and Recollections* (1901); *A Pasteboard Crown* (1902); *Stage Confidences* (1902). Consult McKay and Wingate, *Famous American Actors of To-day* (New York, 1896); Matthews and Hutton, *Actors and Actresses of Great Britain and the United States* (ib., 1886).

MORRIS, Dinah. In George Eliot's *Adam Bede*, the character which really becomes the centre of interest for the novel. The book was suggested by, and the character partly drawn from, the author's aunt, who, like Dinah, was a Methodist evangelist; but the prominence which the character assumes is due to the criticism of Lewes. Sir Leslie Stephen calls it "not only an elaborate but a most skillful and loving portrait of a beautiful soul."

MORRIS, Edward Joy (1815-81). An American diplomat and translator, born in Philadelphia. He graduated at Harvard in 1836, and began the practice of the law in Philadelphia. He was a member of the Pennsylvania State Assembly in 1841-43, and in November, 1842, was elected as a Whig to the Twenty-eighth Congress, serving from 1843 to 1845. From 1850 to 1854 he was chargé d'affaires for the United

States at Naples. After his return he took a leading part in the movement for the organization of the Republican Party in Pennsylvania, and in 1856 was elected to Congress by that party, serving from 1857 to 1861. From 1861 to 1870 he was United States Minister to Turkey. He was a frequent contributor to American magazines for many years, and published *Notes of a Tour Through Turkey, Greece, Egypt, and Arabia Petræa to the Holy Land* (2 vols., 1842). He translated with copious notes and additions *The Turkish Empire, Social and Political* (1854), from the German of Alfred de Besse. He also translated Theodore Mügge's *Afraja, or Life and Love in Norway* (1854), and Ferdinand Gregorovius's *Corsica, Picturesque, Historical, and Social* (1856).

MORRIS, Edward Parmelee (1853—). An American Latinist. He was born at Auburn, N. Y., graduated at Yale in 1874, and afterwards studied at the universities of Leipzig and Jena. He was professor of Greek at Drury College (1879-84), professor of Latin, Williams College (1885-91), and in the latter year he was appointed to the same position in Yale University. He was editor of Plautus's *Mostellaria,* Plautus's *Pseudolus* (Boston, 1890), *Captives and Trinummus of Plautus* (Boston, 1898); also the author of various philological monographs and reviews.

MORRIS, George Pope (1802-64). An American journalist and poet, born in Philadelphia. He founded with Samuel Woodworth (q.v.) in New York *The Mirror* (1823-42), a literary weekly, which became *The New Mirror,* and *The Evening Mirror.* In these journals appeared much early work of Bryant, Halleck, Poe, Paulding, Willis, Hoffman, and others, making these periodicals important elements in the literary development of the time. Morris also founded *The National Press* (1845), out of which was developed *The Home Journal* (1846), in which Willis, who had long been associated with Morris, again collaborated. His drama *Briarcliff* (1825) was a popular success. His *Poems,* collected for the last time in 1860, contained the familiar ballads, "Woodman, Spare That Tree" (founded on a real incident), "My Mother's Bible," "We Were Boys Together," and "A Long Time Ago." He also published a number of prose sketches and was prominent in the New York militia. Morris died in New York, July 6, 1864.

MORRIS, George Sylvester (1840-89). An American educator and philosophical writer, born at Norwich, Vt. He graduated in 1861 at Dartmouth, served in the Federal Army during the first two years of the Civil War, and was a tutor at Dartmouth in 1863-64. After spending several years abroad in the study of philosophy and theology, he was appointed, in 1870, professor of modern languages and literature in the University of Michigan, and in 1881 professor of logic, ethics, and the history of philosophy there. From 1878 to 1885 he also lectured on ethics and the history of philosophy at Johns Hopkins University. He translated Ueberweg's *History of Philosophy* (1871); edited Gregg's *Philosophical Classics;* and wrote Kant's *Critique of Pure Reason: A Critical Exposition* (1882); *Philosophy and Christianity* (1883); and *Hegel's Philosophy of the State and of History* (1887).

MORRIS, George Upham (1830-75). An American naval officer, born in Massachusetts. He entered the navy in 1846, was commissioned lieutenant in 1855, and still held that rank when Commander William Radford's absence on March 8, 1862, left him the senior officer on the *Cumberland* during its battle with the Confederate ram *Merrimac.* Lieutenant Morris's gallantry in fighting his ship until she sank with her flags still flying aroused the greatest enthusiasm in the North, and earned his promotion to the grade of lieutenant-commander, July 16, 1862, a rank which he held until 1866, when he was commissioned commander.

MORRIS, Gouverneur (1752-1816). An American statesman and diplomat. He was born at Morrisania, N. Y., January 31, 1752, and graduated at King's (now Columbia) College in 1768. He studied law and was admitted to the bar in 1771. In 1775 he was chosen to represent Westchester County in the first Provincial Congress of New York, and took a prominent part in the advocacy of the American cause. He served in two succeeding Congresses in the same and the following year. He was one of the recognized leaders of the Congresses; served on nearly all the important committees, among them the committee that drafted the Constitution of the State of New York; and with Jay and Livingston had much to do with framing the plan of government for the State. In 1777, when only twenty-five years of age, he was elected to the Continental Congress, in which he served until 1780. Immediately upon taking his seat he was appointed on a committee to investigate the condition of the army at Valley Forge, and afterwards devoted his energies to securing the adoption by Congress of Washington's plans for the organization and pay of the army. His ability won for him the chairmanship of the committee to confer with the British commissioners on reconciliation who arrived in 1778. As chairman of the committee to publish an address to the people of the colonies on the existing condition of affairs, he drew up a masterly account of the causes of the war, the efforts that had been made to achieve independence, and the transactions with the British commissioners. The address was entitled *Observations on the American Revolution.* In 1779 he was chairman of three other important committees and performed the whole duties of each. During his career in Congress Morris drew up several reports and papers on finance which showed evidence of marked ability. His services were recognized by his appointment as assistant superintendent of finance in 1781, a position which he held with great credit until 1785. It was in this capacity that he drew up a scheme for a system of coinage which, though not adopted at the time, ultimately became the basis of our present system. He represented Pennsylvania in the Constitutional Convention of 1787 at Philadelphia; took a leading part in the debates of that body, and the published proceedings showed that he made more speeches than any other member, always championing a strong national government. He urged the proportional representation of the States in the Senate, and favored a freehold suffrage, a good behavior tenure for the executive, and representation in Congress apportioned according to the number of free inhabitants. In 1789 Morris went to France on private business, and was in Paris at the outbreak of the French Revolution. He kept a diary during his stay, and wrote letters which threw much light on the character of the events which he witnessed. In 1790 he went to London as private agent to the British Government to conduct negotiations regarding the unfulfilled stipulations of the treaty of 1783. His mission was not successful, and he again returned to the Continent. In 1792, while still in Europe, he was appointed Minister to France, and served in that capacity during the stormy scenes of the two ensuing years. In 1794 the French Government requested and obtained his recall. He remained in Europe until 1798. In 1800 he was elected from New York to the United States Senate, where he acted with the Federalists. After his retirement from the Senate in 1803 he took great interest in the Erie Canal project, and served as chairman of the Canal Commission from 1810 to the time of his death, which occurred November 6, 1816. His biography has been written for the "American Statesmen Series" by Theodore Roosevelt (Boston, 1900). An elaborate biography was prepared by Jared Sparks (3 vols., Boston, 1832). Morris's diary and letters have been published in two volumes (New York, 1888).

MORRIS, Henry W. (1806-63). An American naval officer. He was born in New York City, entered the United States Navy in 1819, and became a captain in 1856. For some time after the outbreak of the Civil War he was in Washington superintending the construction of the *Pensacola*, which vessel, when completed in January, 1862, he took safely by the Confederate batteries on the Potomac. He then joined the Federal blockading squadron in the Gulf of Mexico, distinguishing himself in the attacks upon Forts Jackson and Saint Philip, and after the capture of New Orleans was in command for a short time of the squadron stationed there. He was made commander in July, 1862. His health giving way, he went to New York, where soon afterwards he died.

MORRIS, John Gottlieb (1803-95). An American clergyman, born at York, Pa. He graduated at Dickinson College in 1823, then studied theology at Princeton and at Gettysburg Seminary, and in 1827 was licensed as a preacher. In the same year he went to Baltimore, where he founded the Trinity English Lutheran Church, of which he continued to be pastor until 1860, when he became librarian of the Peabody Institute. In 1864 he became pastor of the Third English Lutheran Church, and in 1874 accepted a call to Lutherville, Md., where he was actively interested in the founding of the College for Women. He held a number of academic positions, founded the Lutheran Historical Society, presided over the General Synod in 1843 and in 1883, contributed frequently to scientific and religious journals, edited the *Lutheran Observer* (1823-34), and wrote a number of books, among which may be mentioned *Life of John Arndt* (1853); *Life of Catherine de Bora* (1856); *Quaint Sayings and Doings Concerning Luther* (1859); *and Fifty Years in the Lutheran Ministry* (1878).

MORRIS, John Thomas (1826—). An English Jesuit. He was born at Ootacamand, Madras, India; entered Trinity College, Cambridge, where he became a Roman Catholic; completed his education in the English college at Rome, and was ordained to the priesthood. After passing three years in the diocese of Northampton he returned to Rome and became vice-rector of the English college. At the end of three years he went back to England, where he was appointed canon residentiary of the London Chapter. He also acted as private secretary to Cardinal Wiseman and his successor, Cardinal Manning. In 1867 he became a member of the Society of Jesus. He was for a time rector of a Jesuit college in Malta, professor of canon law and Church history in Saint Bruno's College near Saint Asaph, and from 1879 rector and master of novices at Roehampton. He published a *Life of Saint Thomas of Canterbury* (1860; 2d ed. 1885); *Condition of Catholics Under James I.* (1871); *The Troubles of Our Catholic Forefathers* (1875); *The Letter-books of Sir Amias Paulet* (1874); and *Cardinal Wiseman's Last Illness* (1871).

MORRIS, Lewis (1671-1746). An American colonial Governor. He was born on Manhattan Island, the son of Richard Morris, an officer of Cromwell's army, who had emigrated to the West Indies after the Restoration and a few years later purchased a tract of 3000 acres of land on the west side of Manhattan Island, in the region later named Morrisania, after his family. Lewis Morris was well educated by private tutors, studied law, and after several years' practice was appointed a judge of the Superior Court in East Jersey. After the union of East and West Jersey and the establishment of New Jersey as a royal colony, he continued to take a prominent part in its affairs, serving for many years in both the Colonial Council and the Assembly. He served for a time as Chief Justice of both New Jersey and New York, was appointed Acting Governor of New Jersey in 1731, and from 1738 until his death was Governor of the colony.

MORRIS, Lewis (1726-98). An American patriot during the Revolutionary War, and one of the signers of the Declaration of Independence. He was born at Morrisania, N. Y., graduated at Yale in 1746, and as early as 1767 became conspicuous as an opponent of the restrictive measures of the British Ministry. He was elected to the Continental Congress in 1775, and at the close of the session was sent to Pittsburg to secure, if possible, the adherence of the Indians. In 1776 he again sat in Congress, and was one of the signers of the Declaration of Independence. Giving up his seat in 1776 in favor of his half-brother, Gouverneur Morris (q.v.), he returned to his estate, and subsequently served as a member of the New York Legislature and as major-general of the State militia.

MORRIS, Sir Lewis (1833—). An English poet, born at Carmarthen, Wales, in June, 1833. After graduating from Jesus College, Oxford (B.A. 1855, M.A. 1858), he studied law and was called to the bar at Lincoln's Inn (1861). He practiced as a conveyancer till 1880. He has taken an active part in higher education in Wales, serving on the governing boards of three Welsh colleges. On several occasions he has stood for Parliament in the Liberal interest, but without success. In 1895 he was knighted. His verse comprises *Songs of Two Worlds* (3 vols., 1871-74-75); the *Epic of Hades* (3 books, 1876-77); *Gwen: A Drama in Monologue* (1879); the *Ode of Life* (1880); *Songs Unsung* (1883); *Gycia: A Drama* (1886); *Songs of Britain* (1887); *A Vision of Saints* (1890); *Songs Without Notes* (1894); *Idylls and Lyrics* (1896); and *Harvest-Tide* (1901). To the critic, Morris writes slight and easy verse on pretentious themes. But he has been exceedingly popular.

MORRIS, Mary (Philipse). (1730-1825). One of the celebrated Philipse family, born in the Philipse manor house on the Hudson. She possessed much personal beauty, and, according to tradition, she received an offer of marriage from Washington, whom she met in 1756 while visiting her brother-in-law Beverly Robinson (q.v.) in New York. Two years later she married Captain Roger Morris, an English officer, and lived for many years in an elegant mansion—now known as the Jumel mansion—on the outskirts of New York. When the Revolution broke out, she remained loyal to the Crown, and as a result she was attainted of treason and her property was confiscated. Her mansion was subsequently used by General Washington as his headquarters. In 1809 her children sold their reversionary rights in the confiscated property to John Jacob Astor for $100,000. In recognition of her loyalty, the English Government made her a grant of $85,000.

MORRIS, Michael, Baron of Killanin (1827-1901). An Irish jurist. He was born in Galway; studied at Trinity College, Dublin; and was called to the bar. His great popularity made his advance in politics very rapid. He was elected to Parliament in 1865 as a Conservative; was named Solicitor-General of Ireland in 1866, a puisne judge in the following year, and after the abolition of his post of Chief Justice of Common Pleas, Lord Chief Justice. In 1900 he retired from the bench, and the same year was made an hereditary baron.

MORRIS, Richard (1833-94). An English philologist. He was born in London, was educated at Saint John's College, Battersea, in 1869 became lecturer on the English language and literature in King's College School, and in 1871 took holy orders. Four years later he was made headmaster of the Royal Masonic Institution for Boys. He edited a number of publications for the Early English Text Society, the Chaucer Society, and the Philological Society; and in 1874 was elected president of the latter. Besides his editions of early English works, he published: *The Etymology of Local Names* (1857); *Specimens of Early English* (1867); *Historical Outlines of English Accidence* (1872); *Elementary Lessons in Historical English Grammar* (1874); *Primer of English Grammar* (1875).

MORRIS, Robert (1734-1806). An eminent American financier and one of the signers of the Declaration of Independence. He was born at Liverpool, England, January 31, 1734. At the age of fourteen he was sent to America and placed in the counting house of Charles Willing, a rich Philadelphia merchant, whose partner he became in 1754, continuing as such until 1793. The firm of Willing & Morris became one of the leading mercantile establishments in America, and by the outbreak of the Revolutionary War Morris had already acquired a large fortune. Although naturally averse to a rupture with Great Britain, he sacrificed his personal interests, signed the non-importation agreement of 1765, and served as a member of the citizens' committee that compelled the stamp distributer for Philadelphia practically to relinquish his office. In June, 1775, he became a member of the Pennsylvania Committee of Safety; in October of the same year he was elected to a seat in the Legislature of Pennsylvania (to which he was reëlected in 1776), and in November he was appointed by that body a delegate to the Continental Congress. All three of these offices were held by him at the same time. As a member of Congress he served on several important committees and signed the Declaration of Independence, although he had opposed Lee's resolution of June 7th and absented himself from the Congressional hall on July 4th, when the final vote was taken. At the expiration of his term in Congress, in 1778, he was elected again to the State Legislature, but on account of miscellaneous charges against him in connection with his mercantile operations, he failed of reëlection in the following year. In October, 1780, however, he was returned to the Legislature for the fourth time. It was at this time that the fortunes of the Colonial Army reached their lowest ebb. Charleston had fallen; Gates had been defeated by Cornwallis; Arnold's treachery cast gloom on the country. Munitions and supplies were sadly wanting, and Continental currency had depreciated until it was worth but little more than the paper on which it was printed. In this almost desperate situation, Congress resolved to supersede the old treasury board by a superintendent of finance. Morris was chosen to the position February 20, 1781, at a salary of $6000 a year, and was given large powers over the finances of the Confederation. His chief programme was to relieve the situation by import duties, loans and subsidies from France, and to inaugurate a policy of retrenchment. He was unable, however, to carry out the first part of his scheme on account of the refusal of the States to confer the necessary power upon Congress for the laying of import duties. On several occasions he succeeded in borrowing large sums on his personal credit, without which some of the important campaigns of the war would have been impossible. Thus the means which enabled Washington and Greene to carry out the campaign of 1781 were raised mainly by his exertions. In 1781, with the approval of Congress, he founded the Bank of North America, and became a large stockholder in it. This institution became of great service to the American cause and was, to a certain extent, under the control of Morris. He continued to hold the difficult and vexatious office of Superintendent of Finance until November, 1784, when he resigned it with a sense of relief. In the same year the Pennsylvania Legislature had annulled the charter of the bank, and in order to obtain its reëstablishment Morris secured an election to the Legislature in 1785 and succeeded in having the charter renewed in 1786. In the latter year he was again elected to the Legislature, and in 1787 became a member of the Constitutional Convention at Philadelphia. He had the honor to nominate Washington for the Presidency of the Convention, but did not take a prominent part in the proceedings of that body. Upon the organization of the new Government, President Washington offered him the position of Secretary of the Treasury. He declined the offer and recommended Alexander Hamilton, who was appointed. At the same time, however, he accepted a seat in the United States Senate, where he served without special distinction until 1795. Unfortunate business speculations proved disastrous, and on February 16, 1798, he entered a debtor's prison in Philadelphia, where he was confined until August 26, 1801. He died May 8, 1806. A short biography of Robert Morris has been written by W. G. Sumner (New York, 1892). A more comprehensive work by the same author is *The Financier and the Finances of the American Revolution* (New York, 1891). Consult also Bolles, *The Financial Administration of Robert Morris* (1878).

MORRIS, Thomas (1776-1844). An American anti-slavery leader, born in Augusta County, Va. His father removed to Ohio in 1795. While working on a farm in Clermont County, he studied law, and was admitted to the bar in 1804. From 1806 to 1830 he was a member of the Ohio State Legislature. In 1832 he was elected to the United States Senate, as a Democrat. He very soon took ground on the slavery question, however, in radical opposition to that held by the majority of his party. He willingly presented anti-slavery petitions, and ardently defended the right of petition in the Senate. He also spoke strongly against Texan annexation. In 1838, when Calhoun introduced a series of resolutions touching the constitutional status of slavery, Morris introduced a set of alternative resolutions embodying a rational and explicit statement of the views of the anti-slavery men. On the expiration of his term as Senator his constituents, to whom his views on the slavery question had been displeasing in the extreme, discarded him for Benjamin Tappan. In January, 1840, at the Democratic State convention, he was read out of the party, and later in the year associated himself politically with the new Liberty Party (q.v.) movement. In May, 1841, he was nominated for Vice-President on the Liberty Party ticket, on which James G. Birney (q.v.) had been named for President. These nominations, which were for the campaign of 1844, were confirmed at the Buffalo convention of the party in 1843. Consult: Smith, *The Liberty and Free-Soil Parties in the Northwest* (New York, 1897); and B. F. Morris, *Life of Thomas Morris* (Cincinnati, 1856).

MORRIS, William (1834-96). An English poet, artist, and socialist, born at Walthamstow, near London, March 24, 1834. Morris's early boyhood was spent in the romantic region near Epping Forest, where he showed at the outset his love for nature. He was educated at Marlborough School and at Exeter College, Oxford. Here he mingled little in the college life, but he read swiftly and widely, thus quickly storing in his strong memory a stock of knowledge which he put to use. In 1854 distress of religion almost cast him upon the wave of Catholic feeling, but the impulse passed. He mastered Church history and Anglican theology, but he soon left them in a new enthusiasm for Carlyle, Ruskin, and Kingsley. In 1854 Morris visited France, whither he went again in 1855 with his friend Edward Burne-Jones (q.v.). On this tour he fell so wholly under the spell of French Gothic that he gave up his earlier purpose of founding a religious brotherhood and became an architect. After trying his hand at architecture and painting, he found his true calling in 1861, when with Rossetti, Burne-Jones, and other friends, he established a firm in London for designing and manufacturing artistic furniture and household decorations. As time went on, Morris took up the manufacture of tapestry and other textiles, dyeing, book-illumination, and printing. The old firm of decorative art was dissolved in 1871; and in 1881 Morris transferred his works to Merton in Surrey. In 1890 he founded the famous Kelmscott Press at Hammersmith. For the practical advancement of the lesser arts, and of the rare doctrine that all things should be made beautiful, Morris did more than any other man of his time. At Oxford, Morris showed his literary talent in several contributions in verse and prose to the *Oxford and Cambridge Magazine*, which he maintained (1856). Two years later he published the *Defence of Guenevere, and Other Poems*. This volume, pre-Chaucerian in tone, marks a date in later Romanticism; and never again did Morris equal it in force and concentration. Afterwards, Morris turned for his subjects to Greek, Old French, Norse, and other mediæval stories, which he clothed in verse with great facility. By the *Life and Death of Jason* (1867) and *The Earthly Paradise* (1868-70), he proved himself one of the best story-tellers since Chaucer, his avowed master. In the summer of 1871 he made a trip through Iceland. In 1876 appeared *Sigurd the Volsung and the Fall of the Niblungs*, a narrative poem approaching the dignity of an epic. Morris wrote many romances in prose or in prose and verse combined; among which are the *House of the Wolfings* (1888), *The Roots of the Mountains* (1890), *The Well at the World's End* (1896), and, best of all, the *Story of the Glittering Plain* (1891). In the same year he published a semi-utopian romance, *News from Nowhere*, in which he sought to popularize his socialistic ideals. As a translator, he succeeded capitally in his renderings from the *Sagas*. In 1885 he became an active socialist, delivering lectures to workmen and contributing to the *Commonweal*, the organ of the Socialistic League. He died October 3, 1896, leaving to the world an immortal example of the man who devotes his wealth and his genius to the bettering of visible things and to the spread of manly ideals. A collection of various papers, entitled *Architecture, Industry, and Wealth*, was not published till 1903. Consult: Vallance, *William Morris, His Art*, etc. (containing a bibliography, London, 1897); Mackail, *The Life of William Morris* (London and New York, 1899); Cary, *William Morris, Poet, Craftsman, and Socialist* (New York, 1902); Riegel, "Die Quellen von William Morris's Dichtung, The Earthly Paradise," in *Erlanger Beiträge zur englischen Philologie* (Leipzig, 1890); and see Pre-Raphaelites.

MOR'RISBURG. A port of entry of Dundas County, Ontario, Canada, on the left bank of the Saint Lawrence River, opposite Waddington, N. Y., 43 miles southeast of Ottawa (Map: Ontario, H 3). It is on the Grand Trunk Railway at the entrance to the Rapide du Plat Canal. It has a shipping trade and is the seat of a United

States consul. Population, in 1891, 1859; in 1901, 1693.

MORRIS DANCE (from OF. *morisque, moresque*, Fr. *moresque*, from Sp. *morisco*, Moorish, from *moro*, Moor, from ML. *Morus*, Lat. *Maurus*, Gk. Μαῦρος, Moor). An obsolete English dance of Moorish origin. It seems to have been introduced into England about the time of Edward III., but it did not become universally popular until the time of Henry VII. During the succeeding reign it reached its highest development. When danced in connection with May Day it was an elaborate costume dance, and the characters of Robin Hood, Friar Tuck, Maid Marian, Little John, a dragon, and hobby-horse were introduced. The costumes of the performers were generally decorated with scores of small bells which were tuned in musical intervals. There were several variations of the Morris Dance, the two most notable being a sword dance, where the performers leaped over swords, and a ribbon dance, in which the girls danced back and forth between colored streamers. At the Restoration the Morris Dance was revived for a time, but soon died out. There is at present in Yorkshire a country dance called the Morris, but the time ($\frac{4}{4}$) is the only feature which it has in common with its prototype.

MORRIS ISLAND. An island at the southern entrance to the harbor of Charleston, S. C. Three small batteries on Cumming's Point, at the northern end, took part in the bombardment of Fort Sumter on April 12-13, 1861. Later the works were strengthened and called Battery Gregg, and Battery Wagner was constructed to the south. In the spring of 1863 Admiral Du Pont and General Hunter made unsuccessful attempts to reduce these defenses. When these officers were succeeded by Admiral Dahlgren and General Gilmore, early in July, a landing was effected on the southern part of the island, but on the 11th and 18th desperate assaults failed. A regular siege was established and five parallels were constructed. The guns of Fort Sumter, which were trained to protect the island, were silenced by the Federal fleet, and on September 7th General Beauregard ordered the evacuation of the island. Later Battery Gregg was remounted by the Federal forces and did much damage to the city.

MOR′RISON. A city and the county-seat of Whiteside County, Ill., 124 miles west of Chicago; on the Chicago and Northwestern Railroad (Map: Illinois, B 2). It is surrounded by a section interested largely in farming, stock-raising, and dairying, and manufactures refrigerators and school furniture, flour, carriages, and wagons. It has a public museum and library. Population, in 1890, 2088; in 1900, 2308.

MORRISON, Arthur (1863—). An English novelist, widely known for the remorseless realism with which he depicts London life. His publications comprise: *Tales of Mean Streets* (1894); *Martin Hewitt, Investigator* (1894); *Chronicles of Martin Hewitt* (1895); *Adventures of Martin Hewitt* (1896); *A Child of the Jago* (1896); *The Dorrington Deed-Box* (1897); *To London Town* (1899); *Cunning Murrell* (1900), the scene of which is laid in Essex; and *The Hole in the Wall*, a story of Wapping (1902).

MORRISON, James Dow (1844—). An American Episcopal bishop, born of Scottish parents in Waddington, N. Y. He received his early education in Canada, graduated from McGill University, Montreal, in 1865, and three years afterwards was ordained a deacon in Quebec. Becoming a priest in 1870, he took a charge in Canada, but the following year was called to Herkimer, N. Y., and thence to Ogdensburg in 1875, where he was archdeacon from 1881 until 1897, when he was consecrated first Protestant Episcopal Missionary Bishop of Duluth. In 1898 he was appointed Paddock lecturer by the General Theological Seminary of New York.

MORRISON, Robert (1782-1834). The first Protestant missionary to China, born at Buller's Green, Morpeth, England. Three years later his father removed to Newcastle. He learned the trade of boot-tree maker after leaving school. In 1797 he was converted, joined the Presbyterian Church, and began to improve himself by study. In 1803 he was admitted to Hoxton Independent Academy, and in the following year entered the Mission College of Gosport. The London Missionary Society decided in 1807 to begin mission work in China, and Morrison, having been ordained, was sent out as the first missionary. Under the protection of some merchants from the United States settled at Canton, he assumed Chinese dress and began the study of Chinese. In 1809 he was appointed translator to the East India Company's factory here, and while in this position he prepared a *Grammar of the Chinese Language*, published in 1815. Between 1815 and 1823 appeared the six thick quarto volumes of his *Dictionary of the Chinese Language*, a work of great learning, but now superseded. He also produced several vocabularies of Canton-English and English-Canton. His *New Testament* in Chinese was published in 1815, and the *Old Testament* appeared in 1818. In that year he founded the Anglo-Chinese College at Malacca. He removed to Hong Kong in 1845. He died in Canton. Consult: the *Memoir* by his widow (2 vols., London, 1839); and Townsend, *Robert Morrison* (New York and Chicago, 1888).

MORRISON, William (c.1783-1866). A Canadian explorer and fur trader, born at Montreal. He began trapping and trading for Sir Alexander MacKenzie & Co. at Fond du Lac in 1802, and joined the Northwest Company in 1805. After John Jacob Astor gained control in 1818 of the business in the United States, Morrison worked for him until 1826. Morrison claimed to have explored during the winter of 1803-04 Lac La Biche, or Elk Lake, which was long afterwards (1832) identified as the source of the Mississippi by Schoolcraft (q.v.) and renamed Itasca. He was probably naturalized as an American citizen, but spent the last years of his life in Canada. Consult *Minnesota Historical Society Collections* (vol. i., Saint Paul, 1872; vol. vii., Minneapolis, 1893; vol. viii., Saint Paul, 1898).

MORRISON, William Ralls (1825—). An American politician and Congressman, born in Monroe County, Ill. He was educated at McKendree College, but left before graduation to enlist as a private in an Illinois volunteer regiment for the Mexican War, and participated in most of the battles of Taylor's campaign. After his return he studied law, was admitted to the bar, and from 1855 to 1859 was a Democratic member of the Lower House of the Illinois Legislature, serving as Speaker in the last year. At the outbreak of the Civil War he organized and became colonel of the Forty-ninth Illinois Infantry, serving in that capacity until December, 1863, when he resigned to take his seat as a Democrat in the Thirty-eighth Congress, to which he had been elected while at the front in the preceding year. He practiced law from 1865 until 1873, and from that year until 1887 was again a member of the National House of Representatives. During his Congressional career he attained wide distinction as an advocate of a radical reduction in the tariff, but was never able to secure the support of enough members of his own party to assure the passage of bills which as chairman of the Ways and Means Committee he introduced in 1876, 1884, and 1886. The bill of 1884, embodying the famous 'horizontal' tariff scheme, which proposed a straight (or horizontal) reduction of 20 per cent. from the tariff of 1883, was defeated by a slender majority obtained through the opposition of the protectionist Democrats under the lead of Samuel J. Randall. In 1885 Morrison was defeated for election to the United States Senate by John A. Logan by one vote, and in the following year failed of reëlection to the House. He was appointed by President Cleveland a member of the Interstate Commerce Commission in 1887, and served until 1897, for the last six years as chairman.

MOR'RISTOWN. A town and the county-seat of Morris County, N. J., 18 miles west of Newark; on the Lackawanna, the Rockaway Valley, and the Whippany River railroads (Map: New Jersey, C 2). Among the features of the town are Memorial and All Souls' hospitals, the Young Men's Christian Association and Young Men's Catholic Association buildings, a public park with a Soldiers' Monument, and a large public library and lyceum, occupying a handsome edifice. Here is the site of Fort Nonsense, erected by Washington and marked by a memorial monument. Four miles from the town, at Morris Plains, is the State Hospital for the Insane, which cost nearly $3,000,000, has accommodations for 1500 patients, and at the time of its completion was the largest institution of its character in the United States. Morristown is in the rose and peach belt of the country, on a tableland surrounded by hills, rising nearly 700 feet above sea level, and is in a great measure a wealthy residential place with large villas. No effort has been made to foster manufacturing, but the trade of the town with the surrounding country is active. Its comparatively dry and bracing winter climate attracts invalids. The government, as provided under the original charter of incorporation, is vested in a mayor and a municipal council, of which the executive is a member. The school commissioners are chosen by popular vote. Population, in 1890, 8150; in 1900, 11,267.

Settled about 1710, Morristown was known as West Hanover until in 1740 it received its present name in honor of Lewis Morris, then Governor of New Jersey. During the Revolution Washington made his headquarters here from January to May, 1777, and again from December, 1779, to June, 1780, occupying during the latter period the old Ford mansion, which now belongs to the Washington Association, and in which numerous Revolutionary relics are exhibited. At the old Speedwell Iron Works here the shaft of the *Savannah,* the first steamboat to cross the Atlantic, was cast, and here, from 1837 to 1843, Professor Morse and Alfred Vail perfected the electric telegraph. Morristown was incorporated in 1865. Consult: Colles, *Authors and Writers Associated with Morristown,* etc. (Morristown, 1893); Tuttle, *History of Morristown.*

MORRISTOWN. A city and the county-seat of Hamblen County, Tenn., 42 miles northeast of Knoxville; on the Morristown and Cumberland Gap and the Southern railroads (Map: Tennessee, H 4). It is the seat of the Morristown Normal College, a Methodist Episcopal institution for negroes. Morristown is the commercial centre of a rich agricultural section, and is an important stock market. The manufactures include flour, tobacco, stoves, wagons, leather, brooms, agricultural implements, and sash and blinds, and there are quarries of variegated marble and zinc, lead, and iron mines in the vicinity. Population, in 1890, 1999; in 1900, 2973.

MORS. The largest island in the Limfjord, in the northwestern part of Jutland, Denmark (Map: Denmark, B 2). Its area is 139 square miles. It is in marked contrast with the surrounding mainland, being much more fertile, and having a somewhat elevated (250 feet) interior, with steep coasts. Population, in 1901, 22,237. The chief town is Nykjöbing.

MORSE (probably from Icel. *mar,* sea + *ros,* horse, cf. Norweg. *rosmar,* walrus; less plausibly from Russ. *moryŭ, morzhŭ,* morse, from *more,* sea). An old name for the Atlantic walrus (q.v.).

MORSE, Edward Sylvester (1838—). An American naturalist and archæologist, born at Portland, Maine. He was educated at Bethel Academy, Maine, and at the Lawrence Scientific School, Cambridge. He was professor of comparative anatomy and zoölogy at Bowdoin College from 1871 to 1874, and at the Imperial University, Tokio, Japan, from 1877 to 1880. In 1881 he was appointed director of the Peabody Academy of Sciences, of which he was a founder. He also became known as a popular lecturer on natural history and Oriental travel. Morse established a reputation early as a zoölogist by the following studies of brachiopods, which proved them not to be mollusks: *Early Stages of Terebratulina* (1870); *Embryology of Terebratulina* (1872); *Systematic Position of Brachiopods* (1873). He also wrote *Ascending Process of the Astragalus in Birds* (1880). While in Japan Morse interested himself greatly in the art, antiquities, social customs, and folk-lore of the people, and he made extensive collections of pottery and investigated its prehistoric archæology. Some of the results were published in the books: *Japanese Homes and Their Surroundings* (1886); *On the Older Forms of Terra-Cotta Roofing Tiles* (1892); and other pamphlets and papers, which are regarded as highly important by specialists. His unique collection of Japanese pottery and objects of art was bought by the Museum of Fine Arts in Boston, where it is installed separately as the 'Morse Collection,' of which Professor Morse was made curator. An illustrated *Catalogue* of it, prepared by Morse, was published by the museum in 1901; it is regarded by critics as "a masterpiece of hard work and intelligence," and a fine example of beautiful book-making. Morse has also had charge for many years of the Museum of the Peabody Academy of Sciences at Salem, Mass.

MORSE, John Torrey (1840—). An American biographer. He graduated at Harvard College in 1860, lectured there on history (1876-79), was co-editor with Henry Cabot Lodge of the *International Review*, and practiced law in Boston. His work is to be found in various reviews. His books include: a *Treatise on the Law Relating to Banks and Banking* (1870); *Law of Arbitration and Award* (1872); *Famous Trials* (1874); a *Life of Alexander Hamilton* (1876); *Life and Letters of Oliver Wendell Holmes* (1896), and in "The American Statesmen Series," edited by him, the lives of *John Quincy Adams* (1883), *Thomas Jefferson* (1883), *John Adams* (1884), *Benjamin Franklin* (1889), and *Abraham Lincoln* (1893).

MORSE, Samuel Finley Breese, LL.D. (1791-1872). An American artist and inventor. He was born at Charlestown, Mass., and graduated at Yale College in 1810, later visiting England with the American painter Washington Allston, where he studied painting with him and Benjamin West. In 1813 he received the gold medal of the Adelphi Society of Arts for his first effort in sculpture, the "Dying Hercules." Returning to New York in 1815, he became in 1826 the first president of the National Academy of Design, and was appointed in 1835 professor of the arts of design in the University of the City of New York. He did not give his entire attention to art, but was interested in chemistry and especially in electrical and galvanic experiments; his interest doubtless being awakened in the subject of electro-magnetism through conversation with Prof. J. Freeman Dana, who lectured in New York on that subject in 1826-27, and exhibited an electro-magnet. Morse first conceived the idea of the telegraph while on board the packet-ship *Sully* on his way from Europe to America in 1832, while discussing the then recent discovery in France of a method for obtaining the electric spark from the magnet. Before the close of that year a portion of the apparatus which he had devised had been constructed in New York, but it was not until three years later that, in a room in the New York University building, he showed the telegraph operating with half a mile of wire. In September, 1837, he made a public exhibition of his discovery, and in that year filed his caveat at Washington. No result followed his appeal to Congress for aid during that session, and Professor Morse visited Europe with the hope of enlisting the interests of foreign governments in his invention. In this attempt he was unsuccessful, and he returned to New York, where, as well as in Washington, he struggled under serious privations during the four years which elapsed before he obtained (1843) Congressional aid. In that year, after he had almost yielded to despair, Congress at midnight, in the last moments of the session, appropriated $30,000 for an experimental line between Washington and Baltimore. After this aid had been granted, Morse succeeded after many difficulties in establishing a working telegraph line, and the first message, "What hath God wrought?" was sent from the rooms of the United States Supreme Court in the Capitol at Washington to Baltimore on May 24, 1844. From this time the telegraph was an assured success, but Professor Morse was frequently involved in litigation to maintain his rights under his patents. He also was engaged in numerous controversies. But the number and character of the honors heaped upon Professor Morse on account of his invaluable invention have probably never been equaled in the case of any other American. See Telegraph.

Professor Morse set up the first daguerreotype apparatus, and with Prof. John W. Draper was associated in taking the first daguerreotypes in America; he also laid the first submarine telegraph line (in New York Harbor in 1842); and from him, in a letter to the Secretary of the Treasury of the United States in 1843, seems to have come the first suggestion of an Atlantic telegraph. His death occurred about three months after his last public act—the unveiling of the statue of Benjamin Franklin, in Printing-house Square, New York. He died in New York, April 2, 1872. Consult Prime, *Life of S. F. B. Morse* (New York, 1875).

MORSE, Sidney Edwards (1794-1871). An American journalist, geographer, and inventor, a brother of Samuel F. B. Morse. He was born in Charlestown, Mass., graduated at Yale in 1811, studied theology and law, and in 1815 established the Boston *Recorder*, a weekly religious newspaper, which he edited for more than a year. In 1820 he published a small geography, and in 1823 a larger one called *A New System of Modern Geography*, of which more than five hundred thousand copies were ultimately sold. The success of the book was partly due to the later use in it of superior map-prints in color produced by a new process called cerography, which he, with the assistance of Henry A. Munson, developed in 1839. In 1823, with his brother Richard, he established the New York *Observer*, another religious weekly, and he continued to be its chief editor and proprietor until 1858.

MORSELLI, môr-sĕl'lê, Enrico Agostino (1852—). An Italian alienist and neurologist, born at Modena, and graduated at the university of that city in 1874. He studied psychiatry at Reggio under Livi, and anthropology at Florence under Mantegazza, and subsequently became professor of psychiatry in the Turin medical school and physician in charge of the insane asylum in the same city. He is the author of a number of medico-legal and neurological papers. Among his published works are: *Critica e riforma del metodo in antropologia* (Rome, 1880); *Suicide: An Essay on Comparative Moral Statistics* (New York, 1882): *Manuale delle malattie mentali* (Milan, 1885); *Il magnetismo animale* (Turin, 1886). Morselli was co-editor of the *Rivista sperimentale di freniatria e di medicina legale* in 1875; and of the *Archivo di psichiatria* in 1885.

MORSHANSK, môr-shänsk'. An important commercial town in the Government of Tambov, Russia, situated near the river Tsna, about 60 miles north-northeast of the city of Tambov (Map: Russia, F 4). It produces tallow, soap, and spirits on a large scale, and is the seat of an extensive trade in agricultural products and live stock. Population, in 1897, 27,756.

MORTALITY, Statistics of. See Vital Statistics.

MORTAL SIN. In Roman Catholic theology, the name given to the graver class of sins, in distinction from venial sins (q.v.). For a sin to be mortal, it must be a conscious violation of a known divine law, decided upon deliberately by a free will, and it must be in a matter of importance; thus, for example, the theft of a few pennies, without aggravating circumstances, would not be a mortal sin. Mortal sin, as its name implies, is believed to destroy absolutely the divine life of grace in the soul and render it deserving of eternal punishment, unless remitted by perfect contrition, or by attrition in conjunction with the sacrament of penance (q.v.).

MORTAR (OF., Fr. *mortier*, from Lat. *mortarium*, mortar; connected with *marcus*, hammer, Skt. *mar*, to crush). A mixture or paste of cement or lime and sand. Mortars may be classified according to the nature of the cementing substance used, into: Common lime mortar, hydraulic lime mortar, and cement mortar.

Common Lime Mortar. Mortar made of common lime is extensively used because of its intrinsic cheapness and the ease with which it can be prepared. It sets or becomes hard only in air, however, and should consequently not be used under water or in wet places. Its small strength compared with cement mortar, however, limits its use to structures in which great strength is not required. In making lime mortar the proportions of the mixture are usually about one volume of lime to from two and one-half to three volumes of sand. The lime is placed in a layer in a shallow box or in a depression scooped out of the sand and then sprinkled with a quantity of water from two and one-half to three times the volume of the lime. This being done, the lime should be left to 'slack' undisturbed. It is generally held by engineers that the lime should be slacked at least twenty-four hours before it is mixed with the sand. This is frequently not done, through haste or carelessness, in common building operations. It is also important that all the water required for slacking should be added to the lime at one time, since the addition of water after slacking has begun retards that process and results in the production of a lumpy mortar. After the lime has been slacked the sand is spread in a layer over its top and the two materials are mixed and remixed by means of a hoe or shovel until a uniform paste is secured. The mortar is then ready for use.

Hydraulic Lime Mortar. In hydraulic lime mortars the proportions of the ingredients and the manner of mixing them are substantially the same as for common lime mortar. The only change practically is the use of hydraulic lime instead of common lime. See Cement.

Cement Mortar. The most valuable of all mortars are those made with hydraulic cements (see Cement) as a binding material. The proportions of the ingredients that are most commonly use are one part cement and two or three parts sand. To make the mixture about half the sand is spread in a layer over the bottom of the mixing box; the cement is then spread in a layer over this sand bed, and is in turn covered with the remainder of the sand. The mass of cement and sand is then turned and re-turned with a shovel until the two ingredients are thoroughly intermingled. Water is then added to the mixture, which is again turned by the shovel until it is uniformly wet.

Grout. A thin or liquid mixture of lime or cement is called grout. It is used to fill up small interstices by pouring it on to the masonry, into the voids of which it is expected to find its way because of its liquid nature.

For a comprehensive discussion of mortars, see Baker, *A Treatise on Masonry Construction* (New York, 1902). See Building.

MORTAR. A type or form of ordnance used for high-angle fire. In design it is short in length in proportion to its calibre or size of bore. In the United States and England mortars are almost entirely used for coast defense purposes. In the former country mortar batteries consist of either eight or sixteen mortars each, four mortars to a pit. The pits are fortified with parapets constructed of sand reënforced on the interior by a concrete wall. They are separated by substantial traverses which contain the necessary magazines, bomb-proofs, etc. (See illustration under Fortification.) The batteries are controlled by an officer (the predicting officer), who observes the plotting board, the target, and the effect or destination of the projectile, in order to give the proper direction and elevation to the men working the pieces in the pit. France has taken the lead in the manufacture of these types of ordnance, the Creusot works of Messrs. Schneider & Co. being perhaps the best known in the world.

The use of field mortars has not been as yet put to the test of modern battle conditions, so that their employment is largely a matter of conjecture. In 1903 Russia led the world with a regularly organized and equipped division of 24 batteries, 6 mortars to a battery. Austria and Germany come next, the latter country differing from Russia in details of organization. Although the advantages of field mortars are conceded to be greater than their disadvantages, the latter are still sufficiently important to delay their general immediate employment. The most important disadvantage is the difficulty of getting men so thoroughly trained that they are equally expert with the ordinary flat projectory field gun and the high-angle mortars. Another defect in field mortars is their utter inability of defending themselves at close range. For illustration of the 12-inch breech-loading mortar used in the United States service, see Coast Artillery, and for an illustration of the 10-inch cast-iron muzzle-loading mortar, see Artillery. See also Coast Defense; Howitzer; Ordnance. Under the latter head the construction of a modern mortar is described.

MORTARA, môr-tä′rȧ. A town in the Province of Pavia, Italy, situated on the Arbogna, and at the junction of several railroads, 25 miles southwest of Milan (Map: Italy, C 2). There are a Gothic church (San Lorenzo), with paintings, a theatre, and a high school. Manufactures of machines and hats are carried on. At the battle of Mortara, March 21, 1849, the Austrians defeated the Sardinians. Population (commune), in 1881, 8085; in 1901, 8631.

MORTARA, Edgar. A Jewish boy whose alleged abduction excited much interest in Europe in 1858 and following years. He was the son of

Momolo Mortara, a resident of Bologna, and, as was said, was forcibly taken from his father's house on June 23, 1858, by the authorities on the ground that he had been baptized into Christianity by a Roman Catholic maid-servant. The efforts of the parents to recover the boy aroused much sympathy, but were unsuccessful. Apparently of his own choice, he remained with the Church authorities, was educated for the priesthood, became an Augustinian monk, and preached his first sermon in 1874. Consult *The True Story of the Jewish Boy Edgar Mortara* (London, 1860).

MORTAR VESSEL. A vessel fitted for carrying and operating a mortar. Such a vessel requires good beam and a strong deck to resist the recoil of the mortar. During the Civil War schooners were used as mortar vessels. In Europe, ketch-built vessels were largely used for this purpose, the so-called bomb-ketch being a frequent adjunct to a fleet in conducting operations against land defenses. Ketch-built vessels are not only stoutly framed and broad of beam, but the length of deck forward of the masts gives ample room for working a mortar.

MORTE D'ARTHUR, môrt där'tụr′ (OF., the death of Arthur). The name applied, in slightly varying forms, to several versions of the Arthurian legend and cognate stories. (See ARTHUR.) There are two English metrical romances of the name, each existing in a single manuscript, and probably based on French originals. But in more than one way the most important work bearing this name is the celebrated reduction or blending by Sir Thomas Malory of French and English romances. It was completed in 1469 and first printed, by Caxton, in 1485. Of this edition but two copies exist, the only perfect one in New York: a scholarly reprint of it, with valuable editorial matter, was made by Sommer (London, 1889). Probably very popular for a time, this 'noble and joyous book,' as Caxton calls it, fell later into disrepute with an age out of harmony with its spirit, and was scornfully condemned by Ascham in a well-known passage of *The Schoolmaster*. But the nineteenth century recognized fully its extraordinary merits. "There was," says Saintsbury, "at Ascham's date, no more exquisite example of English prose in existence. There is not to this day a book, either in prose or in verse, which has more of the true romantic charm." Apart from the skillful combination of diverse elements to make a story, in which Malory shows little short of genius, his style, in its stately harmony and graceful picturesqueness, is most remarkable for its period. Indeed, he may be called the first English writer who shows a sense of the rhythmical flow and gracious music of which the language is so richly capable. The book probably did more than any other influence to nationalize the Arthurian legend; and the poets, from Spenser to Tennyson (in the *Idylls of the King*), have drawn abundantly on its treasures. The best modern editions, besides that mentioned above, are by Rhys (London, 1894); Wright (ib., 1856); Strachey (ib., 1868); and Gollancz, Temple Classics (ib., 1900).

MORTGAGE (OF. *mortgaige*, *morgage*, Fr. *mortgage*, from *mort*, from Lat. *mortuus*, dead, from *mori*, Skt. *mar*, to die + *gage*, ML. *vadium*, *wadium*, from Goth. *wadi*, OHG. *wetti*, Ger. *Wette*, AS. *wedd*, archaic Eng. *wed*, Lat. *vas*, pledge, Lith. *vaduti*, to redeem a pledge). Mortgage is the conveyance or transfer of property, either real or personal as security for the payment of a debt or the performance of a legal obligation.

The debtor or obligor may, and usually does, retain possession of the property mortgaged—the validity of the security not depending upon possession as in the case of pledge (q.v.) and common-law lien (q.v.) This method of securing performance of an obligation was known to the ancient law; and under the civil law the distinction was well settled between *hypotheca*, in which the property given as security remained in the possession of the debtor, and *pignus*, in which the property given as security was surrendered to the creditor.

Some writers have attributed the origin of the common-law mortgage to the civil law, while others assert that it grew out of the common-law conditional gift. However this may be, the giving of security by mortgage first became of importance at common law after the passage of the statute *Quia Emptores* (18 Edward I.), by which the restraints on alienation of lands held in fee were removed. Mortgages were then in form conditional grants, a form of gift or limitation peculiarly adapted to the giving of security without necessarily changing the possession of the security. At common law the owner of real estate might grant to another any estate in fee with the right on the part of the grantor or his heirs to reënter upon the property and revest the title in the grantee or his heirs upon the happening of a specified condition.

By making the condition of reëntry the payment of money or the performance of an obligation due from the grantor to the grantee, all the essentials of a common-law mortgage were created. Upon payment of the sum due when due, the condition of the grant or conveyance happened and title was thereby revested in the grantor or mortgagor, but if the mortgagor failed to pay the mortgaged debt when due, performance of the condition thereafter became impossible, and the mortgagor thereby lost all claim upon the mortgaged property.

Equity early exercised its jurisdiction to mitigate the harsh operation of the common-law rule relating to conditional conveyances by allowing the mortgagor who had failed to perform his obligation upon the due date (or the law day, as it was called) to redeem the mortgaged property upon payment of the sum due with interest. But as a means of limiting this equitable right of the mortgagor, equity also gave to the mortgagee the right to cut off the right of redemption by foreclosure, which was an equitable suit asking a judicial declaration that the right to redeem had been forfeited.

The modern law of mortgages, then, combines both legal and equitable doctrines; and many of its peculiarities, both of form and substance, will be explained by reference to the historical development of the law. While the mortgage in modern practice may, for most purposes, be regarded only as a lien created in favor of the mortgagee, it is still in form a conveyance vesting the title of the property in the mortgagee, and in the absence of statute, it is generally the rule that no mortgage valid at law can be created without a conveyance.

It is usual to incorporate in the mortgage a clause providing for the defeasance of the title upon payment of the mortgage indebtedness, but, as will appear, even that is not essential. In some States statutes have been passed authorizing a mortgage which is not a conveyance in form, but which for all practical purposes has the same effect as the common-law mortgage as modified by equity. One important consequence arising from the fact that at common law the mortgagee acquired a title was that his mortgage was valid against an innocent purchaser of the property for value without notice of the mortgage, which could not have been the result had the mortgage been a mere lien or right *in personam* against the mortgagor. See EQUITY; FRAUD.

This rule has been modified in the United States by statutes universally adopted requiring mortgagees and purchasers of property generally to record their documents of title in order to protect them against claims of purchasers without notice.

When the intention of an agreement is to create a mortgage, although it is not in effect a conveyance and consequently not a legal mortgage, equity will enforce the agreement against the mortgagor or third parties having notice of the agreement as though it were a valid mortgage.

Thus where the owner of real estate deposited his title deeds of the property with another for the purpose of scuring a debt or obligation, the English courts of equity have recognized in the transaction a valid mortgage. This doctrine of creating a mortgage by pledge of title deeds has not been recognized in the United States. (See LIEN.) When a conveyance is absolute on its face, equity, disregarding the parol-evidence rule, will inquire into all the circumstances of the transfer of title, and if it appear that the transfer was made only for the purpose of giving security, equity will treat the whole transaction as a mortgage and allow the grantor to redeem the property upon payment of the mortgage indebtedness. All mortgages, however, whether express or implied from the circumstances, are to be distinguished from conditional sales, which are agreements to sell and transfer title to the property upon the happening of a certain event. It will be observed that the position of a mortgagor is closely analogous to a conditional vendor who has agreed to sell property upon payment of a certain sum. There is, however, one important distinction between the two relations. In the case of conditional sales there is no existing indebtedness. The vendee is under no obligation to pay money to the vendor before electing to purchase, while the mortgagor is so bound. In determining in any given case whether the transaction is a conditional sale or a mortgage, courts will scrutinize the evidence with great care, and in case of doubt the tendency is to hold the transaction to be a mortgage. From the nature of mortgage it seems probable that a legal liability independent of the mortgage itself is not essential to its validity, but in general all mortgages are accompanied by some form of legal obligation for the performance of which the mortgage is given as security. This is usually a promissory note or bond payable to the mortgagee, and where the purpose is to issue numerous bonds secured by one mortgage, the practice is to make the mortgage or conveyance to a trustee, who holds the property as security for all the bondholders. Railroad mortgages are usually made in this manner. If the note or bond is illegal or there is any illegality in the mortgage transaction, the mortgage is invalid.

Mortgages are sometimes given to secure future advances to be made by the mortgagee. Such mortgages are valid and enforceable as between the mortgagor and mortgagee, but in some States they are held not to be valid against third parties, except as to advances actually made, of which the third party has actual or constructive notice at the time of acquiring an interest in the property. In a number of States, statutes provide that mortgages for future advances shall have no validity against third persons.

Any legal property, either real or personal, may be mortgaged, even including future or inchoate property, as crops planted but not yet grown, which the common law regards as being capable of present ownership. But a mortgage of property not yet acquired by the mortgagor could have no validity at common law. Mortgages of this character as well as mortgages of equitable interests were recognized and enforced by equity when the rights of innocent third parties were not involved. Such mortgages are now generally regarded as valid between mortgagor and mortgagee, but there are a variety of views held in the several States as to their validity against third parties—some courts, as those of Massachusetts, holding that they can have no validity against even creditors of the mortgagor unless the mortgaged property is delivered to the mortgagee, and some, as those of New Jersey, holding that they are valid against all parties having notice of the mortgage.

The mortgage, besides a description of the mortgaged property and the mortgage indebtedness, may, and usually does, contain clauses providing that the whole debt shall become due and payable upon failure to pay interest or taxes and assessments upon the mortgaged property. The mortgage may also include a power of sale enabling the mortgagee to sell the mortgaged property without foreclosure upon the mortgagor's failure to pay the debt. In many States such a provision is made inoperative by statutes which require foreclosure of the mortgage exclusively by judicial proceedings. A stipulation that the mortgagor shall have no right to redeem will be disregarded by the courts upon the same principle that courts of equity disregarded the condition of the common-law mortgage.

The estate of the mortgagor in possession has been likened to a tenancy at will or by sufferance, and as between himself and the mortgagee, the analogy is very close. At common law the mortgagee having the title could take possession at will, the sole right of the mortgagor, if the mortgagee exercised this right, being to redeem by payment of the mortgage indebtedness on the due date, but as to all others, the mortgagee in possession is clothed with substantial ownership. He is entitled to the rents, issues, and profits of the mortgaged property; he may sell or incumber it subject to the mortgage, and upon his death the property goes to his heirs at law.

In many States the mortgagee's common-law right to take possession of the mortgaged property by ejectment or other appropriate action has been cut off, and he can only secure possession of the mortgaged property through foreclosure.

Although the mortgagee holds the title to the mortgaged property, the law recognizes that he holds it as an incident to his claim against the debtor, which is personal property. The mortgagee's estate, therefore, in both real and personal property, is regarded as personal property only, and passes, upon his death, to his next of kin and not to his heirs.

In general, the mortgagee out of possession is in the position of one having a mere lien or personal claim against the mortgagor. But the mortgagee in possession of the mortgaged property, who was at common law substantially in the position of owner of the property, was compelled by equity to account for the rents, issues, and profits, and to apply them upon the mortgage indebtedness. This is now the established rule.

Both the mortgagor and the mortgagee may freely assign their interests. It is not unusual for the assignee of the mortgagor to assume the mortgage indebtedness by the instrument of assignment, and it is the general rule that the mortgagee may enforce this undertaking either upon the theory of subrogation or that the mortgagee may sue upon a contract made for his benefit. For other incidents of the estates of mortgagor and mortgagee, see CURTESY; DOWER; FIXTURES; WASTE.

When several mortgages are given upon the same property they have priority in the order of their creation unless otherwise provided. This rule may be varied by the operation of the various recording acts.

A mortgage may be extinguished by payment of the mortgage indebtedness, or by a legal tender of the amount due on the day when due. Tender after that time had no effect at common law, and in equity the only effect was to prevent interest accruing. A mortgage may also be terminated by a release of the mortgagor, or by a merger. If the merger is accomplished by a conveyance of the mortgaged property by the mortgagor to the mortgagee, the courts will scrutinize the transaction with the greatest care, and if there appear to have been any unfairness or undue influence on the part of the mortgagee, will allow the mortgagor to redeem. See MERGER.

A mortgage is extinguished by the final judgment or decree in an action to foreclose the mortgaged property or in an action to redeem it from the mortgagee. See FORECLOSURE; EQUITY OF REDEMPTION.

Courts have always favored the mortgagor's right to redeem, and at any time before the extinction of the mortgage will allow him to compel a cancellation and surrender of the mortgage upon payment of the mortgage indebtedness with interest, and, as an incident to the redemption, will compel the mortgagee to account for rents or other income which he has received from the mortgaged property. Consult: Jones, *Treatise on the Law of Mortgages of Real Property* (5th ed., Boston, 1894), and of *Personal Property* (4th ed., Boston, 1894); Pingrey, *Treatise on the Law of Chattel Mortgages* (Jersey City, 1891); *On the Law of Mortgages of Real Property* (Jersey City, 1893); and the authorities referred to under REAL PROPERTY.

MORTGAGE BANKS. Banks designed primarily to furnish credit on land, houses, mines, and other immovable property. The loans are usually for periods from ten to seventy-five years, and are secured by mortgage. The loan contract provides for the extinguishment of the debt by means of equal annual payments, comprising interest and amortization; but the debtor has the option of paying the principal in anticipation, and, as a matter of fact, a large percentage of the loans made by mortgage banks are canceled before maturity. The bank secures funds by selling its obligations or mortgage pledges, the difference between the interest on the loans made by the bank and the interest which it pays on its obligations constituting its profit. Mortgage banks are found in many European countries. The first important one was the Crédit Foncier of France, which has been in existence since 1852 and has had an organization similar to that of the Bank of France since 1854. It can make loans on first mortgages to the amount of one-half of the estimated value of houses and farms, and one-third of that of vineyards and other plantations. The rate of interest on loans must not exceed the rate paid by the bank on its obligations by more than six-tenths of one per cent. The Crédit Foncier of Algeria and the Crédit Foncier Colonial were formerly branches of the Crédit Foncier of France, but are now independent. Instead of one large national organization, Germany has forty mortgage banks, fourteen of which are in Prussia. In 1898 these institutions had an aggregate capital of 554,297,256 marks and held mortgages to the amount of 6,207,889,143 marks. Some of them, however, issued other forms of credit. In Belgium the only bank which deals in mortgages exclusively is the Crédit Foncier, but there are banks at Brussels and Antwerp which deal largely in land credit. Similar institutions are found in Austria-Hungary, Holland, Italy, Spain, Portugal, Sweden, and Russia. The chief service of mortgage banks consists in making mortgages negotiable. In Europe, the owners of land and houses are able to get loans at a low rate of interest—less than 3 per cent. in France and 4 per cent. in Germany. They can pay their debts in small yearly installments from the produce of their capital. In the United States, where there is no legislative provision for the establishment of mortgage banks, the lender and the property owner can be brought together only by a form of brokerage, and the terms of the debt usually require the payment of the principal in a few years. Consult the article on "Hypothekenbanken," in Conrad, *Handwörterbuch der Staatswissenschaften* (Jena, 1898-1901); Taft, "Mortgage Banks," in *Journal of Political Economy* (September, 1898).

MORTIER, môr'tyâ', EDOUARD ADOLPHE CASIMIR JOSEPH, Duke of Treviso (1768-1835). A French marshal. He was born at Cateau-Cambrésis, February 13, 1768. His father was a Deputy to the States-General in 1789, and though Mortier was educated for a business career, he entered the service of the Republic as a lieutenant of carbineers in 1791. He rose rapidly, and in 1793 became adjutant-general. After greatly distinguishing himself under Moreau and Kléber, he was made a general of division in 1799. In 1803 he was in command in Hanover, and in the administration of that country showed the utmost probity and sagacity. Created a marshal of the Empire in 1804, and placed in charge of an army corps in 1805, Mortier showed his military genius by holding in check a superior force of Russians at Leoben. In 1806 he occupied Hanover, Hesse-Cassel, and Hamburg, and defeated the Swedes in several encounters. He commanded the left wing of the French army at Friedland, and after the Peace of Tilsit was intrusted with the government of Silesia and created Duke of Treviso. Sent to Spain in 1808, he took part in the siege of Saragossa and defeated the Spaniards at Ocaña (November 19, 1809). After sharing in the Russian campaign of 1812 Mortier took a decisive part in the battle of Lützen (May 2, 1813), and in all the subsequent military events of 1813-14. When Napoleon's cause was lost Mortier at last gave in his adhesion to the Government of Louis XVIII. During the period of the Hundred Days Mortier first saw the King safely out of France and then joined his old leader. After the second Bourbon restoration, he was crossed off the list of peers for refusing to sit on the court martial of Ney. He became a member of the Chamber of Deputies in 1816, and was restored to the Chamber of Peers in 1819. After the Revolution of 1830 he was made Ambassador at Saint Petersburg, became Grand Chancellor of the Legion of Honor in 1833, and Minister of War and president of the Council in 1834-35. He was killed on the Boulevard du Temple, July 28, 1835, by a missile from the infernal machine of Fieschi (q.v.).

MORTILLET, môr'tē'yȧ', LOUIS LAURENT GABRIEL DE (1821-98). A French anthropologist, born at Meylan, Isère. His interest in prehistoric archæology dates from a trip to Italy in 1858, and he began to study the Swiss lake dwellings. In 1864, after his return to France, he founded a review, *Matériaux pour l'histoire positive et philosophique de l'homme,* and in 1868 became an assistant at the Museum of Saint Germain. In 1876, with Broca, he planned the Ecole d'Anthropologie. His published work includes: *Signe de la croix avant le christianisme* (1866); *Les habitations lacustres du lac du Bourget* (1867); *Origine du bronze* (1876); *Le préhistorique* (1882); and *Origines de la chasse, de la pêche et de l'agriculture* (1890).

MOR'TIMER, JOHN HAMILTON (1741-79). An English painter and engraver, born at Eastbourne. He was a pupil of Hudson and of Reynolds, and won the first prize of the Society of Arts in 1763. His vigorous if somewhat uncertain talent and his love of the terrible are shown in such works as the "Battle of Agincourt," "Vortigern and Rowena," and "Hercules Slaying the Hydra," in the Victoria and Albert Museum, South Kensington. He was elected a Royal Academician in 1779. His etchings are notable for their bold execution. They include several after his own works. He also made designs for stained-glass windows in Salisbury Cathedral and Brazenose College, Oxford.

MORTIMER, ROGER DE (1287?-1330). First Earl of March and eighth Baron of Wigmore. For some years he was a faithful adherent of Edward II. of England, and from 1316 to 1321 his representative in Ireland to oppose Edward Bruce; but when recalled in 1321 Mortimer joined the insurgent barons who were hostile to the Despensers (q.v.), with whom he had been allied for a year. In 1322 Mortimer submitted to Edward and was imprisoned in the Tower of London, but escaped to France two years later. There he met and fascinated Queen Isabella, wife of Edward, became her paramour, and determined upon the overthrow of the King. With a small force the two landed on the English coast in 1326, and were soon joined by large numbers of the discontented nobles and common people. The King was defeated, taken prisoner, and probably murdered in his prison in 1327. (See EDWARD II.) Mortimer took the title of Earl of March in 1328, and was given confiscated estates and offices of immense value, while his creatures controlled the administration. Edward III. was a minor, and though a council held the regency, Mortimer's influence was supreme. Mortimer became very unpopular when he made the 'Shameful Peace' with the Scots in 1328. Finally Edward III. resolved to be King in fact as well as in name, had the Earl of March seized at Nottingham Castle, and summoned a new Parliament. Mortimer was tried on charges of treason, condemned, and in 1330 drawn and quartered. Consult: Stubbs, *Constitutional History,* vol. ii. (4th ed., Oxford, 1896), and Longman, *Edward III.,* vol. i. (London, 1869).

MORTIMER, HIS FALL. A tragedy by Ben Jonson, consisting of only the argument and a few lines. It was completed in 1691 by W. Mountford as *King Edward III., with the Fall of Mortimer.* Coxeter states that it was written by John Bancroft, who presented it to Mountford.

MORTIMER'S CROSS, BATTLE OF. See EDWARD IV.; ROSES, WAR OF THE.

MORTISE (OF. *mortaise, mortoise,* Fr. *mortaise,* Sp. *mortaja,* mortise: possibly from Ar. *murtazz,* fixed, p.p. of *artazza,* to be fixed, from *razza,* to lay) **AND TENON** (OF., Fr. *tenon,* from *tenir,* to hold, from Lat. *tenere,* to hold). A form of joint in carpentry. The tenon is a projection, generally rectangular in form, on the end of a piece of wood, cut so as to fit exactly into a deep groove (called the mortise) in another piece, so that the two are united at a required angle. The framing of doors, shutters, and such pieces of joinery is usually fitted together with mortise and tenon joints. Mortise holes are also made to receive locks and other fittings.

MORTMAIN (OF. *mortemain,* from ML. *mortua manus,* dead hand), STATUTES OF. The term mortmain is applied to the perpetual tenure of lands by corporations, particularly church corporations, whose members and officers, being ecclesiastics, were by the early law deemed civilly dead, and hence the derivation of the term as signifying land held by the dead hand of the Church. In later times the term has been applied to the tenure of lands by corporations generally, whether ecclesiastical or lay.

Mortmain first became a matter for the serious attention of English legislators and lawyers as early as the reign of Edward I. The policy of the various ecclesiastical corporations of acquiring large holdings of land and retaining them became a menace to the well being of the State, partly because it afforded a ready means of accumulating wealth and power which were held in strict allegiance to the Church, whose interests were often in conflict with those of the civil authority, but primarily because the ownership of land by ecclesiastical corporations was inconsistent with feudal tenure. The feudal system presupposed the holding of land by a tenant who could render to his overlord certain services or dues upon the happening of certain events. The most important of these were: (a) *Relief.*—A sum which an heir was accustomed to pay to the lord upon coming into his ancestor's tenancy. (b) *Wardship.*—The right of the lord to become the guardian of the infant heir of his tenant. (c) *Marriage.*—The right of the lord to dispose of the tenant's daughter in marriage. (d) *Escheat.*—The right of the lord to the freehold upon the death of the tenant without heirs.

It is apparent that the acquisition of land by an ecclesiastical corporation which could not die or contract marriage, and which had not any of the other attributes of a natural person, struck at the very basis of the feudal system, and was regarded with jealousy by the great lords and civil officers of the Crown. The result was a series of legislative enactments, extending over a period of nearly six hundred years, having for their purpose the restraint of alienation in mortmain. No sooner did the will of the State find expression in appropriate legislation for this purpose than the powerful influence of the Church sought to evade or nullify it by judicial interpretation or by resort to legal fictions invented by skillful lawyers and urged by them upon the courts with such success that ultimately new legislation became necessary. To this historic struggle between the Church and the landed aristocracy are attributable many of the peculiarities of the common law of real property.

The earliest statute relating to the subject after the fall of the Western Empire was an edict of the Emperor Frederick Barbarossa in 1158 prohibiting conveyances to church corporations. In England there have been enacted in all twenty-one statutes affecting the power to alienate in mortmain. The earliest of these (a provision contained in the Magna Charta, ch. 43, that there should be no transfer of land to church corporations by a tenant without the consent of his lord) seems to have fallen into disuse or to have been evaded by conveyances direct to the officers of the religious houses, who held the property for the benefit of such houses.

The next statute of importance, and the first to curb effectively the acquisition of land by the ecclesiastical corporations, was the statute De Religiosis (7 Edw. I., Stat. II., ch. 13), passed in 1279. The preamble of this interesting piece of legislation reads as follows:

"Where of late it was provided that religious men should not enter into the fees of any without license and will of the chief lord of whom such fees be holden immediately, and notwithstanding such religious men have entered as well into their own fees as into the fees of other men, appropriating and buying them, and sometimes receiving them of the gift of others, whereby the services that are due of such fees and which at the beginning were provided for defense of the realm are wrongfully withdrawn, and the chief lords do lose their escheats of the same—" etc.

This statute made all alienations in mortmain unlawful, and made the provision effective by enacting that all such conveyances should work a forfeiture to the lord of the land attempted to be conveyed. The lawyers of the time, however, soon devised a method for evading the statute by the use of common recovery (q.v.). This development in the common law was met by a new legislative enactment (13 Edw. I., ch. 32), in 1285, which forbade alienation of lands in mortmain by common recovery, and attached the same penalty to such alienation as in case of the conveyances forbidden by the Statute De Religiosis. The Statute Quia Emptores (18 Edw. I., ch. 1), which removed some of the common-law restraints upon alienation, expressly excluded from its operation all alienation in mortmain.

These statutes in time were evaded by the practice of conveying lands to a layman to be by him held for the use or benefit of an ecclesiastical corporation, which obligation came to be enforced by the Chancellor. The *use* was the forerunner of the modern trust and the basis of equity jurisdiction over trusts. And it is to the great struggle over alienation in mortmain more than to any one other factor that the growth of the modern law of trusts is due. In 1391 this practice was forbidden on pain of forfeiture, unless such conveyance to *uses* was licensed by the King (15 Richard II., ch. 5).

The Statute of Wills, allowing testators to dispose of their property by will, did not in terms permit the testator to devise real estate to a corporation. By judicial interpretation, however, the power was established to devise lands to corporations for charitable purposes.

From this period down almost to the present time statutes have been enacted modifying or further restraining the power of alienation to corporations, whenever judicial interpretation or the ingenious devices of lawyers made such enactments necessary.

The statute 9 Geo. II., ch. 36 (1736), is noteworthy in that it shows that the policy on which the Statute of Mortmain had hitherto been based had then changed somewhat. This statute, reciting that "public mischief had greatly increased by many large and improvident dispositions made by languishing and dying persons to charitable uses, to take place after their deaths, to the disinhersion of their lawful heirs," enacted that in future no lands or sums of money to be laid out in land should be given to any person or body unless such gift or conveyance should be made or executed in presence of two witnesses twelve months before the death of the donor or grantor, and be enrolled in the Court of Chancery within six months after the execution. Under this act, therefore, a person on his deathbed cannot in England give land, or money to buy land, for a charitable purpose. It can only be done in the life of the donor at least twelve months before his death, and the property must be completely alienated so that he has no further control over it. The deed must have a present operation, and must not reserve any life interest to the donor; it must be done at once and forever. The policy of this statute has sometimes been questioned, and several well-known modes of evading the statute have been adopted from time to time.

All the English statutes of mortmain were revised and consolidated by the statute 51 and 52 Victoria, ch. 42. In general the statute still restricts alienation to corporations, but makes numerous exceptions in favor of gifts to churches, public parks, museums, and for literary and scientific purposes. Gifts to charity by will are regulated by 54 and 55 Victoria, ch. 73, which in general permits such gifts of land to charities if the land be sold within one year from the testator's death. Throughout the period of mortmain legislation it was possible for the Crown to grant a mortmain license enabling a corporation to purchase and hold lands, a prerogative which at times was freely exercised.

Owing generally to the absence of great religious corporations in this country, and to the fact that the feudal system never obtained a foothold here, the mortmain acts were not reenacted in the United States, with possibly one or two exceptions. Pennsylvania has a mortmain act, and New York has a statute which, like the statute of 9 George II., seems calculated rather to restrain a testator from making unwise and improvident gifts to charity than to prevent land-holding by corporations. The statute provides that a testator who leaves surviving him a wife, child, or parent shall not devise or bequeath more than one-fourth of his estate to a charitable corporation; and no such devise or bequest shall be valid unless made more than two months before the death of the testator.

In many States business corporations may not receive real estate by devise, but generally charitable corporations may do so; and in most States there is no restraint upon conveyance of lands *inter vivos* to corporations, unless the charter of the corporation or the general law under which it is created limits the total amount of land which the corporation may hold. See Charitable Trusts; Uses; and Trust; and consult the authorities there referred to, and also under Real Estate. Also consult: Highmore, *View of the History of Mortmain* (London, 1809); Rawlinson, *Notes on the Mortmain Acts* (London, 1877).

MORTO DA FELTRE, môr′tô dȧ fĕl′trȧ (c.1474-c.1519). An Italian painter, born at Feltre. His fame rests upon Vasari's statement that he was the first to use classic arabesques in ornamentation. Of his life nothing certain is known, nor do any authenticated works by him survive. Cambruzzo, a seventeenth-century historian of Feltre, identified him with Pietro Luzzi (also called Zarato) of that town, who was an assistant of Giorgione at Venice. Luzzi is recorded as having been at Rome in 1495, at Florence in 1506, and at Venice in 1508. He is known to have decorated with frescoes the town-hall, the Church of San Stefano, and two houses in his native town. According to the usual account, Morto was killed fighting in the Venetian army at the battle of Zara; but if he be identical with Luzzi, he cannot have died till after 1519, in which year the latter was active in his native town.

MOR′TON, Charles (1627-98). An English clergyman and educator, born at Pendavy, Cornwall, and educated at Wadham College, Oxford. He renounced the Royalist traditions of his family and became a Puritan, though he did not leave the Anglican communion until 1662. He opened a school for dissenters at Stoke Newington, near London, which he maintained until 1685, having Daniel Defoe among his pupils. Contrary to the custom of the universities, he made his pupils write their dissertations and hold their disputations in English—a practice which, Defoe affirms, made his pupils excel in English those of any other school. In 1686 he emigrated to New England. He settled first at Charlestown, Mass., and became the pastor of a church there. He became connected with Harvard College, and two of his manuscript works—*A System of Logic* and *Compendium Physicæ*—were used as text-books. He was made vice-president of the college at the establishment of that office, and hoped to succeed Increase Mather as president. His death prevented the fulfillment of this ambition. Consult Josiah Quincy, *History of Harvard University* (Cambridge, 1840).

MORTON, James Douglas, fourth Earl of (1530-81). Regent of Scotland. The second son of Sir George Douglas of Pittendriech, in 1553 he succeeded in right of his wife, Elizabeth, daughter of the third Earl of Douglas, to the title and estates of the earldom. He early favored the cause of the Reformation, and in 1557 was one of the original lords of the congregation. Sworn a Privy Councilor in 1561, he was appointed Lord High Chancellor of Scotland, January 7, 1563. As one of the chief conspirators against Rizzio (q.v.), he fled with his associates to England, but obtained his pardon from the Queen. Though privy to the design for the murder of Darnley, on the marriage of the Queen to Bothwell he joined the confederacy of the nobles against her. After Mary's imprisonment in the Castle of Lochleven, he was restored to the office of High Chancellor, of which he had been deprived, and constituted Lord High Admiral of Scotland. On the death of the Earl of Mar, in October, 1572, he was elected Regent of the kingdom. His rule, chiefly directed toward the benefit of the masses and toward the formation of a Protestant league with England, in anticipation of the union of the two kingdoms, made him obnoxious to many of the nobles, and as the young King, James VI., desired to assume the reins of government, Morton resigned the regency in March, 1578. Two months later, however, he obtained possession of the Castle of Stirling, with the person of the King, and for a time recovered his authority. Intrigue, however, was active against him; he was accused of having participated in the murder of Darnley, and was beheaded at Edinburgh, June 2, 1581, bearing himself with dignity and composure, and maintaining his innocence of 'art and part' in the murder of the King's father. Consult: Crawford, *Crown and State Officers of Scotland* (Edinburgh, 1726); Froude, *History of England*, ch. lxiii. (London, 1881-82).

MORTON, George (c.1585-c.1628). An English colonist in America. He was born in England, became a separatist, and removed to Holland with his brother, Thomas Morton, settling at Leyden, where for some years prior to 1620 he was an agent of the London Puritans. In 1623 he sailed for New England in the ship *Ann*, in charge of a party of new settlers for the Plymouth Colony. He remained at Plymouth several years, and then returned to England. The book known as *Mourt's Relation* (1622), which was the first published account of the New England settlement, comprising a journal of the first twelve months of the Plymouth Colony, has the name 'G. Mourt' subscribed to the preface, and for that reason has been ascribed to Morton. Careful investigators, however, among them Dr. H. M. Dexter, who reprinted the work with critical and historical notes in 1864, while agreeing that the name 'G. Mourt' evidently referred to George Morton, are inclined to think that the account itself was the work of Bradford and Winslow.

MORTON, Henry (1836-1902). A distinguished American scientist and educator. He was born in New York, and was educated at the Episcopal Academy in Philadelphia and at the University of Pennsylvania. He first studied law, but afterwards took up chemistry, and in 1863 became professor of chemistry in the Philadelphia Dental College. In 1869 he took the chair of chemistry in the University of Pennsylvania. In 1870 he became president of the Stevens Institute of Technology, at Hoboken, N. J., toward the endowment of which he contributed over $60,000. Dr. Morton conducted the photographic work of the eclipse expedition that went to Iowa in 1869. In 1873 he carried out a series of important investigations on the fluorescent and absorption spectra of the uranian salts, on the fluorescent hydrocarbon thallene, discovered by him in petroleum residues, etc. In 1878 he was a member of Henry Draper's eclipse expedition, and while a member of the Lighthouse Board (1878-85) carried out valuable experiments on electric lighting, fog signals, illuminating buoys, etc. His publications include numerous papers in scientific periodicals and the *Students' Practical Chemistry* (written jointly with Leeds and published at Philadelphia in 1868).

MORTON, James Saint Clair (1829-64). An American soldier, a son of Samuel George Morton (q.v.). He graduated at West Point in 1851, and from 1855 to 1857 was assistant professor of engineering in that institution. In 1860 he conducted an exploration for a railway route across Central America for the Government; in 1861 was promoted to be captain; in 1862 became chief engineer of the Army of the Ohio, and later in the year was transferred to a like position in the Army of the Cumberland. He commanded a brigade at Stone River, was wounded at Chickamauga, and was made major of engineers in July, 1863. As chief engineer of the Ninth Army Corps he participated in Grant's Virginia campaign, and was killed while leading the assault on Petersburg. In recognition of his gallantry in this engagement Congress voted, after his death, that he be ranked as a brigadier-general in the Regular Army. Previous to the war he published a number of works on fortification and engineering.

MORTON, John (1420?-1500). Archbishop of Canterbury and cardinal. He was born in Dorset, and educated at Cerne Abbey, a Benedictine foundation, and at Balliol College, Oxford. Having studied law, he took orders and began to practice in the Court of Arches, the ecclesiastical tribunal of the Archbishop of Canterbury. Here he attracted the attention of Archbishop Bourchier, who presented him to Henry VI., and the latter made him a member of the Privy Council about 1450, and also gave him valuable ecclesiastical benefices. Though he had followed for a time the fortunes of the Lancastrians, Edward IV. took him into favor, made him Master of the Rolls in 1473, and in 1479 Bishop of Ely. He was not in favor with Richard III., who arrested him and committed him to the custody of the Duke of Buckingham, from whom he escaped and fled to the Earl of Richmond on the Continent. He is said to have suggested the union of the houses of York and Lancaster by the marriage of Richmond with the daughter of Edward IV. Henry VII. on his accession made Morton a member of the Privy Council, and on the death of Cardinal Bourchier, in 1486, he was promoted to the See of Canterbury. In 1487 he was appointed Lord Chancellor, and in 1493 Pope Alexander VI. made him a cardinal. Morton was the chief councilor of Henry VII., and hence has been held responsible, perhaps unjustly, for Henry's avarice. (See Morton's Fork.) He died October 12, 1500. The history of Richard III. which bears the name of Sir Thomas More was probably written in Latin by Morton. At Ely he drained the fens by Morton's Dyke. Consult Hook, *Lives of the Archbishops of Canterbury*, vol. v. (London, 1867).

MORTON, John (1724-77). One of the signers of the Declaration of Independence, born of Swedish ancestry, in Ridley Township, Chester County, Pa. He was a surveyor for some years, but subsequently became a lawyer. He was for several years a member of the Pennsylvania Assembly, and in 1765 was chosen a delegate to the Stamp Act Congress. From 1766 to 1770 he was high sheriff of Chester County. During all this period he continued to serve in the Pennsylvania Assembly, and from 1772 to 1775 was Speaker of that body. He was an earnest champion of the rights of the Colonies in the pre-Revolutionary controversies, and was active in furthering the cause of the Revolution after the outbreak of hostilities. In 1774 he was elected a member of the Continental Congress, and remained a member of that body until his death, taking a leading part in the debates and helping to frame the Articles of Confederation.

MORTON, Julius Sterling (1832-1902). An American political leader. He was born in Adams, Jefferson County, N. Y., and when two years old was taken to Michigan by his parents. He was educated in the Methodist Episcopal Academy at Albion, and in 1850 entered the University of Michigan. He completed his course at Union College, graduating in 1854, and in the year following settled in Nebraska, first at Bellevue and later at Nebraska City, where he founded and edited the Nebraska City *News*, the first newspaper to be established in the State. In 1856 and 1857 he was elected to the Nebraska Territorial Legislature, and in 1858 was appointed by President Buchanan secretary of the Territory, and became Acting Governor upon the resignation of Gov. W. A. Richardson, a few months later. In 1866 he was the Democratic candidate for Governor, but was defeated. From that time until 1881, when he was again a candidate for Governor, he took no part in politics. In 1893 he entered the Cabinet of President Cleveland as Secretary of Agriculture, remaining in office until 1897. Upon the advent of William Jennings Bryan into Nebraska politics he became one of his most active opponents, and identified himself with the Gold-Democratic wing of the Democratic Party. In 1901 he was appointed by President McKinley one of the United States Commissioners for the Louisiana Purchase Exposition. He was a student of forestry, and was the originator of 'Arbor Day' in Nebraska, the observance of which has extended to many other States. At the time of his death he was editing a weekly paper entitled *The Conservative*, in which he opposed most of the doctrines advocated in Bryan's *Commoner*.

MORTON, Levi Parsons (1824—). An American banker and political leader. He was born at Shoreham, Vt., and was educated at the academy in that town. In 1843 he established himself in a mercantile business in Hanover, N. H. In 1850 he removed to Boston, where he entered the banking business, and four years later he settled in New York City, where he was successful from the start. In 1863 he founded the banking-house of Levi P. Morton & Co., later Morton, Bliss & Co., which became one of the most successful private banking firms in the country. A London branch, Morton, Rose & Co., was subsequently established. In 1878 Morton was elected to Congress as a Republican. From the completion of his term until 1885 he was United States Minister to France. In 1888 he was the successful candidate for Vice-President on the Republican ticket. From 1894 until 1896 he was Governor of New York.

MORTON, Marcus (1784-1864). An American lawyer and politician, born at Freetown, Mass. He graduated at Brown University in 1804, and at the Litchfield (Conn.) Law School, was admitted to the bar in 1807, and established himself in the practice of his profession at Taunton, Mass., where he remained for the rest of his life. From 1817 until 1821 he was a member of Congress. In 1823 he was a member of the Governor's Council, in 1824 was Lieutenant-Governor, and in 1825 began a notable career as judge of the Supreme Court. He remained on the bench until 1839. In 1840 he was the candidate of the Democratic Party for Governor, and was elected by one vote over Edward Everett, the Whig nominee, although the Whigs carried the State electoral ticket. In 1841 he failed of reelection, but in 1842 was again elected. From 1845 to 1848 he was Collector of the Port of Boston. In the same year he became a violent opponent of the Democratic policy as to slavery extension, and took a leading part in the organization of the Free-Soil Party (q.v.), by which he was elected to the State Legislature for one term. Later he identified himself with the Republican Party.

MORTON, Nathaniel (1613-85). An American colonial historian, born of English blood in Leyden, Holland. He came to Plymouth, Mass., in 1623, and dwelt there till his death. On the death of his father he was taken into the family of Governor Bradford, whose wife was his maternal aunt, and early helped the Governor in public business. He was Secretary of the Colony from 1645 till his death. In 1669, at the request of the commissioners of the New England colonies, he compiled and published at Cambridge, Mass., his *New England's Memorial, or a Brief Relation of the Most Remarkable and Memorable Passages of the Providence of God Manifested to the Planters of New England,* etc., a work which was reprinted in England and several times in the colonies, and was the chief authority for the events of which it treated until the discovery in 1855 of Bradford's *History of Plymouth,* on which, together with the journals of Winslow, Morton, who had little originality, drew largely. Morton also wrote a *Synopsis of the Church History of Plymouth* (1680), and obituary poems of the style then in vogue.

MORTON, Oliver Perry (1823-77). An American political leader, best known as the 'War Governor' of Indiana. He was born in Salisbury, Wayne County, Ind., August 4, 1823, attended the Wayne County Seminary, spent two years at Miami University, studied law, and in 1847 was admitted to practice. He soon became a prominent member of the Indiana bar, and in 1852 was elected circuit judge. He entered politics as a Democrat, but opposition to the Kansas-Nebraska Bill led him on May 2, 1854, to withdraw from the Democratic State convention; and ultimately he assisted in the formation of the Republican Party, to whose first national convention he was a delegate. In 1856 the People's Party, as the Republican Party in Indiana was at first called, nominated him for Governor, but after a close contest he was defeated. Four years later he was elected Lieutenant-Governor, and upon the Governor's election as United States Senator, Morton became Governor, January 16, 1861. Upon the outbreak of the Civil War he threw himself with extraordinary energy and success into the work of raising troops. The election of 1862, however, resulted in the choice of a Democratic Legislature and Democratic State officers, who bitterly opposed the war, and threw obstacles in his way. His task was still further complicated by the presence in the State of a large secret society called the Knights of the Golden Circle (q.v.), which resisted the draft, encouraged desertion, and even plotted the assassination of the Governor and the carrying of Indiana out of the Union. But Morton triumphed over all difficulties. He borrowed sufficient money on his own personal responsibility to meet the exigencies of the situation: put down the treasonable associations and brought the leaders to trial; and he secured the triumph of his party and his own reelection as Governor in 1864. In the opinion of such men as Chase and Stanton his services during this period were greater than those rendered by any other of the great 'War Governors.' Shortly after the close of the war, Morton was stricken with paralysis, and was obliged to go to Europe. On his return to the United States, he resumed his duties as Governor. In 1867 he was elected United States Senator, and was reelected in 1873. In the Senate he became a recognized leader of the Republicans, and, despite his poor health, accomplished a prodigious amount of work, serving on the committees on foreign relations, agriculture, military affairs, private land claims, and privileges and elections. At first an opponent of suffrage for the freedmen, he ultimately did much to promote the passage of the Fifteenth Amendment. He was one of President Grant's chief advisers, and sustained the Administration in the unsuccessful attempt to carry through the Senate the proposed treaty for the annexation of Santo Domingo. In return for this last service, he was offered the English mission, but refused it. In 1873, on the death of Chief Justice Chase, he declined also to become Chief Justice of the Supreme Court. At the Republican national convention in 1876 he was a strong candidate for the Presidential nomination, and received 124 votes on the first ballot. He subsequently served on the Electoral Commission (q.v.). At this time his infirmities were such that he required assistance in moving about, and had to be carried from the lobby of the Senate chamber to his carriage. He died at Indianapolis, November 1, 1877, as the result of an attack of paralysis. Morton possessed a powerful intellect, a determined will, and high executive ability, and was an orator of great popularity and force. An admirable biography has been written by W. D. Foulke (2 vols., Indianapolis, 1899).

MORTON, Samuel George (1799-1851). An American physician and natural scientist. He was born in Philadelphia. He became a student of medicine under Dr. Joseph Parrish, and was assisted in his studies by Dr. Richard Harlan, the natural historian, from whom he imbibed the strong taste for general science which always distinguished him. He became a doctor of medicine in 1820, and after three years of European study received a degree from Edinburgh University. In 1824 he began practice in Philadelphia, and soon attained a prominent position. In 1839 he was appointed professor of anatomy in the Pennsylvania College at Philadelphia, which chair he continued to fill until 1843. Besides his contributions to medical literature Morton was always engaged in general scientific investigation and writing. While abroad he studied the geology of Scotland, and on his return presented to the Academy of Science a collection of the greenstone rocks of Scotland. In 1827 he published an *Analysis of Tubular Spar from Bucks County*, and in the succeeding year some *Geological Observations.* He was besides an ethnologist of wide fame, and possessed an immense collection of skulls from all races of the world. His medical works are: *Illustrations of Pulmonary Consumption* (Philadelphia, 1834); an American edition of Mackintosh's *Principles of Pathology and Practice of Physic* (Philadelphia, 1836); *An Illustrated System of Human Anatomy* (Philadelphia, 1839); and *Crania Americana* (Philadelphia, 1839).

MORTON, Thomas (1564-1659). An English prelate, born in York, and educated at Cambridge. He was ordained a deacon in 1592, and became chaplain to Lord Huntingdon. Upon the death of Elizabeth he became chaplain to the Earl of Rutland. In his first work, *Apologia Catholica* (1605), he defended the Church of England and attacked the Jesuits, which he continued to do throughout his life. A royal chaplain, he was also successively Bishop of Chester, of Lichfield and Coventry, and of Durham. In 1641 he was mobbed by the people and was one of the twelve bishops impeached by the Parliament for high treason. Morton suffered four months' imprisonment and never resumed his seat in the House of Lords. His works include: *A Treatise of the Threefolde State of Man* (1596); *An Exact Discoverie of Romish Doctrine* (1605); *A Catholic Appeal for Protestants* (1610); *The Grand Imposture of the Church of Rome* (1628); *The Necessity of Christian Subjection* (1643); and *A Treatise of the Nature of God* (1669).

MORTON, Thomas (c.1590-1646). An English adventurer, by profession an attorney. He visited New England with Weston's expedition in 1622; and in 1625 he returned with Captain Wollaston's colony, which settled at Mount Wollaston, within the present limits of Quincy, Mass. After Wollaston's departure to Virginia the next year, Morton ousted Fitcher, who had been left in charge, and changed the name of the settlement to Ma-re-Mount or Merry-Mount. He began to trade with the Indians, and the settlement became the rendezvous for the reckless and dissolute. In 1627 he erected a May-pole eighty feet high, and the revels lasted for days. When this and the fact that he was supplying the Indians with firearms in defiance of King James's proclamation of 1622 became known at Plymouth, a remonstrance was sent to him. In 1628 he was captured by Capt. Miles Standish and sent back to England with charges. There he ingratiated himself with Sir Ferdinando Gorges. Meanwhile Endecott visited Merry-Mount, cut down the May-pole, and renamed the place Mount Dagon. In 1629 Morton returned to Plymouth and to Merry-Mount. In 1630 he was again arrested after several unsuccessful attempts, and was placed in the stocks, while his house was burned, and his property seized, on a charge of disorderly conduct and oppression of the Indians. When sent to England he again joined the Gorges claimants and furnished much information against the Massachusetts Colony. When the New England Council surrendered its charter in 1635 and divided the territory, Morton was appointed solicitor to press the confirmation of the deeds and the revocation of the Massachusetts charter. Only want of money prevented the destruction of the colony. In 1637 he published the *New English Canaan*, which had probably been written in 1634-35. The first part is an account of the Indians, the second a description of the country, and the third a confused, somewhat humorous account of the 'precise separatists' of Plymouth and Massachusetts Bay. In 1643 he again appeared in Plymouth, and remained through the winter. He then appeared in Maine and Rhode Island. In 1644 he was captured by the Massachusetts authorities, kept in prison a year, and fined £100 on charge of having made a complaint of the colonies to the council. He was released without payment of the fine, and died in Maine. Morton's life and his settlement at Merry-Mount form the subject of John Lothrop Motley's novels, *Morton's Hope* (1839) and *Merry-Mount* (1849), and one of Hawthorne's short stories is entitled *The Maypole of Merry-Mount.* Motley's book has been reprinted with an elaborate memoir and full notes by C. F. Adams, Jr., in the *Prince Society Publications* (Boston, 1883). Consult Adams, *Three Episodes in Massachusetts History* (Boston, 1892).

MORTON, William James (1845—). An American physician, son of William T. G. Morton, the introducer of ether anæsthesia. He was born in Boston, Mass., educated at the Boston Latin School, and graduated at Harvard in 1867. He engaged in teaching for a year, and then entered the Harvard Medical School, where he graduated in 1872, taking the Boylston prize for his thesis on Anæsthetics. After a hospital experience he engaged in practice in Bar Harbor, Maine, and in Boston. From 1873 to 1874 he pursued his studies at Vienna, going from there to Kimberley, in South Africa, where he built up a large practice and engaged in diamond mining. After two more years of European study he returned to America and settled in New York. Here he was for a time editor of the *Journal of Nervous and Mental Diseases;* was adjunct professor of nervous diseases at the New York Post-Graduate Medical School from 1882 to 1885; neurologist to the New York Infant Asylum from 1887 to 1890. Since 1890 he has been professor of nervous diseases and electro-therapeutics at the New York Post-Graduate Medical School. Dr. Morton's name has been intimately connected with the recent advances in electro-therapeutics, and he has contributed not a little to the advancement of this science. In 1880 he devised a mechanism consisting of a Holtz machine and Leyden jars by means of which a new variety of electric current was established (condensed currents in rapid discharge) and named by him the 'static induced current.' By the aid of this Morton current, as it is called in the scientific world, the X-ray can be produced, and Dr. Morton probably made the first X-ray picture in this country. He has made many contributions to medical literature, and is a member of numerous scientific bodies. He is a member of the State and county societies; of the New York Academy of Medicine; was president of the New York Neurological Society in 1874; of the New York Electro-therapeutic Society in 1894; of the American Electro-therapeutic Association in 1893; and is a member of several foreign societies.

MORTON, William Thomas Green (1819-68). An American dentist, exploiter of the general anæsthetic properties of sulphuric ether. He was born at Charlton, Mass. In 1840 he took up the study of dentistry at the Baltimore College of Dental Surgery, then recently established by the new Society of American Dental Surgeons. On his return to Boston in 1842 to practice Morton's attention was drawn toward medicine, and in 1844 he began study with Dr. Jackson of Boston, and continued in the Harvard Medical School. He did not complete his course, but was afterwards awarded the degree of M.D. *honoris causa* by the present College of Physicians and Surgeons, Baltimore. The art of dentistry was at that time in a transition stage, and Morton's inventive genius discovered many improvements, especially in attaching false teeth. He first devised a new solder by which teeth could be attached to gold plates, and further contrived to obviate dependence upon old fangs in inserting new teeth. The removal of these stumps or roots was attended with great pain, and alcoholic stimulation, laudanum, and the galvanic current were tried to diminish it, without avail. In the course of his investigations Morton became acquainted with the value of sulphuric ether as a local anæsthetic and used it in minor operations. After a long series of experiments on animals, he finally succeeded in proving the efficacy of vaporized ether, and making known his results to Dr. John C. Warren, he administered ether at the latter's request in the Massachusetts General Hospital, the operation being that of removing a tumor from the jaw. The first public demonstration was made October 16, 1846. At the suggestion of Dr. Oliver Wendell Holmes the new form of narcosis was christened 'anæsthesia.' Dr. Morton obtained a patent for the use of ether, under the name of 'letheon,' in 1846, a month after the operation in the hospital, and a month after this, in England. Dr. C. T. Jackson also claimed the honor of having made the discovery, and the Montyon prize of the French Academy was equally awarded to Dr. Morton and to Dr. Jackson, but Dr. Morton declined to accept it, which resulted in his receiving in 1852 the large gold medal, the Montyon prize in medicine and surgery. He claimed compensation from Congress for his invention, the Government having used it, and also from individuals, and he was involved in many suits. He received, however, no compensation, and his life was spent in contests, literary and legal, in regard to his invention. Memorials were presented to Congress signed by many physicians, but for one reason or another they failed to secure what was asked.

MORTON'S FORK. A famous dilemma said to have been proposed by the Chancellor of Henry VII. of England, John Morton (q.v.). In 1491 Henry resorted to the unconstitutional method of obtaining money by a benevolence (q.v.), and Morton in carrying out the scheme is supposed to have told those who lived well that their opulence was proved by their large expenditure; while those who spent little were told that they must have saved considerable by their economy. Either class could well afford to assist the sovereign.

MORTUARY CUSTOMS. Observances connected with death and burial. The care of the dying and of the dead is a marked feature of religion among all peoples, from the lowest to the highest, and is associated most closely with spirit belief and custom. It is possible to treat the subject ethnically, enumerating and classifying peoples by their mortuary customs, or culturally, studying the genesis and development of each class of actions and beliefs involved. The latter method is here adopted. Mortuary customs, for the convenience of study, may be considered under the following heads, which by their characteristics as well as by their presence or absence are worthy of note.

(1) Customs concerning the dying.

(2) Treatment of the corpse, including the posture of the body, bathing, cutting, decapitating, embalming, or cremating the corpse, or scraping the bones.

(3) Clothing or wrappings of the corpse.

(4) Incasement of the corpse in the crate, basket, jar, box, or other receptacle which may answer to the coffin. In this, protection and convenience of carrying are the ends desired.

(5) Watching the corpse, including the wake and funeral feast.

(6) Bearing the corpse to the place intended for it, the funeral, with all its apparatus, processions, and rites.

(7) Disposal of the corpse.

(8) Post-mortem ceremonies, passing under the general term mourning.

(9) Cult of and for the dead, beliefs about the dead, the ghost, necromancy.

(10) Memorials for the dead, mementos preserved or worn, and monuments of every kind.

(11) Ascriptions to the dead, epitaphs, mortuary sayings, and literature.

Customs Concerning the Dying. In the belief of the lower races, death from natural causes is a thing unknown; it is always the act of some god or personage, designed and chiefly malevolent. Every disease and every death among the Polynesians is held to be caused by the gods for some crime against taboo or as the result of some offering by an enemy. Hence the neglect and cruel treatment of the sick. Even death caused by poison is thought to be due to the displeasure of the gods.

Care for the dying can scarcely be said to exist among savages, although the most strenuous efforts of the magician and friends are put forth to exorcise the destroying angel and thus to restore the patient. The moment hope has departed, the preparations for burial are begun almost before the breath has left the body. So strong is the belief in the necessary connection between magic and death among the Australians that when a man believes he has been 'pointed at' or run through with a magic spear that has been 'sung' he frequently dies. Well authenticated cases are on record in which the slightest ailment or wound has resulted fatally, because the victim was convinced that the instrument had been charmed by magic. For many forms of conjuring there is no remedy. In others a cure is possible by the aid of a magician belonging to the totem of the person who 'pointed' at the sick man. The practices of the medicine men are almost universally the same. They make the same passes, suck the wound, and mutter incantations, and the imagination of the patient often effects a cure.

Treatment of the Corpse. No sooner has life become extinct than the preparation of the body begins. For economy's sake most primitive tribes double the corpse into the smallest compass, the chin resting on the knees. Even among such an advanced people as the ancient Peruvians this custom of packing the body into the smallest compass prevailed, a strong rope being used to draw the limbs into place and bind them fast. It has been said that the motive in this is to imitate the posture of the unborn infant, but aside from the fact that crouching is a common position in life among savages, economy of space in the grave or tomb has much to do with the custom.

Embalming the dead was at first only a natural process. There are regions where the arid climate desiccates all flesh, as on the plains of the West, and in Peru, Egypt, and Arabia. Here, the drying up of the body suggested to the primitive mind religious ceremonies which found their culmination in the all-absorbing mortuary cult of Egypt. The Polynesians when first discovered had an elaborate ceremony of embalming their dead priests. The brains and intestines were removed, and all moisture was carefully wiped from the body, which was anointed with fragrant oils and dried in the sun. It was then clothed and seated in a little house erected for the purpose, where a table was set before it for food, fruits, and flowers. Here also belong such ceremonies as calling the dead, anointing, closing the eyes and lips, bathing, kissing, placing coin in the mouth, all of which have symbolical meanings with reference to the future well-being of the dead, as well as to the immediate relations of the ghost with the living.

Clothing or Wrappings of the Corpse. Scarcely any people consigns its dead to the last resting place naked. The corpse is clad either with the clothing worn in life, or the best attire, or special grave cloths, shrouds, or winding sheets. Futhermore, masks are frequently placed over the whole body or over the face. Among the very lowest peoples the corpse may be put away naked, but this takes place only among those tribes that wear no clothing. The preparation of a special shroud has its prototype even among very primitive races, and begins with the chiefs or leading men, who in life wear an official or professional dress. The order of the development of cerements seems to have been first, the disposal of the body naked; second, dressing the corpse as in life in order to take up the new life in the spirit world at once; third, arraying it in its best clothing, to make a good impression on the ghosts among whom it goes; fourth, wrapping it in a shroud for sentimental reasons. Among the Egyptians the corpse was wrapped with narrow strips of linen. In Turkestan a similar practice is now in vogue, in Kimbondo leather is used, and in Mashonaland the toes and fingers are tied up each in a separate piece of cloth.

Incasement of the Corpse. The receptacles for the dead body are of many sorts. Among the ancient Aleuts the corpse was doubled up and fully clothed. It was then crated, hung on the wall of a cave, or set in a safe place on the floor. The Eskimo employ tough walrus hide as a case for the dead. The Pacific Coast tribes, wherever the giant cedar grows, make boxes or hollow logs for the corpse. The Plains Indians crated the bodies of the dead and all their belongings before placing them on the platforms, and the old cave people of Utah packed them in burden baskets.

The Southern Indians made hurdles of cane and rolled them about the corpse. Farther south no coffin was needed, for the bodies were exposed in *quiobogons* or dead houses until the flesh was gone, after which the bones were buried in the earth or in jars. Some of the ancient mound-builders made a stone box or coffin in the grave for the bones.

A common motive among primitive tribes in using the coffin was to hold the bones together for burial. Custom demanded it, and the ever watchful and jealous ghost required it. Again, the coffin or its substitute guarded the corpse from ravenous beasts and birds of prey, and it may also be possible that among some tribes the dead are boxed up to prevent them from escaping or being spirited away by unfriendly ghosts. In many tribes the habitation motive prevails; the coffin or tomb is regarded as the house of the dead.

Watching the Corpse. Between death and burial the spirit or the double of the dead hovers around the body, and expects the most rigid adherence to custom. This belief is the origin of the widespread custom of lykewake, or watching the corpse. Among many primitive tribes the dead are not hurried to burial, but the ceremonies of mourning begin around the corpse. The Polynesians placed the body of the dead on a bier-like frame covered with white tapa, which was decorated with flowers, or upon a bed of fragrant leaves. Relatives sat around lamenting and cutting themselves with sharks' teeth. Vigils about the dead are widespread among the white races. The folk-lore of the civilized abounds in customs during the day or two that intervene between death and burial. The watch feast, or wake, has dwindled to a company of a few friends. Salt is placed on the breast of the dead, a candle burns night and day at the head of the coffin. The sin-eater takes bread and publicly devours it for the misdeeds of the deceased.

Removing the Corpse to the Place Intended for It. The funeral proper is one of the most solemn of rites the world over. Among many tribes the corpse must be taken out of the dwelling through the roof or by some roundabout way, in order that the ghost may get bewildered and not return. The procession to the grave, among savages, has changed little in the course of centuries. Usually, mutilations of a more or less cruel character are then observed by certain persons, while among other tribes only a small number carry the dead away and are thereafter unclean.

Disposal of the Corpse. The disposal of the corpse does not necessarily mean interment. We may distinguish five methods which have undergone countless modifications as outgrowths of race, climate, soil, and grade of culture. (1) *Exposure.*—The bodies are not sealed up, but are left to destruction on the ground (rare), or are hidden in clefts, caves, or grottoes; in the hut where the death took place; on trees, posts, scaffolds, or platforms; in boxes or canoes; in log pens, or dead houses; or in Towers of Silence. (2) *Aquatic Burial.*—The corpse is placed on the water or under the water, as among the Hindus, who consign dead bodies to the Ganges. (3) *Inhumation.*—The corpse is buried in a single grave, which is often shelved or recessed; in pits or Golgothas; in cairns, or under mounds or tumuli; under the floor of the home or in consecrated structures. (4) *Encysted.*—The body is inclosed in rude boxes of wood, stone, or other materials, which are placed in dolmens, vaults, sepulchres, house-tombs, kistvaens, or mausoleums. (5) *Cremation.*—The corpse is burned and the ashes are abandoned, scattered, buried, boxed, or inurned.

In this connection belongs the custom of making deposits with the dead. No other part of this complicated series of customs comes so near to the world of shades. Thus in Dahomey the bodies of wives and slaves were sacrificed without number, and in the days of knighthood the horse and armor accompanied the warrior. It is through these relics found with the dead that archæology is to a large extent possible. Most extinct peoples were without the art of writing; but stone implements, pottery, objects in bone and metal, and even textile fabrics reveal enough to enable the archæologist to reconstruct ancient society. Among some American tribes articles of use were punctured or broken before being placed in the grave. One of the tribe who robbed a grave would not be tolerated, but an inimical tribe might be tempted. The Polynesians would rob sacred inclosures of the enemies' dead in time of war and steal the bones of distinguished men to make tools, fish-hooks, and other degrading implements. To avoid this, bones were carried to the caverns far away and hidden in clefts of rocks. In the Fiji Islands favorite wives as well as slaves were strangled on the death of a chief in order that they might wait upon him and be happy with him in the spirit world. To this they gladly submitted, not only in the prospect of greater happiness, but to avoid unspeakable miseries in after life.

Post-Mortem Ceremonies. These may be grouped together under the general head of mourning, including both what is done and what is left undone in dress, conduct, etiquette, and rites. As soon as a burial takes place among the Australians and other savage races, the camp is burned down, everything in it is destroyed, and the people move to another place. During the mourning period no person must mention the name of the dead except in case of necessity, when it must be done in a whisper for fear of annoying the ghost. If the ghost should hear the name mentioned it would come to the conclusion that the relatives were not properly mourning, and they would be in consequence liable to his vengeance; for if their grief were genuine, it would cause them too much pain to hear his name mentioned to allow them to speak it.

Many seemingly absurd customs about the graves or tombs of the dead are easily explained when it is kept in mind that the dead are not regarded as really dead. Putting rags or parts of torn clothing about the tombs, or on trees near by, as a notice to the ghost that the appropriate rending of garments had taken place, is one of these customs. A complete list of them would fill a volume. It is enough to mention the tolling of bells, choice and fashions of mourning, cutting one's flesh, calling the dead, turning pictures toward the wall, feeding the dead, scrupulous care of the grave, hired mourners, and the imperative customs as to who shall mourn, when, how long, and how, sacrifices at the grave, naming the dead, and the widow's lot.

Cult of and for the Dead. The ghostly world of savages is never far away. The anthropomorphism of nature does not end with this life. The dead go at once to some place on the earth or under the earth where the most congenial occupations are renewed. When the ghost of the Polynesian leaves the body it is drawn out through the head as the sword is pulled out from the scabbard. Evil powers also lie in wait for the ghost to seize it when it is drawn out. Arriving safely at the place of the blessed, it is devoured by the gods, cannibalism being in full vogue above.

Not in savagery only, but in all races, ages, and grades of culture this belief in the nearness of lost ones is held. More than this, reincarnation and metempsychosis are believed to be possible. The savage woman complacently murders her babe thinking that the same one will enter into the mother's womb and be born again. As the dead are not considered dead, but are even more powerful as ghosts than they were as men, a complex and wide-reaching cult of almost universal extent has been evolved, which has for its object the propitiation and gratification of the spirits of the dead. See Demonology; Ghosts.

Memorials for the Dead. Combined with the fear of the dead is a desire, primarily, perhaps, based on anxiety to propitiate the ghost by a proof of suitable mourning, and later founded on real affection, to preserve the memory of the departed. The Andamanese widow carefully dries the skull of her deceased husband, paints it with ochre, decorates it with rude lace-work, and wears it for a memorial about the neck. Analogous synecdochic preservation of the dead is almost universal among primitive peoples. The Eskimo place by the side of the grave the huge jaw of a whale. The Northern Pacific tribes set up great posts of cedar. The ancient people of the Mississippi Valley built mounds of earth and stone. In Easter Island images cut in lava were memorials. The Tahitians set up little models of their houses about six feet high where the body of a chief clothed and rubbed with aromatic substances was laid while offerings were made. These all tell the same story. As culture advanced monuments (q.v.) became more elaborate, and the modern cemetery differs from the primitive memorials in degree rather than in kind.

Ascriptions to the Dead. The custom of eulogizing the dead is extremely primitive and ancient. The Polynesians had professional bards who composed elegies which were committed to memory and preserved. These were recited on special occasions when the dead were mentioned. The American Indians had a solemn style of speech for such occasions quite above the grasp of the ordinary man, while the great epics of Greece and Rome abound in passages over the dead of deepest pathos. Here, too, belong the entire body of epitaphs, or memorial inscriptions placed on tombs in honor of the dead who are laid in them.

MORVI, môr-vē′. A native Gujarat State of Bombay, India, on the Kathiawar Peninsula (q.v.). Area, 821 square miles. Population, estimated at 106,000. Capital, Morvi.

MOSAIC (ML. *mosaïcus*, Gk. μουσαῖος, *mousaios*, mosaic, artistic, relating to the Muses, from μοῦσα, *mousa*, Muse). A branch of fine art which was especially prominent during the Middle Ages, though not unknown to antiquity, and is still practiced to a limited extent. Mosaic work, when it attained full growth, had various branches. It was used: (1) on floors; (2) on walls; (3) on detached objects, monuments or furniture. It consisted of the grouping of pieces of marble, glass, or enamel so as to form ornamental or figured compositions. In the *opus sectile* the thin marble plates were cut so as to follow the outlines of the design, and it is not properly a branch of mosaic. *Opus tessellatum* is the best technical term, the *tessellæ* meaning the small cubes forming the mosaic. Marble cubes were used for floors altogether, though glass was occasionally mingled with them in the Middle Ages. For wall compositions, architectural details, and furniture, though marbles were at first used almost exclusively, the possibility of producing a greater variety of shades in artificial enamels led to their exclusive use on walls as early as the fifth century and in furniture after the eleventh century. The cubes used for figures were usually smaller than those used for decorative work. Some are as small as three millimeters, more than one hundred thousand being contained in a square meter. Gilt cubes were made by inclosing the gold leaf between two pieces of white glass. The cubes were colored with metallic oxides. Colored glass was first cut into long narrow sticks and these again broken into the cubes, which were sorted into their separate cases, according to colors and shades, like printers' type. To execute a wall composition the mosaicist prepared his cartoons; the mason plastered as large a section of the wall as could be covered in a day; the mosaicist stenciled or dotted his cartoon on to the wet plaster and then rapidly fastened to it the mosaic cubes. The surfaces were flattened, washed, and burnished. In the best work the cubes are not absolutely even or adjacent, so that mechanical effects are avoided.

Origin. The Greeks before Alexander apparently did not practice any kind of mosaic work; it first appears in the Alexandrian age, and probably originated in Egypt. It came into prominence for its reproductions in permanent form of famous paintings on the floors of public and private buildings. We even hear that scenes from the Trojan War were represented on floors of the great ship of Hiero of Syracuse. A famous floor at Pompeii represents in a grand composition a scene of Alexander's victory at Issus, full of action and variety. Even larger and more complicated is the Nile scene of a floor found at Palestrina, with its inundated city, its fishing and other genre scenes.

Roman Mosaics. Although the Romans were not ignorant of the use of glass cubes on walls, they never developed this branch of mosaic work; the fountains and niches at Pompeii and Ostia are almost the only surviving examples. But in their pavements they showed the greatest variety, from the simple crude geometric designs in black and white to the exquisite gradations of color and form in such works as the Capitoline doves, the landscapes from Hadrian's villa in Rome and Berlin, the Pompeian actors by Dioscorides in Naples, the portraits of poets and philosophers at Cologne, and many more. Midway between stand such colossal works as the gladiator pavement of the Baths of Caracalla. Roman mosaic pavements of artistic value have been found not only throughout Italy, but in France, Spain, Germany, Hungary, North Africa, Syria, and Asia Minor.

Early Christian. In the fourth century, Christian artists perceived the value for church interiors of the rich coloring and permanency of mosaic. No form of painting harmonizes so well with architecture. Mosaics were placed nearly always in the apses and on the triumphal arches of the early Christian basilicas, and in important cases upon the walls of the nave, and sometimes both on the inside and outside walls of the façades. The interiors of mausoleums and baptisteries were covered with them on dome, walls, and apse. While the upper part of the walls was decorated in this way with figured mosaic composition, the geometric mosaics or *opus sectile* were used on the dadoes below, and the marble geometric mosaics covered the floors. In the later Middle Ages, the twisted columns, sepulchral monuments, altar canopies, pulpits, choir screens, and other details were entirely inlaid in geometric designs, in the East and in Italy. The wealth of works is concentrated in Italy and in the purely Hellenic world. Rome and Ravenna had special schools with offshoots at Naples, Milan, Grado, and Parenzo. Constantinople and Thessalonica, also, were independent centres, radiating over Greek lands.

Rome preserves the earliest Christian works at Santa Costanza, similar to Catacomb frescoes, and at Santa Pudenziana, the counterpart of the Christian sarcophagi with Christ and the Apostles. The earliest series where mosaic painting attempts a great scheme of subjects taken from the Old and New Testaments is in Santa Maria Maggiore in Rome, on apse, triumphal arch, and nave. The mosaics over the chancel arch of Saint Paul's, representing subjects from the Apocalypse, date from the fifth century. In both cases the composition is still confused, the art has not yet found itself. It was from Greek artists that the solution came, in the introduction of the uniform gold background, against which the figures stood out clearly, as compared with the old white ground. At Ravenna we see this style in its earliest glory in the two baptisteries (fifth century), and especially in the mausoleum of Galla Placidia (440) and later in the Church of Sant' Apollinare Nuovo (c.500-550). The latter monument has its entire main walls covered with a triple row of mosaics. Thoroughly Greek also is the culminating work of the sixth century, the decoration of San Vitale, also at Ravenna, with its two great historic panels of Justinian and Theodora, the Byzantine court and the ecclesiastical grandees.

Meanwhile the Roman school had somewhat fallen from its supremacy, for the only great work after Saint Paul's was the mosaic of Saints Cosmas and Damian (530), after which Rome suffered from the wars between the Goths and Byzantines and the attacks of the Lombards. The decline reached Ravenna in the seventh century, as is shown at Sant' Apollinare in Classe, and continued in Rome, with Italo-Byzantine stiffness, as in the works at San Lorenzo, Sant' Agnese, and San Venanzio. The coloring is still superb, but the figures are rigid and staring.

MEDIÆVAL. The Carolingian era saw a revival in both East and West about the year 800, which lasted for less than a century in Italy, but continued in the East from Basil the Macedonian to the capture of Constantinople by the Crusaders in 1204. In Rome the mosaics of the Church of Santa Prassede, especially the scenes from the Apocalypse, are a masterpiece, while Santi Nereo ed Achilleo and San Marco are of secondary importance. The art did not then spread beyond Rome, as in the earlier period. Only in the Orient was it still supreme. The real revival of the art in the West came in the eleventh century and was due to Byzantine influence and imported Byzantine artists. The two great schools were that of Sicily and Campania, with its masterpieces of Cefalù, Palermo, and Monreale, and that of Venice, represented at San Marco, Torcello, and Murano. In variety of subject, in splendor of color, and in sheer amount, these works surpass the mosaics of the fifth and sixth centuries.

The Roman school took part in this revival, but mingled antique traditions with Byzantinism, and retained a freedom and beauty of decoration and detail foreign to the other schools. It can best be studied at San Clemente, Santa Maria in Trastevere, Santa Maria Maggiore, and Saint John Lateran. In some of these works we can trace the first steps in the great revival of painting usually connected with the names of Cimabue and Giotto.

PAVEMENTS AND DECORATION. Meanwhile the mediæval mosaicists had been executing pavements far more beautiful than any geometric floors of antiquity. The Byzantine school, as usual, took the lead, and the exquisite designs and coloring of the pavements of San Marco and the Torcello Cathedral at Venice are but repetitions of the pavements of the churches of Constantinople, Salonica, Mount Athos, Chios, and elsewhere. The Italian school, though centring at Rome, did similar work in Campania and Sicily. The small marble cubes were worked in patterns around large circular, square, long, or polygonal slabs of porphyry, serpentine, verde antico, rosso antico, or other rich marbles which formed the centre of each design.

It was not long before the geometric designs of the floors were transferred to the various details and objects in the church interiors, thus forming a perfectly harmonious whole. The altar fronts and canopies at Ferentino, the canopies at Santa Cecilia and San Paolo at Rome, the choir seats at Cività Castellana and San Lorenzo at Rome, the pulpits at Alba Fucense, San Lorenzo, Palermo, Salerno, and Ravello, the choir screens at the two latter cathedrals and at Alba, the Paschal candlesticks at Anagni, Ferentino, Santa Cecilia, and Salerno, the episcopal thrones at San Lorenzo and Fondi, the sepulchral monuments at San Francesco in Viterbo, at the Cathedral of Perugia, at Orvieto, at Assisi, Rome (Santa Maria Maggiore, Sopra Minerva, Ara Cœli, etc.), are a few among hundreds which made the interiors of churches wonderfully rich in this part of Italy.

The geometrical mosaic patterns even invaded the field of architecture. The portals were surrounded by it; it formed the main decoration of the colonnaded porticoes, and even of the cloisters. The cloisters of San Paolo and of the Lateran at Rome would lose all their beauty if their columns and friezes were divested of the color and design given by these mosaics. Even Tuscan church architecture felt this influence to the extent of obtaining a faintly similar effect by *opus sectile* with broader design—as at Pisa (baptistery) and San Miniato, near Florence.

None of the European countries besides Italy and Greece used mosaics. An occasional work is found in Germany, France, or England; but, as at Westminster Abbey, it is the work of an Italian or a Greek. Only in Russia, as at Kiev and Novgorod, can we trace the existence of a regular branch of the art.

MOHAMMEDAN. The art passed from the Byzantine Greeks in the East to the Mohammedans, and was used by them for pavements and the revetments of walls in nearly all the schools, but especially in Egypt, Spain, and Syria. Figured mosaics were substantially forbidden by the law of the Prophet, so that decorative, and especially geometric, patterns were alone used. Mosques, fountains, palaces, baths, and other buildings, between the tenth and fifteenth centuries, had them in profusion. The mosques of Cairo (see MOSQUE) contain an unbroken series which is paralleled in the old Coptic churches of the city. It is probable, in fact, that most of the mosaicists of the mosques were Christian Copts. The Alhambra at Granada contains dadoes of this geometric ornament, though here and in Syria, and especially in Persia, it was less used than the enameled tiles.

MODERN. With the rise of the Giottesque school early in the fourteenth century the golden age of mosaic painting ended, frescoes taking its place. Such works as appear on the façades of Orvieto and Siena cathedrals by Orcagna and his contemporaries in the fourteenth century are purely decorative. Henceforth mosaic loses its individuality, and seeks to imitate the delicate soft tones of fresco and then of oil. Great artists like Raphael (Santa Maria del Popolo, Rome), Titian, and Tintoretto (San Marco, Venice) furnished cartoons to be carried out by mosaicists, who are no longer artists, but mechanics. The atelier of the Vatican, busy producing altar-pieces for Saint Peter in exact imitation of masterpieces in oils, multiplying shades and minimizing the size of the mosaic cubes, has perfected this mechanical method. The atelier at Venice is the only other modern centre of importance. These modern artisans, in their restorations of mediæval mosaics, have done immense damage by trying to 'improve' on the originals, setting the cubes closer together and with greater regularity and smoothness, thus ruining their art. They have long since abandoned the method of working directly on the wall, which had previously been universal, and they either set the cubes, face up, in portable compartments, which when filled are covered with linen prepared with glue and then transferred to the wall, the linen or paper being then wet and removed, or else they set the cubes, face down, directly on the adhesive paper or linen, on which the design is marked, with similar frames, and then effect the transfer to the prepared wall.

Bibliography. The subject of mosaics is well treated in Woltmann and Woermann, *History of Painting* (Eng. trans. New York, 1880); a good general monograph is Gerspach, *La mosaïque* (Paris, 1885). The technique is carefully described by E. Müntz in *La mosaïque chrétienne* (Paris, 1893). All the mosaics of the Roman churches are reproduced in large colored plates and described by De Rossi, *Musaici cristiani di Roma* (Rome, 1876-94). The same has been done for those of Saint Mark's in Venice by Organia in *La basilica di S. Marco* (Venice, 1881-88); for Monreale by Gravina, *Il duomo di Monreale* (Palermo, 1859). All the figured mosaics earlier than A.D. 900 are outlined and described in Garrucci, *Storia dell' arte cristiana* (Prato, 1873-81). Consult also: Pohl, *Die altchristliche Fresko- und Mosaikmalerei* (Leipzig, 1888), and Kurth, *Die Mosaiken der christlichen Aera* (ib., 1902 et seq.).

MOSAIC DISEASE. See Tobacco.

MOSAIC WOOL. See Rugs.

MO′SASAU′RIA (Neo-Lat., from Lat. *Mosa*, the river Meuse + Gk. σαῦρος, *sauros*, lizard). An order of extinct marine reptiles—the Pythonomorpha of Cope. The reptiles possessed the slenderness of a snake combined with strong paddles, such as those of the whale, together with many lizard-like characters. The first specimen of a nearly perfect head skeleton was discovered in 1780 in the upper chalk of Saint Pietersberg, in Holland, on the Meuse River. A few other specimens have been found in the Cretaceous of England and Europe. In North America this reptile seems to have attained its most flourishing existence, for over fifty species, included in several genera, have been found. The Cretaceous of New Jersey has yielded fifteen species. The Yale College collection contains a great number of specimens. *Mosasaurus princeps* from New Jersey is estimated to have been 40 feet long, and *Tylosaurus dyspelor* from Kansas was about 30 feet in length. Consult: Marsh, "Cretaceous Vertebrates of the West," *United States Geological Survey Reports* (Washington, 1875); Lucas, *Animals of the Past* (New York, 1901).

MOSBY, mōz′bĭ, John Singleton (1833—). An American soldier in the Confederate service, born at Edgemont, Powhatan County, Va. He was educated at the University of Virginia, studied law, and was practicing his profession at Bristol, Washington County, Va., at the outbreak of the Civil War. After serving under Joseph E. Johnston in the Shenandoah Valley, in the winter of 1861-62, he was appointed by Gen. J. E. B. Stuart an independent scout, and guided that officer's cavalry in a bold raid in the rear of McClellan's army on the Chickahominy, in June, 1862. Returning to Richmond after a short captivity early in 1863, Mosby recruited an independent body of cavalry for scouting and raiding purposes, and he then began his remarkable career as a 'partisan' leader of an irregular force known as rangers, with which, until the close of hostilities, he operated in Virginia and Maryland. His force was subsequently organized as a regular branch of the Confederate service as the Forty-third Battalion of Virginia Cavalry. His most brilliant exploit was the capture, in March, 1863, of Brigadier-General Stoughton, U.S.A., at that officer's headquarters at Fairfax Courthouse, which he accomplished by a raid inside the Federal lines. Promoted to be major as a reward for this capture, he followed Lee's army into Pennsylvania in June, 1863, and worried the flanks of the Federal army as it moved southward after Gettysburg. In January, 1864, he was repulsed with considerable loss in a night attack on Harper's Ferry. In May he harassed the rear of Grant's army as it advanced on Fredericksburg, and later made a long raid in Maryland. In August he made one of the most important captures of his career, consisting of Sheridan's entire supply train, which he surprised near Berryville. The loss was such a heavy one to Sheridan as to compel him to fall back on Harper's Ferry. In September he was wounded at Falls Church, but in the following month was again in the saddle, captured two Federal paymasters with $168,000 in greenbacks, tore up the Baltimore and Ohio Railway tracks, destroyed rolling stock and made a prisoner of Brigadier-General Duffié. In December, 1864, he was promoted to be colonel. After being disabled for a short time by a wound, he continued his operations until Lee's surrender, when he disbanded his troops, gave himself up, and by General Grant's intercession was paroled. After the war he opened a law office at Warrenton, Va., and became a member of the Republican Party, which he thought could best settle the question of reconstruction satisfactorily. From 1878 to 1885 he was United States Consul at Hong Kong. On his return to America he established himself in law practice in San Francisco. He published an account of his exploits entitled *War Reminiscences* (1887). Consult also: Scott, *Partisan Life with Mosby* (New York, 1867); Crawford, *Mosby and His Men* (1867); Williamson, *Mosby's Rangers* (New York, 1896).

MOSCHELES, mō′she-lĕs, Felix (1833—). An English painter and author. He was born in London, and studied art in Paris and under Van Lerius in Antwerp. Afterwards he exhibited in Antwerp, at the Paris Salon, and at the Academy and New Gallery in London. His works include genre scenes and portraits of Mazzini, Gounod, Browning, Rubinstein, Stanley, and ex-President Cleveland. He wrote: *Felix Mendelssohn's Letters to Ignaz and Charlotte Moscheles* (1888); *In Bohemia with Du Maurier* (1897); and *Fragments of an Autobiography* (1899). He also wrote pamphlets on the subject of international arbitration and peace associations, such as *Patriotism as an Incentive to Warfare.*

MOSCHELES, Ignaz (1794-1870). An Austrian piano virtuoso and composer, born in Prague, of Jewish parentage. After a course of study at the Prague Conservatory he went to Vienna, where he became a pupil of Albrechtsberger and Salieri. He was a remarkable improvisator, and won his greatest successes as much by that gift as by the more important discovery of the 'singing tone' by which he secured modifications of tone and variations in tone color by means of touch—an art subsequently developed by Liszt and his school. Although he was very successful in his tours of Russia, Holland, Germany, and France, his greatest fame was won in London, in which city he took up his residence in 1821. He did not, however, sever his connection with the Continent, for in 1824 he was giving lessons in Berlin, where he numbered Mendelssohn among his pupils, and formed a friendship with him that was of great mutual profit. He was of much assistance to Mendelssohn when that master first visited England, and was in turn persuaded to join Mendelssohn in the management of the newly formed Leipzig Conservatory (1824). With the exception of five concertos and a collection of studies which are still highly esteemed, his compositions are gradually being forgotten. His works include piano concertos, arrangements, instrumental chamber music, sonatas, and numerous études, about 140 opus numbers altogether. He died in Leipzig. Consult *Aus Moscheles' Leben. Nach Briefen und Tagebüchern herausgegeben* (Leipzig, 1872); English translation by Coleridge.

MOSCHEROSCH, mō′she-rȯsh, Johann Michael (1601-69). A German satirist of the seventeenth century. He came of an old Spanish family, and was born at Willstett, near Strassburg, and wrote under the name Philander von Sittewald. He studied in Strassburg, and held various diplomatic positions. He was admitted to the Fruchtbringende Gesellschaft in 1645 with the name of 'Dreamer,' and about 1640 published his "Book of Visions," *Wunderliche und wahrhaftige Geschichte*, apparently patterned after Quevedo's *Sueños*. Consult: Nickels, *Moscherosch als Pädagog* (Leipzig, 1883), and Pariser, *Beiträge zu einer Biographie von Moscherosch* (Munich, 1891).

MOSCHI, mŏs′kī (Lat., from Gk. Μόσχοι). An ancient people of Asia, living south of the Caucasus. According to Pliny they dwelt around the sources of the Phasis, between the Euxine and Caspian seas. Their name by early writers is often coupled with that of the Tibareni, and the two people are generally identified with the Meshech and Tubal of Scripture. Under the appellation of Muskai they appear in the cuneiform inscriptions as carrying on war against Tiglathpileser, King of Assyria (c.1150 B.C.), who defeated their forces and overthrew their five kings. Consult Rawlinson, *Five Great Monarchies, Assyria* (London, 1867).

MOSCHUS, mŏs′kŭs (Lat., from Gk. Μόσχος). A Greek bucolic poet of the second century B.C., apparently a native of Southern Italy. Besides some short poems we possess his "Lament for Bion" ('Επιτάφιος Βίωνος), his teacher, which is an imitation of Bion's "Lament for Adonis;" also his "Rape of Europa" (Εὐρώπη) and his "Cupid the Runaway" (῎Ερως δραπέτης). His poems were united in antiquity with those of Theocritus and Bion, and appear with them in modern editions also. He was translated by Lang (London, 1896).

MOSCOSO DE ALVARADO, mȯs-kō′sȯ dȧ äl′vȧ-rä′ᴅȯ, Luis de (1505-61). A Spanish soldier and explorer in America. He was born in Badajoz, and was a kinsman of Alvarado (q.v.), whom he followed to Peru. Four years afterwards, with De Soto (q.v.), he started for Florida, and succeeded him in command in 1542. After terrible privations and with decimated forces he reached Mexico in 1543. There Mendoza received him kindly. In 1551 Moscoso accompanied Mendoza to Peru, where he died.

MOSCOW, mŏs′kō (Russ. *Moskva*). A government of Central Russia, bounded by the Government of Tver on the northwest, Vladimir on the northeast, Ryazan on the east, Tula and Kaluga on the south, and Smolensk on the west (Map: Russia, E 3). Area, 12,875 square miles. It occupies a portion of the central plateau of Russia, and slopes eastward toward the Oka. It belongs to the basin of the Volga, and is watered by that river and the Oka on the boundaries, and by the Klyama, Moskva, and other rivers in the interior. Geologically the government belongs to the Moscow coal basin, the carboniferous formation being covered up with various clays, sandstone, and marble. The soil is loamy and not very fertile. About 40 per cent. of the area is clothed in forests, mostly belonging to private persons.

Agriculture is highly developed, and the farm products are of great diversity. Rye, potatoes, and oats are the staples. Gardening is carried on extensively, and vegetables are raised in quantities sufficient to be exported to Saint Petersburg and Kronstadt. Stock-raising is also important.

Moscow is the leading manufacturing government of Russia. In 1896 it had 1755 manufacturing establishments, employing over 207,000 hands. The value of the output of that year was over $130,000,000. The chief products are textiles (especially cotton and silk), which were manufactured in that year to the value of over $80,000,000. Other important products are machinery, brick, chemicals, knit goods, etc. An important item in the economic life of the government is the house industry, which has reached here a higher degree of development than in any other part of Russia. It exists all over the province, groups of villages being engaged in the manufacturing of one product. The articles manufactured in this way are of a very wide range, including leather and leather products, hats, pins, brushes, cheap chromos, carriages and wagons, lace, gloves, etc. It is estimated that agriculture furnishes on the average only about 40 per cent. of the income of a peasant family in the government.

The commerce in the products of the house industry is of great extent, and is centred chiefly in the city of Moscow. The government is well supplied with transportation facilities, being traversed by six of the most important railway lines of the Empire. Education is meagrely provided for. The proportion of illiterates is estimated at 80 per cent. Population, in 1897, 2,433,356, chiefly Great Russians. Capital, Moscow.

MOSCOW. The second capital and historically the most famous city of the Russian Empire, capital of the military district and government of the same name, and the second largest city of Russia. It is situated on the river Moskva (a tributary of the Oka) in latitude 55° 45′ N., and longitude 37° 37′ E., 400 miles southeast of Saint Petersburg, at an altitude of from 500 to 850 feet above the level of the sea (Map: Russia, E 3). It has a rather cold climate, the annual temperature being 39° F., ranging from a mean of 12° in January to 66° in July.

The city is irregularly built. On the northern bank of the river rises the Kremlin, the acropolis of old Moscow, for many centuries the centre of the political and religious life of Russia and still the most venerated place in the heart of every Russian. It was the nucleus of the modern city and contained in the early periods of the history of Moscow the palace of the Czar, the chief churches and monasteries, and the palaces of the nobility. As the city developed, the merchants and the numerous artisans began to settle outside of the walls. Thus grew up the commercial quarter east of the Kremlin, known as the Kitai Gorod (Chinatown), still constituting the commercial centre of Moscow, and numerous small communities independent in their internal administration and composed mostly of members of the same trade. These divisions are still retained to a large extent in the parishes into which the city is divided. They were subsequently grouped together and surrounded by walls, and now form the Byely Gorod (white town), surrounding the Kremlin and the Kitai Gorod, and the Zemlyanoi Gorod (earthen town), inclosing all the above-mentioned quarters as well as Zamoskvoryetchye on the southern bank of the river. There is also a fourth inclosure (Kramer-Kollezh, earthen wall) surrounding the outer parts of the city and forming the limits of Moscow proper. Only the walls of the Kremlin and of the Kitai Gorod have been preserved, all others having been converted into boulevards and avenues. See KREMLIN for illustration.

Although one of the oldest cities of Russia, Moscow has preserved comparatively few architectural monuments outside of its churches and monasteries, most of the old buildings having perished in the destructive conflagrations which figure so prominently in the history of the city. With the introduction of Western civilization into Russia by Peter the Great and his successors, the Russian style of architecture gradually disappeared in connection with the secular and private buildings, and the application of Western standards not infrequently produced very peculiar results. Under Alexander II. a revival of Russian architecture was inaugurated and a number of successful restorations have been accomplished. The chief interest of Moscow, as already stated, is centred in the Kremlin, both for its historical associations and for its churches and monasteries with their semi-barbaric splendor and curious architecture. The Kremlin is nearly triangular in shape and surrounded by a wall about a mile and a half long. The wall is surmounted by 18 towers and pierced by 5 gates, among which is the Spasskiya Vorota (Gate of the Saviour)—one of the most revered historical places of Russia, and associated with many of the chief events of national history. Within the walls of the Kremlin, the most famous edifice is the Uspenski Sobor (Cathedral of the Assumption), in which all the Russian monarchs since Ivan IV. have been crowned. The present building was erected by Aristotele Fioraventi in the fifteenth century on the site of an older church founded in 1326. It is Lombardo-Byzantine in style, with Indian cupolas. The semi-dark interior is adorned with numerous icons, covered with gems and precious metals. They are of great antiquity, one of them being attributed to Saint Luke. The treasury of the cathedral, one of the richest in Russia, contains many valuable Bibles, manuscripts, and sacred vessels, as well as numerous relics of saints. The Cathedral of Saint Michael the Archangel is the former burial place of the Russian monarchs. It dates in its present form from the beginning of the sixteenth century and is surmounted by five domes, the central one being of gilt. The interior is richly decorated and its walls are covered with the portraits of the Russian monarchs interred there. In the partly Gothic Cathedral of the Ascension, founded in 1397, the walls and the thick pillars are covered with portraits of saints and Greek philosophers, and the floor is made of semi-precious stones of various colors.

One of the sights of the Kremlin is the tower of Ivan the Great, 322 feet high and crowned by a gilt dome; it contains 34 bells, weighing altogether about 580,000 pounds. In former times the Kremlin contained numerous monasteries and convents, of which only a few have been retained. The most interesting of these are the Maiden Convent, for centuries the burial place of the Russian princesses, and the Tchudov Monastery, an institution of great historical importance and a great factor in the development of ecclesiastical learning in Russia. Near the Tower of Ivan the Great stand two objects very famous in Russia. One is the Czar Bell, cast in 1735, and now resting on a stone pedestal. Part of the bell, broken off during the fire of 1737, lies near by. It is over 60 feet in circumference around the rim, 19 feet high, and weighs nearly 199 tons. The other, near the Museum of Arms, is the Czar Cannon, cast in 1586, and weighing nearly 40 tons. The palaces of the Kremlin are mostly modern, and only a few portions of the old abode of the Russian monarchs have survived. The great palace, finished in 1849, is a vast building of white stone with a gilt cupola, and possessing numerous magnificent halls devoted to the different orders of Russia. Attached to it are the living rooms of the old Russian rulers, known as the Terem, and dating from the seventeenth century. They are of great architectural value and well preserved. Connected with the palace are the old banquet hall known as Granovitaya Palata, with its red stoop, from which Russian monarchs used to address the populace; and the Oruzheijnaya Palata (hall of arms), containing immense treasures in the form of crowns, sceptres, thrones, costumes, banners, armor, gold and silver plate, carriages, etc. The palace of the patriarch, built by Nikon in 1655, has one of the most valuable libraries in Russia, and a treasury of fabulous wealth. The arsenal of the Kremlin is one of the largest in the world.

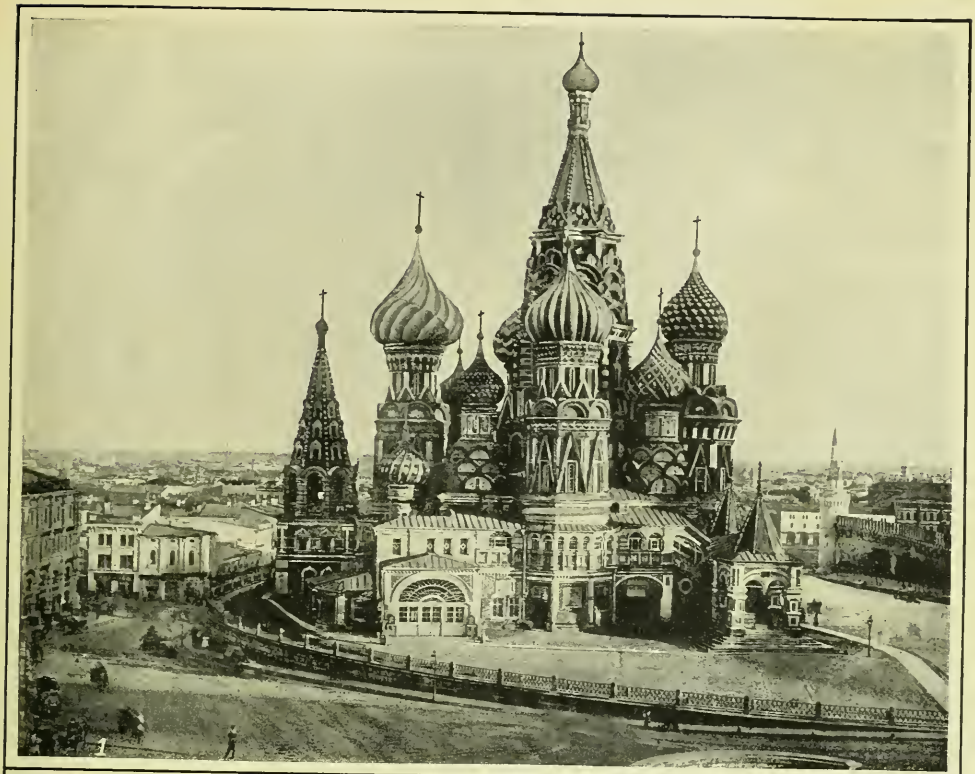
The Kitai Gorod, adjoining the Kremlin, also has many historical associations. Especially noteworthy is the Red Square, used repeatedly as a camp by the besieging Mongols, as a forum by the Russian monarchs, and as a place of execution. Facing the Red Square is the Cathedral of Vasili the Beatified, which for mixture of styles, colors, and architectural lines has few rivals in the civilized world. It was built by an Italian architect at the command of Ivan the Terrible in 1554 to commemorate the conquest of Kazan, and consists of a number of separate buildings under separate cupolas, differing from each other in form, dimension, and glaring colorings. The interior does not differ essentially from that of the other great churches of Moscow, being dark, close, and covered with paintings, gold, and gems in great profusion. Contrasting favorably with the Cathedral of Vasili the Beatified is the modern Church of the Saviour, consecrated in 1881 in commemoration of the destruction of Napoleon's Grand Army in 1812. It is Lombardo-Byzantine in style, cruciform, and well proportioned, built of white marble and surmounted with five cupolas. The paintings and the marble reliefs of the interior have been executed by the best artists of Russia.

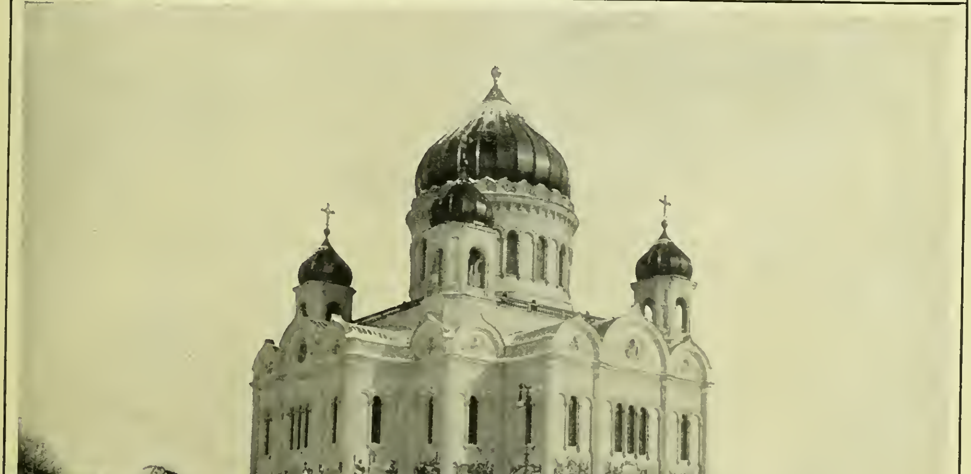
In the centre of the Red Square stands the monument to Minin and Pozharski, who liberated Moscow from the Poles in 1612. The Greek Monastery of Saint Nicholas in the Kitai Gorod deserves mention for its influence on education in Russia. It was under the auspices of the monks of Saint Nicholas that the first academy for classical education was established in the seventeenth century. It numbered, among its pupils, Lomonosoff and many others prominent in the literary and the political life of the country. The Kitai Gorod possesses a number of old residences of the boyars (q.v.), of which the most interesting is the family house of the Romanoffs, faithfully restored in 1859. The Gostinoy Dvor, the centre of the retail trade of Moscow, is also very interesting architecturally. Other noteworthy secular buildings and monuments are the Petrovski Palace, occupied by Napoleon during his stay at Moscow, the town hall (duma), the Sukhareff Tower (1692-95) with the reservoir, the triumphal arch, etc. Moscow has extensive markets, of which probably the most interesting is the Tolkutchy, where old clothes are sold to the poorer classes. In the most northern quarter of the Zemlyanoi Gorod are still found many stately although somewhat decayed mansions of the old nobility, while Zamoskvoryetchye, on the opposite side of the river, is the stronghold of the wealthy merchant class.

Economically, Moscow is exceedingly important, both with regard to industries and commerce. The manufacturing industries date from the time when the city was the residence of the Court and attracted skilled artisans from all over Russia as well as from foreign countries. At present Moscow is the second largest manufacturing city of the Empire and the centre of the textile industries, furnishing a considerable portion of the cotton goods for the Asiatic trade. According to the industrial census of 1895 there were more than 800 large manufacturing establishments, employing over 65,000 persons and yielding an output of over $67,000,000, of which textiles represented over one-third. Next to textiles are foodstuffs, metal products, paper, leather and wood products, and machinery. As early as the fourteenth century Moscow was an important commercial centre. Its trade grew up with the political power of the Principality of Moscow, and received a great stimulus from the settlement of the Novgorod merchants. The advantageous position of the city at the converging of six railway lines, which connect it with every part of European Russia as well as with Siberia, has played an important part in its recent commercial development. Manufactures, agricultural products from the southern and the central provinces of Russia, minerals from the coast, and tea from Asia, all find their way to Moscow and go partly to supply the local demand and partly to supply the trade with the interior or with foreign countries. The rise of Saint Petersburg had at first a detrimental effect on the foreign trade of Moscow, but the development of the Asiatic trade, of which Moscow is the natural centre, has more than compensated for the loss in any other direction. The trade by water is important. The chief imports of Moscow are tea, iron and steel products, raw silk, indigo, cotton yarn, etc.

Moscow is administered by a Governor-General, who is also at the head of the military district of Moscow. The municipal council of 160 members is elected by owners of real estate and merchants of the first class, and has an executive committee of six members. Both the municipal council and the executive committee are presided over by the mayor or 'golova,' who, unlike the mayors of all other Russian towns except Saint Petersburg, is appointed by the Government from two candidates suggested by the council.

The budget of the city for 1901 balanced at $7,000,000. The chief items of revenue are real estate and internal taxes, subvention from the Imperial Government, the zemstvo, and returns from municipal property and enterprises. Nearly one-fourth of the revenue is spent on sanitation, about 12 per cent. on municipal improvements, and less than 8 per cent. on education. The municipality owns the waterworks, slaughterhouses, and baths, and a number of lodging-houses. In regard to facilities for local transportation Moscow is far behind most European cities of its size and importance. Moscow has many prominent educational establishments. Besides the university (see MOSCOW, UNIVERSITY OF) there are a theological seminary, a technical school, an agricultural institute, an institute for the study of Oriental languages, schools of art, painting, and architecture, a school of engineering, two seminaries for teachers, a number of dramatic schools, a commercial institute, 21 gymnasia, 5 *Realschulen*, a school of church music, and numerous other special schools. Libraries are numerous. The most important museums and collections are the Rumyantzeff Museum, consisting of a fine library and collections of paintings, sculptures, ethnography, etc.; the historical museum, and the Tretyakoff Gallery of modern paintings, now belonging to the city. A number of prominent scientific organizations have their home at Moscow, including the society of naturalists and the society of Russian history and antiquities. The numerous archives of Moscow are also noteworthy. The benevolent institutions are among the largest in Russia, especially the foundling asylum. The theatres of Moscow, especially the 'small theatre,' have played a prominent part in the development of the Russian drama. The periodical publications of Moscow are numerous, and the book trade of the city, especially popular publications, is very extensive.





1. CATHEDRAL OF VASILI THE BEATIFIED
2. CHURCH OF THE SAVIOUR

The population was 753,469 in 1882, and 977,269 in 1897. A very large percentage is made up of persons born outside of Moscow. The predominance of males is very marked (about 131 to 100 in 1897). About 50 per cent. of the population belong to the peasantry. The Greek Orthodox inhabitants constitute 94 per cent. of the total population of Moscow, as compared with 84 per cent. in Saint Petersburg. The environs of the city are replete with historical interest, and contain many estates of the old nobility and royal favorites, among which may be mentioned the Petrovsko-Razymovskoie, with its extensive park and academy of agriculture. There are also many large parks and groves, where the masses amuse themselves on holidays.

HISTORY. The site of the city was probably inhabited long before the twelfth century, but the first mention of Moscow dates from 1147, when it was the estate of the Suzdal Prince Yuri Dolgoruki. The city began to rise with the Principality of Moscow under Daniel, the son of Alexander Nevski (q. v.), in the thirteenth century, and especially under Ivan Kalita (1328-40), who with the aid of the Mongols succeeded in annexing many of the minor principalities to Moscow, and greatly embellished the capital. About this time the Metropolitan Peter transferred his seat to Moscow, thereby laying the foundation of its future position as the religious capital of Russia. With the union of the Russian principalities under Ivan III. (1462-1505) Moscow became the capital of Russia and began to assume the proportions and appearance of a large city. It was surrounded by stone walls, and architects from foreign countries were summoned to build its churches and palaces. But the growth of the city was not infrequently interrupted by the invasions of the Tatars, repeated conflagrations, and pests. It also suffered from the internal dissensions and revolts during the seventeenth century, notably the Polish occupation in 1610-12, the revolt of the people against the corrupt favorites of the Czar, the riots following the introduction of religious reforms by Nikon, and the rise of the *Streltzi* (q.v.) against the reforms of Peter the Great. Peter found Moscow, the bulwark of Russian orthodoxy, extremely unfavorable for the introduction of his reforms, and transferred the Court to Saint Petersburg. In the eighteenth century the city was visited by a number of disastrous conflagrations and the plague of 1771. On September 14, 1812, Moscow, almost entirely deserted and with its treasures and archives removed to Vladimir, was occupied by the army of Napoleon, seven days after his disastrous victory at Borodino (q.v.). On the following day the Emperor made his entry into the city. On the night of the 15th to the 16th, in accordance with a prearranged plan, fires were started in several parts of the city, and soon the entire place was in flames, so that, on September 16th, Napoleon was compelled to remove his headquarters from the Kremlin. The churches and palaces were meanwhile abandoned to the depredations of the invaders and the criminal classes, the jails having been thrown open by the order of the Governor. On October 19th the French began their fatal retreat from the city. On May 18, 1896, Moscow was the scene of a fearful disaster, brought about by the distribution of gifts at a popular festival arranged in honor of the coronation of Nicholas II. Over 2000 people were crushed to death and many more wounded. Consult: Fabricius, *Le Kremlin de Moscou* (Moscow, 1883); Zabel, *Moskau* (Leipzig, 1902); Sabjelin, *History of Moscow* (in Russian, Moscow, 1902).

MOSCOW. A town and the county-seat of Latah County, Idaho, 94 miles south-southeast of Spokane, Wash., on the Northern Pacific and the Union Pacific railroads (Map: Idaho, A 2). It is the seat of the University of Idaho (q.v.) with the State Agricultural College. Mining, farming, fruit-growing, stock-raising, and lumbering are the leading industries, and there are some manufactures. Population, in 1900, 2484.

MOSCOW, UNIVERSITY OF. The oldest and largest institution of higher learning in Russia, organized in 1755. At its inception it consisted of three faculties—law, medicine, and philosophy—with a total staff of ten professors, mostly brought from Western Europe. The curriculum was very limited in its scope until 1807, when it was reorganized by Alexander I. At the burning of Moscow in 1812 the university buildings were destroyed. The most valuable collections, however, had been previously removed. Instruction, suspended for a while, was resumed in 1813, and new buildings were erected in 1816-19. In 1835 the number of chairs was increased to thirty-five and a uniform four years' course established for all departments. In 1841 the Medico-Surgical Academy was united with the University. The liberal University Act of 1863 gave the professors and students a certain amount of self-government which was abolished during the reactionary régime of Alexander III. in 1884. In 1902 Moscow University consisted of the following faculties: (1) Medicine, (2) law, (3) physical and natural sciences, (4) historico-philological faculties. It offers four-year courses leading to the degree of Candidate. In the medical school, however, the course covers five years, the regular degree being 'physician;' the degrees of Master, Doctor of the various sciences, and M.D. are conferred for special investigation. The university library contains 271,926 volumes and 23,239 pamphlets. The departmental libraries, laboratories, observatory, museums, etc., number altogether 33. The medical department has 14 special clinics and hospitals. The teaching staff consists of 27 emeritus, 44 ordinary, and 20 extraordinary professors, 175 privat-docents, and 11 instructors. The number of students in 1902 was 4691, of whom 363 took the historico-philological, 321 the mathematical, 683 the natural science, 1673 the law, and 1100 the medical course. The expenditures of the university amount to about $830,000. As the majority of the students come from the poorer classes, the number of scholarships is very large, the number in 1902 reaching as high as 645. The university is under direct supervision of the Minister of Public Instruction, who appoints the rector. There is a university council, but its powers are very limited.

MOSEILIMA, mô-sī'lê-mȧ (Ar. *Musailimah*, from the proper name *Muslimah*, from *salima*, to be safe). One of the most important of the rival prophets who came forward in Arabia when Mohammed had stirred the religious thought of the people. He belonged to the tribe of the Beni Henifah, of Yamama in Nejd. The traditions about his life and age are extremely contradictory and legendary. It appears, however, tolerably certain that he had risen to a certain eminence in his tribe, probably as a religious teacher only at first, before Mohammed assumed his prophetical office. He seems to have proposed to divide the religious leadership with Mohammed, a suggestion which the latter contemptuously refused. He never undertook to supplant Mohammed. After the death of the Prophet, Moseilima set up the standard of open opposition and was defeated and killed in a desperate battle by Khalid, who had been sent against him by Abu Bekr. His 'heresy' was stamped out. and only a few scattered supporters contrived to escape to El-Hasa and Basra, where they may have laid the foundation of the later Karmathian creed. See MOHAMMED; MOHAMMEDANISM.

MOSELEY, mōz'lĭ, HENRY (1801-72). An English mathematician, born at Newcastle-under-Lyme. He graduated at Saint John's College, Cambridge, and in 1831 became professor of natural philosophy and astronomy in King's College, London. In 1853 he was appointed canon of Bristol Cathedral, and two years afterwards was made chaplain to the Queen. He published a number of scientific books, *Mechanical Principles of Engineering and Architecture* (1843) being the most important. Moseley discovered formulæ for the dynamical stability of warships, which have come into common use.

MOSELLE, mô-zĕl'. German MOSEL, mō'zel. One of the principal affluents of the Rhine. It rises on the west slope of the Vosges Mountains in the northeastern corner of France, flows northwestward to the French boundary, then northward past Metz and Thionville, after which it turns to the northeast. and with many windings through the Prussian Rhine Province. enters the Rhine at Coblenz (Map: Germany, B 3). Throughout the greater part of its length the Moselle runs through a narrow valley occupied by fertile fields and meadows. and inclosed by steep hills and mountains, in many places becoming rocky cliffs. In the lower valley the hills are vineclad, producing the celebrated Moselle wines, noted for their delicate aromatic flavor. Numerous ruins and historic landmarks also make the valley notable. The total length of the river is 314 miles; it is navigable 214 miles for small vessels. Two lines of steamers ply regularly between Coblenz and Treves.

MOSEN, mō'zen, JULIUS (1803-67). A German author, born at Marieney in the Vogtland, Saxony. He attended the University of Jena, where Goethe awarded him the first prize for his competitive anniversary poem on Karl August's fiftieth birthday; completed his studies at Leipzig in 1826-28, and from 1828 to 1831 was in the office of an advocate at Markneukirchen. He went to Oldenburg in 1844 under appointment from Grand Duke Paul Frederick August as dramaturgist of the Hoftheater with title of Councilor. His activity in that post was interrupted by illness, and from 1850 he was pensioned. His first public success was achieved by the epic *Lied vom Ritter Wahn* (1831), based on the Italian legend of *Il cavaliere Senso*, and his reputation was much increased by *Ahasver* (1838), a second poem in that kind. whose large, historical action is somewhat impeded by its philosophy. The *Gedichte* of 1836 (2d ed. 1843) include the well-known ballads, long since established as *Volkslieder*, "Andreas Hofer," "Der Trompeter an der Katzbach," and "Die letzten Zehn vom vierten Regiment," descriptive of an episode in the Polish contest for independence. Of his works of fiction, the best, perhaps, are the *Bilder im Moose* (2 vols., 1846), short stories, finished in workmanship. His dramas were overweighted with the rhetorical exposition of his ideas on politics and history. *Otto III.* (appeared with three others as *Theater*, 1842) was the most important. As dramaturgist, he did much to further German drama, especially Shakespearean presentations. The best collective edition of his works is that of 1880 (Leipzig, 6 vols.). Consult the anonymous biography, *Julius Mosen* (Oldenburg, 1878).

MOSENTHAL, mō'zen-täl, JOSEPH (1834-96). A German-American musician, born at Cassel. He studied under his father and Spohr, and in 1853 came to America, where he played the organ in Calvary Church, New York City, from 1860 to 1887. He was conductor of the Mendelssohn Glee Club in New York City from 1867 to 1896, played a first violin in the Philharmonic Orchestra for forty years, a second violin in the Mason and Thomas Quartet for twelve, and composed much Church music, such as the psalm "The Earth is the Lord's," and part songs for male voices, *Thanatopsis*, *Blest Pair of Sirens*, and *Music of the Sea*.

MOSENTHAL, SALOMON HERMANN VON (1821-77). A German dramatist. He was born at Cassel, studied at Marburg, and in 1850 became an official in the Ministry of Public Instruction at Vienna, and was soon afterwards appointed Ministerial archivist. His investiture with the Order of the Iron Crown in 1871 conferred knighthood upon him. He is chiefly known by the dramas *Deborah* (1850; numerous later edd. known in English as *Leah the Forsaken*), and *Der Sonnenwendhof* (1856). which have been represented with success, and translated into several languages. He also wrote the libretti for a number of well-known operas, notably Nicolai's *Die lustigen Weiber von Windsor* (1849) and Goldmark's *Die Königin von Saba* (1875). His collected works were published in six volumes in 1877-78.

MÖSER, mē'zēr, ALBERT (1835-1900). A German lyric poet. He was born at Göttingen, and after studying there became a teacher in Dresden. His odes, sonnets, and songs attained great popularity, especially a ballad, 'Die Rose von Mars la Tour.' and are marked by much melody, by a dreamy reflective manner, and occasionally by great skill in the reproduction of classical metres. His *Gedichte* were published in 1865.

MOSER, mō'zēr, GEORGE MICHAEL (1704-83). An English gold-worker and enameler, born at Schaffhausen in Switzerland. At an early age he went to London, where he was a friend of Sir Joshua Reynolds, of Goldsmith, and of Dr. Johnson; was drawing teacher to George III., and was one of the founders and first keepers of the Royal Academy. Moser was especially famous as an enameler of jewelry.

MOSER, GUSTAV VON (1825—). A popular German dramatist, born at Spandau, May 11, 1825. He was trained for the army, entered it in 1843, and served till 1856, when he married the daughter of a wealthy landed proprietor. After an unfortunate venture in comedy, *Der weibliche Hussar*, he devoted himself to agriculture till a happy meeting with the Berlin stage-director

Wallner brought him back to the stage in 1861 for a career of almost unbroken popular success. Of more than forty comedies the most noteworthy are: *Das Stiftungsfest* (1873); *Ultimo* (1873); *Der Veilchenfresser* (1876); *Der Bibliothekar* (1878); *Krieg im Frieden* (1880). He also wrote a number of plays in collaboration with others. A uniform edition of Moser's works was begun in 1873, and extends to more than twenty volumes.

MOSER, Johann Jakob (1701-85). A German publicist, born in Stuttgart. He studied at the University of Tübingen, where in 1720 he became professor of law. In consequence of some difficulties with the censor, he resigned this position in 1732, and in 1736 answered a call to the University of Frankfort-on-the-Oder. Here he incurred the displeasure of Frederick William I., and in 1739 was again compelled to resign. In 1747 he became Privy Councilor and chief of the chancery in the service of the Landgrave of Hesse-Homburg, but two years later he went to Hanau and in 1751 returned to his native city, where he entered the service of the Duke of Württemberg. In 1759, being held responsible for certain manifestoes directed against the Duke, he was imprisoned in the fortress of Hohentwiel, where he remained for five years. After his release his offices were restored to him. Among his works are: *Deutsches Staatsrecht* (1766-75, 21 vols., besides two supplementary vols., and an index); *Neues deutsches Staatsrecht* (1766-75, 21 vols. and additions, 1781-82, 3 vols.); *Deutsches Staatsarchiv* (13 vols., 1751-57); and his *Lebensgeschichte* (3d ed., 4 vols., 1777-83). Consult Wächter, *J. J. Moser* (Stuttgart, 1885).

MÖSER, mē′zẽr, Justus (1720-94). A German historian and publicist, born at Osnabrück. He studied law at Jena and Göttingen, and in 1747 was chosen *advocatus patriæ*. He was sent to England in 1763 on financial business of the Allies. During the minority of the Duke Frederick of York, who became afterwards Bishop of Osnabrück, Möser was the principal adviser of the Regent. He founded in 1766 the weekly *Die Osnabrückischen Intelligenzblätter*, from which he reprinted in 1774 *Patriotische Phantasien*, a series of brilliant and valuable essays. His *Osnabrückische Geschichte* (1768; 3d ed. 1819) is an anticipation of the best results of the modern German historical methods. His collected works, edited by Abeken (Berlin, 1842-44), include a biography by Nicolai and Möser's poetry. Consult: Kreyssig, *Justus Möser* (Berlin, 1857); and Rupprecht, *J. Mösers soziale und volkswirtschaftliche Anschauungen* (Stuttgart, 1892).

MOSES, mō′zĕs. The most prominent figure in the earlier portion of the Old Testament narrative. According to the modern view which regards the Pentateuch as a combination of different sources, those portions relating the career of Moses (in the main, the books of Exodus and Numbers) combine three distinct documents or strata of tradition. It is still possible in most cases to separate the historical compilation known as JE (see Elohist and Yahwist) into its two component parts. In addition to these is the so-called Priestly narrative (see Hexateuch), which is considerably later than either J or E. A brief summary of the career of Moses as given by each of these sources will make clear wherein they differ, and also indicate their value as historical material.

In the narrative of the Yahwist, Moses first appears as a fugitive in Midian. A story is told of his helping the daughters of a priest of Midian to water their sheep, the tale reminding of a similar incident in Jacob's life (Gen. xxix. 1-10); and just as Jacob married Rachel, so Moses marries Zipporah, a daughter of the priest. After the death of the king from whom he had fled, and of those who had sought his life, Moses returns to Egypt. On the way Yahweh appears to him in a burning bush and gives him the command to deliver his people, the Hebrews, from the oppression in Egypt, and bring them to Canaan. Moses hesitates, but is reassured by three signs given him. He delivers his message to the elders of Israel, and Pharaoh is requested to let the Israelites go into the wilderness to perform a sacrifice. Upon the refusal of Pharaoh, seven plagues (see Plagues of Egypt) are sent in succession. Pharaoh proposes a compromise, which Moses refuses, and at last, when the first-born in every Egyptian family is stricken with death, the Egyptians in a panic hurry the Israelites out of Egypt. Pharaoh recovers from his terror and starts in pursuit of the fugitives, who are guarded by a cloud at day and by a pillar of fire at night; but the King and his army are drowned in the sea after the Israelites have crossed in safety. The people are led into the wilderness and endure hardships until they reach Mount Sinai, where Yahweh appears and calls Moses to Him on the Mount. He remains there forty days and forty nights, and receives from Yahweh two tables of stone. Moses' father-in-law, Hobab, the son of Reuel, the Midianite, visits him and decides to accompany the Israelites. They continue their wanderings amid many hardships till they reach Kadesh. Caleb and others are sent into Canaan as far as Hebron and bring back reports about the fertility of the land and the powerful character of the inhabitants. Israel marches along the borders of Edom to Moab, conquering Heshbon and other Amorite cities. Balaam is sent for by Balak, the King of Moab, to curse Israel, but fails to do so; final laws and exhortations are delivered by Moses to his people. He is then called to the top of Pisgah, where, after being shown all of Canaan, he dies, being buried by Yahweh Himself in a valley of Moab opposite Beth-peor. Aaron in this narrative is completely ignored.

In the Elohistic narrative, the birth of Moses in Egypt is related with the story of his miraculous deliverance from the decree of Pharaoh. His sister (Miriam) was by him when he was found in an ark of bulrushes by Pharaoh's daughter. He is educated as an Egyptian noble, but learning that he is an Israelite, goes out to see how his people fare, and observing an Egyptian ill-treating an Israelite, he slays the former, and when the deed becomes known, flees to Midian. While tending the flocks of his father-in-law, Jethro, on Horeb, 'the mountain of God' [Elohim], God reveals Himself and announces His new name, Yahweh. Moses is ordered by Yahweh, who has heard the cry of the oppressed people, to go to Pharaoh and demand the release of the Israelites. On his way to Egypt, he is joined by Aaron. Together they appear before Pharaoh. Five plagues are brought upon Egypt, and when the last—the death of the first-born—is sent, Pharaoh gives Moses and Aaron permission to depart with the Israelites. The latter, loaded with presents from the Egyptians, and carrying with them the bones of Joseph, start on their journey. Pharaoh follows in pursuit with 600 chariots, but Moses lifts up his rod. An angel places himself between Israel and the pursuers and the latter perish. The people, fed by bread from heaven, reach Horeb, where Yahweh appears amid thunder and lightning, and delivers to the people the Ten Commandments. (See DECALOGUE.) Moses and Joshua ascend the Mount and during their absence Aaron makes a golden calf for the people. Upon the return of Moses and Joshua, they see the people dancing around the calf, and in anger Moses breaks the two tables. Moses returns to Yahweh, intercedes on behalf of his people, and receives laws which he communicates to the people. Jethro visits Moses and suggests the appointment of subordinates to assist in the government of the people. Miriam and Aaron revolt against Moses and are punished; Amalek attacks Israel and is completely routed; Dathan and Abiram rebel against Moses and are swallowed up by the earth. The people reach Kadesh, where Miriam dies. Moses urges Israel to invade Canaan, and 12 men are sent out to survey it, who bring back discouraging reports so that the people ask Moses for a leader to take them back to Egypt. Because of the complaints of the people at their hardships, fiery serpents are sent as a plague; Moses makes a brazen serpent by looking at which the sufferers are healed. Yahweh announces to Moses that he is about to die, and Joshua is appointed as his successor. Moses delivers final laws and exhortations and dies in the land of Moab. His burial place is unknown.

The Priestly narrative brings Aaron into constant association with Moses, but ignores Miriam. God speaks to Moses and Aaron in Egypt; the former is at the time eighty years old—the latter eighty-three. Six plagues are wrought in a miraculous way by Moses and Aaron in the presence of Pharaoh and his magicians, who at first are able to perform the same miracles. The Israelites leave Egypt to observe the Passover festival. They are pursued by Pharaoh, and Moses stretches out his hand over the sea, the waters of which are divided and afford a passage for Israel. After the Israelites reach the farther shore, Moses again stretches out his hand, the waters return and the Egyptians are drowned. After long wanderings, the people come to Sinai, where Yahweh appears. Moses ascends into the cloud that hovers over the mountain and receives instruction from Yahweh regarding the tabernacle and its furniture, and the duties of the priests and their vestments. He also obtains two tablets of stone. Moses and Aaron proceed to organize the nation and its worship. A census is taken, and the people leave the wilderness. Korah and 250 princes rebel against Moses and Aaron and a sign is given by Yahweh—the blossoming of Aaron's rod—proving the choice of Aaron and his family for the priesthood. Joshua, Caleb, and ten others are sent to survey Canaan. The ten bring back discouraging reports against which Joshua and Caleb protest. Yahweh appears and announces that Joshua and Caleb alone of the grown men shall enter Canaan; the ten are stricken with death. A second census is taken by Moses and Eleazar. Joshua is appointed the successor of Moses, who, after delivering final laws, ascends Mount Nebo, and dies at the age of one hundred and twenty years in the full possession of all his faculties.

The Book of Deuteronomy, taken up with the final addresses and ordinances given by Moses, adds nothing to the above traditions of his career.

A general survey of these narratives reveals certain features in the career of Moses that must have become permanently fixed in the minds of the people, before the attempt was made to adjust the figure to the pragmatic theory which guides the Old Testament writers in their survey of the past. These are: (1) his presence in Egypt; (2) his association with Midian and the cult at Horeb or Sinai (q.v.); (3) his leadership of certain clans. The popular reminiscences of a sojourn of the Hebrews in Egypt point to the presence at one time in that land of some of the clans that afterwards formed part of the Hebrew confederation. (See JEWS.) These clans subsequently left Egypt and returned to the wilderness, whence they originally issued. Joining other clans at Horeb (or Sinai), they adopted a cult which existed there. The mountain was a sacred one and the deity who dwelt on the top was known as Yahweh. The relationship of Moses to these incidents depends upon the question whether he is to be regarded as an individual or as the representative of a clan. It must be confessed that at times Moses is spoken of as though he were merely the eponymous ancestor of a clan, and yet, taking all things into consideration, the balance of evidence is in favor of the assumption that there was an individual by the name of Moses, of whom some faint reminiscences survived, and who gradually became the favorite personage to whom all traditions, legends, and myths associated with the exodus from Egypt and the birth of the nation—traditions, legends, and myths coming to the Hebrews from various sources and at various times—were attached. The result of this process lies before us in the majestic figure of Moses as portrayed in the union of the three 'strata,' already outlined.

BIBLIOGRAPHY. Consult the histories of Renan, Stade, Guthe, Kittel, Wellhausen, Winckler, Piepenbring, etc.; also the commentaries on Exodus and Numbers enumerated in the articles upon these books; Kuenen, *Religion of Israel*, vol. i. (Eng. trans. Edinburgh, 1874-75); Budde, *Religion of Israel to the Exile* (New York, 1899); Driver in *Authority and Archæology*, pp. 54-79 (London, 1899). For the mass of additional legends that gathered around Moses, see Beer, "Das Leben Moses nach Auffassung der jüdischen Sage," in *Jahrbuch für die Geschichte der Juden und des Judenthums*, vol. iii. (Leipzig, 1863); Weil, *Biblische Legenden der Muselmänner* (Frankfort, 1845; Eng. trans. under the title *The Bible, the Koran, and the Talmud*, London, 1846).

MOSES. A colossal statue in the Church of San Pietro in Vincoli, Rome, one of the most famous works of Michelangelo. The gigantic figure is seated in the attitude of one about to spring to his feet. The left hand is pressed to the body to restrain his indignation at the worship of the golden calf, at which he appears to gaze with flashing eyes and frowning face, while the right hand grasps the tables of the law. The head shows two short horns, based on a mistaken interpretation of Ezekiel xxxiv. 35. The "Moses" was one of thirty proposed statues for the tomb of Pope Julius II. in Saint Peter's, which was not completed. See Plate under MICHELANGELO.

MOSES, ASSUMPTION OF, and REVELATION OF. See APOCRYPHA, section on *Old Testament.*

MOSES, BERNARD (1846—). An American professor of history and political economy, born at Burlington, Conn. He graduated at the University of Michigan in 1870, studied at Heidelberg, and became professor of history in Albion College, N. Y., in 1875. The following year he was appointed to the faculty of the University of California. His first book, *Politics* (1884), was written in collaboration with W. W. Crane; afterwards he produced: *The Federal Government of Switzerland* (1889); *Democracy and Social Growth in America* (1892); and *The Establishment of Spanish Rule in America* (1898). He was one of the Philippine Commissioners appointed by President McKinley.

MOSES OF CHORENE, kō-rē'nē. An Armenian author, belonging to the fifth century. The only extant works now generally admitted to be his are a *Rhetoric,* and a *History of Armenia,* which appeared in a German version by Lauer at Regensburg in 1869, and entitles him to the foremost place among Armenian historians. A work on geography once ascribed to him is now assigned to the seventh century. Consult Von Gutschmid, *Ueber die Glaubwürdigkeit der armenischen Geschichte des Moses von Khoren* (Leipzig, 1876).

MOSGU, mŏs'kōō, or **MASA,** mä'sȧ. Pagan Negroes in the Chad Basin, Sudan, south of the lake, divided into many tribes or branches, and numbering about a million. Less than a third of them have come under the sway of Mohammedanism.

MOSHEIM, mōs'hīm, JOHANN LORENZ VON (1694-1755). A distinguished German Church historian and theologian. He was born at Lübeck, October 9, 1694, and studied at Kiel. In 1723 he became ordinary professor of theology at Helmstedt and in 1747 at Göttingen, where he died as chancellor of the university, September 9, 1755. His theological works are numerous, among them a work on Bible morality, *Sittenlehre der heiligen Schrift* (1735-53; 4th ed. 1753-61, continued by J. P. Miller, 1770-78); and discourses, *Heilige Reden* (1732; 4th ed. 1765). But his contributions to theological literature in the department of ecclesiastical history are most important, by reason of their great learning, fullness, and accuracy. The following have been translated from the original Latin: *Commentaries on the Affairs of Christians Before the Time of Constantine the Great* (London, 1813-15); *Institutes of Ecclesiastical History* (Murdock's trans., ed. by W. Stubbs, 1863; new ed., Boston, 1892); his valuable *Versuch einer unparteiischen Ketzergeschichte* (1746-48) is untranslated.

MOSKVA, mŏs-kvä'. A river of European Russia, a left affluent of the Oka, which is itself an affluent of the Volga. It rises in the Government of Smolensk, flows eastward through the city of Moscow, and joins the Oka near Kolomna, in the Government of Moscow, after a course of 285 miles (Map: Russia, E 3). It is navigable between Moscow and the Oka, a distance of 112 miles, and is an important commercial route. On its banks took place the famous battle of the Moskva or Borodino between the Russians and Napoleon.

MOSLEM, mŏz'lĕm, or **MUSLIM,** mŭz'lĭm. A common designation in the West for a Mohammedan. It comes from the Arabic *muslim,* a derivative of *salima,* 'to be safe,' which is often used by Mohammed in the sense of a 'true believer,' generally in contrast to *kāfir,* an unbeliever, infidel. The name Mussulman, often used in the same sense, is derived from the Persian plural of *muslim* (*muslimān*). See ISLAM; MOHAMMEDANISM.

MOSLER, mōz'lēr, HENRY (1841—). An American genre painter, born in New York City. He studied in Cincinnati under J. H. Beard. During the Civil War he was on the staff of *Harper's Weekly,* and afterwards went to Paris. There he studied under Hébert. Still later he received some instruction at the Munich Academy under Piloty, and in Düsseldorf. He became especially well known in Paris, where he lived many years and exhibited much. He was elected a National Academician in 1895, and in the following year won the Clark Prize. He also won a gold medal at the Salon of 1888, a silver medal at the Paris Exposition of 1889, and a medal and diploma of honor at the Atlanta Exposition in 1895. In 1892 he was awarded the cross of the Legion of Honor. His more notable works include: "Le retour" (1879), which was bought by the French Government for the Luxembourg; "The Purchase of the Wedding Gown" (1880); "The Last Sacrament" (1885); and "The Coming Storm" (1885). His "Wedding Morning" was bought by the Sydney Museum, Australia.

MOSQUE (Fr. *mosquée,* from Sp. *mezquita,* from Ar. *masjid,* temple, from *sajada,* to prostrate one's self, to pray). A Mohammedan house of prayer and worship. Examples of these buildings are found wherever the Mohammedan faith has prevailed, from Spain to India and Turkestan. There is no fixed form of structure for them; in poor communities a bare room provided with a *miḥrāb* to mark the *kiblah* (q.v.) often serves the purpose. In general the earliest type of mosque was an open court, surrounded on all sides by an arcaded portico, like the atrium or cloister of a church or the peristyle court of an Egyptian temple, but sometimes differing from them in having not a single row, but two or more rows of columns or piers. The side of the court toward Mecca is usually deeper than the other three, with more rows of supports; it contains the *miḥrāb* and to the right of it the *mimbar* (pulpit), and, in front, generally a platform and reading desk. In the open court (*saḥn*) is the fountain for ablutions, often of large size and covered with a dome.

The mosques of India and Central Asia are generally constructed after this plan. The Mohammedans, however, have always been influenced by the native forms of architecture in the different countries which they have entered. The Spanish mosques, for example, closely resembled churches, having many parallel aisles supported on a forest like the old Cordova mosque, or fewer aisles, like the mosque at Toledo, now San

Cristo de la Luz. The dome was not used to any extent till the fourteenth century, when two new types made it their central form: the mausoleum mosque originating in Cairo, and the Turkish mosque derived from the Byzantine plan of Saint Sophia (q.v.) at Constantinople. The masterpiece of the first type is the Hasan mosque at Cairo (1356), followed by those of Barkuk, Khawand al-Baraka, and others. Of the second type, besides the several superb examples at Constantinople (Sulaiman, Ahmad, and others) there is the earlier one at Isnik, and the model spread even to Egypt, as in the Sinan mosque at Bulak. Still another way of employing the dome appeared in certain of the mosques of India, as the Doshamma mosque at Delhi. Among the most famous and sacred of the early mosques were the *Masjid al-Ḥarām* at Mecca (q.v.), the *Masjid al-Nabī* at Medina (q.v.), the *Masjid al-Āḳsā*, the Mosque of Omar at Jerusalem, and the great Mosque of Walid at Damascus. All of these have been rebuilt so that their early form is no longer recognizable. The old mosque at Kairwan (q.v.) is a well preserved early example (eighth century), as is also the Mosque of Tulun at Cairo; the Mosque of Amru at Cairo is of even earlier foundation, and still retains portions of old work. The Mosque of Omar represents the concentric mausoleum type. It is now two or three centuries since mosques of any architectural importance have been erected. The poorer mosques have bare whitewashed walls with no decoration of any kind. The larger and more pretentious are often elaborately and artistically decorated with carvings, arabesques, and passages from the Koran in the most involved style of ornamental calligraphy. Hundreds of oil lamps and sometimes ostrich eggs, elephant's tusks, and the like hang from the ceiling. The floor is usually covered with matting. A striking feature of mosque architecture is the minaret (q.v.).

The five prayers are said in the mosque daily. (See Mohammedanism.) The worshiper on entering removes his shoes, carries them in his left hand, sole to sole, and puts his right foot first over the threshold. He performs the necessary ablutions and takes his place in the congregation facing the *miḥrāb*. The attendance is more general on Friday, when some special prayers are said and a sermon (*khuṭbah*) is often added. A mosque which has this service is called *masjid al-jāmiʿ* ('mosque of the general assembling') or simply *jāmiʿ*. Women are not forbidden to enter the mosque, but their presence is not considered seemly during the time of prayer: sometimes a special place, secluded by a screen, is provided for them. There are few mosques to which unbelievers do not now have access. The utmost decorum and solemnity are observed during services, and the mosques are deeply reverenced by the faithful. At the same time they are intended for daily use, and when services are not going on are general gathering and lounging places; persons may be seen there sewing, spinning, or engaged in some similar handicraft; and they serve as resting places for travelers and wanderers. It has been the custom from the beginning for teachers and professors to give lectures and hold classes in the larger mosques, which thus serve as college buildings. The teacher takes his place at a pier or column at stated hours, his favorite pupil holds his books or notes, and the audience sits around on mats. Several such courses are carried on simultaneously in different parts of the covered arcades. Until medressehs were built in the eleventh century, the mosques were probably the only regular seat of advanced teaching. In recent times the advanced education in the mosques has been largely confined to the preparation of candidates for the position of imam, but there are still notable exceptions. The Azhar Mosque in Cairo has long been the main centre of advanced instruction in Mohammedan countries, the only survivor of many finer mediæval institions, and its courses are attended by between 5000 and 10,000 students. Minor buildings, such as school-rooms, academies, libraries, hospitals, dormitories, public kitchens, and almshouses, are often connected with the mosques.

The revenues of the mosques are derived not only from the contributions of the faithful, but also from investments in landed property (*wuḳūf*), often from gifts made centuries ago; this property is in the hands of trustees. The income serves to keep the building in repair and to pay necessary expenses. The mosque officials and attendants include the *'imām*, who leads the prayers, the learned men who teach (*mawlawī*, *'ulamā*), the *khāṭib* or preacher (in a *jāmiʿ*), the muezzins (q.v.), who call to prayers, doorkeepers, lamp-lighters, etc. Their number depends entirely upon the revenues; sometimes a single imam combines in his person the functions of all the others. The imam has a salary from the revenues, but the teachers are dependent entirely upon the gifts of their pupils. See Mohammedanism. Consult the Bibliography of Mohammedan Art.

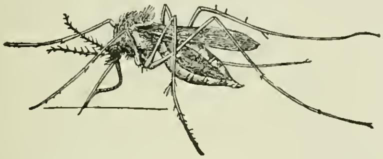
MOSQUERA, mŏs-kā'rȧ, Tomas Cipriano de (1798-1878). A Colombian politician and soldier, born at Popayan. At thirty-one he was general and Ambassador Extraordinary to Peru, and in 1833 was made Senator. From 1845 to 1849 he was President of New Granada, and greatly increased the material prosperity of the country. He headed the revolt against Ospina in 1859, and in 1861 became President of the country reorganized as the United States of Colombia; but was deposed in 1867 for arrogating to himself the power of adjourning Congress. He returned from banishment in 1869, and became Governor of Cauca and a Congressman.

MOSQUE SWALLOW. One of a group of related Asiatic and North African swallows within the genus Hirundo (see Swallow), whose prevailing colors are blue, with chestnut on the rump and side of the head, and buff or brownish streaked breasts. They are familiar town swallows wherever they occur, and take their English name from the habit of placing their nests commonly on the walls and minarets of mosques. These nests and their eggs are much like those of the American eaves swallow. The commonest Oriental species are *Hirundo daurica* and *Hirundo Nepalensis*, and a conspicuous African one of large size is *Hirundo Senegalensis*. Consult Sharpe and Wyatt, *Monograph of the Hirundinidæ* (London, 1885-94), and authorities upon East Indian birds cited under Bird.

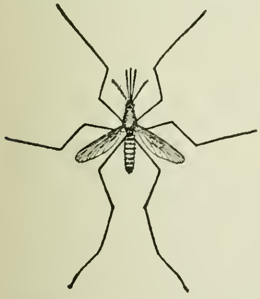
MOSQUITÍA, mōs'kê-tē'ȧ. A strip of territory on the east coast of Central America. See Mosquito Coast.

MOSQUITO (Sp., Port. *mosquito*, diminutive of *mosca*, fly, from Lat. *musca*, fly). A biting fly of the family Culicidæ. These flies belong to the group of nemocerous Diptera, and their nearest allies are the crane-flies, the midges of the families Dixidæ, Stenoxenidæ, and Chironomidæ, the fungus-gnats, gall-gnats, and moth-flies, from all of which true mosquitoes are distinguished by the fact that the veins of the wing and the body itself bear flattened scales, readily perceived under a low power of the microscope. The family is a large one, and includes 22 genera and about 300 species. The number of described species has doubled within the last few years, since especial attention has begun to be paid to this group, and activity in research is now so great that it is probable that it may again be doubled before the mosquito fauna of the globe is fairly well known.

Geographic Distribution. The mosquitoes form a cosmopolitan group, and extend practically to all known portions of the globe. Certain species are excessively abundant in the Arctic regions, while the greatest number of species is to be found in the tropical and subtropical life-zones. Certain of the genera are very widely distributed, the typical genus, Culex, being found practically everywhere. Anopheles is represented in all regions except the Boreal and the Arctic; Stegomyia occurs in Southern Europe, North, South, and Central America, West Indies, Africa, India, Malay Archipelago, Eastern Asia, and Australasia. A similar distribution is found with others of the less conspicuous genera. Certain species are also of almost world-wide distribution, and this is doubtless largely due to the ease and frequency with which mosquitoes are transported by seagoing vessels and by railway trains, and to the extraordinary facility with which they accommodate themselves to a novel environment. It is a well-substantiated fact, for example, that there were no mosquitoes in the Hawaiian Islands until they were brought there by sailing vessels. Certain species have a remarkable range through different life-zones, and the group as a whole has only a slight faunistic value. *Culex cantans*, for example, occurs in Canada and the United States, throughout Europe, and in Southern India; *Culex pipiens* occurs throughout Europe from Scandinavia to Malta, all over North and Central America and the West Indies, and is also found in Oriental regions.



ATLANTIC COAST MOSQUITO (*Culex solicitans*).

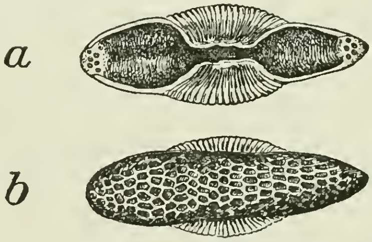


MOSQUITO OF MALARIA (*Anopheles Maculipennis*).

Classification. The family has been divided by Theobald into six subfamilies, Anopheles, Megarhinus, Culex, Ædomyia, Trichoprosoön, and Corethra being the typical genera of these subfamilies. The last named, however, has a short proboscis not formed for piercing, and does not belong to the biting mosquitoes proper. The characters which have been relied upon mainly in the differentiation of the genera have been the comparative length of the palpi in the different sexes, the character of the terminal joints of the palpi, the relative proportions of certain of the cells of the wings, the characters of the scales of the legs and head, the bristles upon the metanotum, and certain other points connected with the relations of the veins of the wings. The species for the most part have been separated upon colorational characters, although certain characteristics of the wing-venation are specific rather than generic, and the study of the body scales reveals specific characters. There are also some interesting characters connected with the teeth of the foot-claws which are both specific and generic.

MOSQUITO OF YELLOW FEVER (*Stegomyia fasciata*).

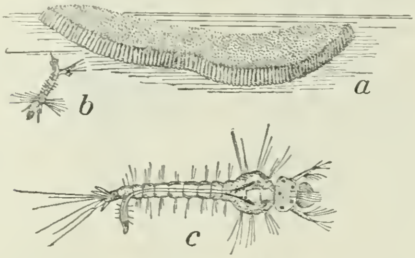
Life History. Mosquitoes in their early stages are all aquatic. The larvæ need a certain amount of standing water for their development. The eggs are laid by the adult insects, in the majority of cases upon the surface of standing water. They may be laid upon end, attached side by side in raft-shaped masses, as in *Culex pipiens* and as in the genus Uranotænia, or they may be laid singly on their sides, as in Anopheles, *Stegomyia fasciata*, Psorophora, and several species of Culex. They may also be laid upon moist earth in swampy places, as with *Culex solicitans*, or upon the leaves of pitcher-plants, as with *Wyeomyia Smithii*, hatching in these cases when water eventually reaches them. The eggs of some species, as those last named and *Stegomyia fasciata*, will bear desiccation; but the vitality of others, as those of Anopheles, is destroyed when they are removed from the water for any length of time. The egg stage is temporary with perhaps the majority of species, but with others it is much longer, and may be the hibernating stage with certain forms. The larva is an active and voracious little creature, and is commonly known as a 'wiggler' or 'wrig-



EGG OF ANOPHELES.

a, upper surface; *b*, under surface. These eggs float in disconnected masses. (Greatly magnified.)

gler.' Its life as a rule is short, and with the great majority of the species it is a true air-breather. coming to the surface of the water at frequent intervals and extruding its respiratory tube in order to suck air into its tracheæ. With at least one species (*Wyeomyia Smithii*), and perhaps with others. the anal locomotory flaps have an abundantly branched tracheal supply, and at least during part of the larval life these flaps function as air-gills, rendering it possible for the larva to remain below the surface of the water for a prolonged period of time. The food of mosquito larvæ is most variable. They swallow all sorts of minute organisms which float upon the surface or are held in suspension in the water. The larvæ of Anopheles feed for the greater part of their life at the surface, and consequently devour mainly the spores of algæ which float there. Later in life in shallow water they descend to the bottom and feed upon heavier objects. The larvæ of Culex feed below the surface upon small organisms, animal and vegetable, and mineral as well. which are held in suspension. The larvæ of Psorophora seem largely carnivorous. and, on account of their large size, are able to overpower and to devour other mosquito larvæ and other aquatic insects. They are even cannibals, and will feed upon small individuals of their own kind. All mosquito larvæ are very active, wriggling quickly through the water by abrupt and rapid bendings of the body, aided in some cases by long lateral hairs, and especially by a well-developed group of flaps at the anal end of the body. Food is brought into the mouth by the active movement of long oral cilia. In many forms the jaws are undeveloped, but in some, as in Psorophora, they are well formed and adapted for piercing and tearing.



EGGS AND LARVÆ.

a, a 'raft' of eggs of the common mosquito (culex); *b*, a single larva ('wiggler') taking breath at the surface; *c*, a larva (enlarged).

The pupa is also active. but does not feed. and possesses no mouth parts. As a rule it floats at the surface of the water, breathing through two respiratory tubes which issue from the thorax—a curious change from the respiratory tube of the larva. which is single and issues from the anal end of the abdomen. Although generally floating at the surface, the pupa when disturbed rapidly vanishes below the surface by energetic movements of the abdomen and of the anal flaps, and is thus enabled to a certain extent to avoid the attacks of fish and other enemies. The pupal stage is usually of short duration, and the adult issues through the cracking of the skin of the thorax. With many mosquitoes there are several generations annually. With *Culex pipiens* and *Anopheles maculipennis*, for example, there may be from eight to twelve such generations in a long summer. With other species it seems reasonably certain that the life-duration of the individual is much greater, and that in some cases there may be but a single generation each year. Most mosquitoes hibernate as adults, stowing themselves away in protected places at the beginning of cold weather. Other species undoubtedly hibernate in the egg stage, and still others unquestionably hibernate as larvæ, readily standing extremes of temperature, and even emerging in good condition with the warm weather of spring from blocks of ice in which they have been solidly frozen.

AGENCY OF MOSQUITOES IN CARRIAGE OF DISEASE. Since 1898 mosquitoes have become of vital importance to the human race, following the discovery that they are secondary agents in the carriage of several diseases of human beings, notably malaria and yellow fever. See INSECTS, PROPAGATION OF DISEASE BY.

RIDDANCE OF MOSQUITOES. The most effective way of relieving a neighborhood of mosquitoes consists in abolishing the breeding places. All accumulations of stagnant water—and these are of the most varied and frequently inaccessible character—must be removed wherever it is possible. Swampy lands should be drained; hollows in old trees and stumps should be filled up; old cans and bottles should be removed; cesspools should be hermetically sealed; rain-water barrels should be covered with fine wire gauze; the roof-troughs of houses should be frequently cleaned out. No possible supply of standing water should be overlooked, and these will in many cases require a most careful and ingenious search. Where mosquitoes are breeding in troughs or large cement basins which are used for watering stock, fish, such as sunfish, goldfish, or top minnows (qq.v.), should be introduced. Where other ponds exist which it is not possible to drain, the water margins should be kept clean and sharp, and superabundant vegetation should be removed. Moreover, if the fish supply of such ponds cannot be made satisfactory, a certain amount of kerosene placed upon the surface of the water will quickly destroy mosquito larvæ. This kerosening of swamp lands, where drainage is impossible or very expensive, is often a temporary remedy of great value. In malarial regions persons may be protected from the bite of the dangerous and annoying mosquitoes by the careful screening of houses and by wearing mosquito veils and gloves at night when obliged to be out of doors. Anopheles, as a rule, bites only at night. By this method the Italian Government has greatly reduced malaria in the black belt of Italy. By protecting healthy persons and malarial patients as well, and by the free use of quinine with the patients, the general health of the population of that region has greatly improved. The Germans in East Africa believe that they can wipe out malaria by simply destroying the disease with medicine. Malaria once abolished in human beings, there will be none for the mosquitoes to carry. In the United States extensive work has been done in the destruction of breeding places and thus reducing the numbers of mosquitoes. Under such conditions malaria will die out. In Cuba, aside from protecting the early yellow-fever patients and the constant use of mosquito bars in hospitals, yellow fever has been exterminated by house-to-house work against the breeding places of Stegomyia, this work being carried on first by the medical officers of the United States Army, and later by the health authorities of the Cuban Government. Mosquitoes, as a rule, may be stupefied by burning pyrethrum powder (Persian insect powder). They may also be deterred from biting by anointing the skin with oil of citronella.

Consult: Howard, *Mosquitoes* (New York, 1901); Ross, *Mosquito Brigades* (London, 1902); Theobald, *A Monograph of the Culicidæ of the World* (ib., 1901); Celli, *Malaria* (ib., 1900); Giles, *Gnats or Mosquitoes* (2d ed., ib., 1902); North Shore Improvement Association, *Report on Mosquitoes* (New York, 1902); Berkeley, *Laboratory Work with Mosquitoes* (ib., 1902).

MOSQUITO, mŏs-kē′tō (corruption of the native name *Misskito*). A considerable people apparently made up of several tribes, which occupies that portion of the eastern coast of Nicaragua known from them as Mosquitia or the Mosquito Coast (q.v.). They are an intelligent people, short in stature, and usually very dark in color. This latter trait is said to be due in part to admixture with negro blood from slavers wrecked upon their coast. They number about 6000 souls. Consult Squier, *The States of Central America* (2d ed., New York, 1858); and (anonymous) *Waikna*.

MOSQUITO BEE. Any one of several of the very small, stingless tropical honey-bees of the genus Melipona, which form communities, consisting at times of countless numbers. They are among the smallest of the bees, and although they do not sting, all the essential elements of the sting are present, the pointed or penetrating part of the apparatus being stunted. One species (*Trigona* or *Melpona mosquito*) sends off swarms after the manner of the common hive bee. The nests abound in honey, and have many enemies, since the bees cannot defend themselves by stinging. The nests, however, are rich in devices for protection and for the exclusion of intruders. Some species of them build their nests in completely with clay. See BEE.

MOSQUITO BLIGHT. A disease of the tea plant in India and Ceylon, caused by the punctures of several of the species of the genus Helopeltis of the plant-bug family Capsidæ. The young bugs as well as the adults feed upon the leaves and young twigs of the plant, causing them to wilt.

MOSQUITO COAST, or MOSQUITÍA. The strip of territory inhabited by the Mosquito Indians on the eastern coast of Central America, stretching along the Caribbean Sea from about latitude 10° 30′ N. to latitude 13° and extending about 40 miles inland (Map: Central America, F 4). It is notable chiefly for the fact that it was for a time the subject of diplomatic controversy between the United States and Great Britain. From about 1665 to 1850 it constituted a protectorate under the nominal control of Great Britain, during which time various attempts were made to plant colonies there, but only with partial success. Both the Central American republics and the United States denied the claim of Great Britain to a protectorate over the Mosquito Coast, the latter particularly on account of the contiguity of the territory to the proposed inter-oceanic canal which the United States wished to construct or cause to be constructed. The seizure in 1848 of Greytown (San Juan del Norte), an important commercial port at the mouth of the San Juan River, in Nicaragua, by the Mosquito Indians with the aid of England, caused great excitement in the United States, and for a time war seemed possible. To avert this danger, however, and to obtain a basis for a uniform policy of abstention from interference in the region by both England and the United States with a view to securing the neutrality of the proposed canal, the Clayton-Bulwer Treaty of 1850 was concluded between the two countries, by which it was agreed that neither party would occupy, fortify, colonize, or exercise dominion over the Mosquito Coast, or any part of Central America. By a treaty of November 28, 1859, with Honduras, Great Britain ceded to that republic its claim to the protectorate hitherto exercised over the Mosquito Indians and agreed to recognize as belonging to and under the sovereignty of Honduras all territory occupied by the said Indians. This arrangement was very unsatisfactory to the Indians and led to a revolt among them. The difficulty was finally adjusted by the Treaty of Managua between Great Britain and Nicaragua of January 28, 1860, by which it was stipulated that Great Britain would recognize the sovereignty of Nicaragua over the Mosquito territory lying within its bounds; that a certain district should be assigned to the Indians; and that the British protectorate should cease within three months after the exchange of ratification. A dispute having arisen between Nicaragua and the Mosquito nation in regard to the interpretation of the treaty, the Emperor of Austria was requested to decide upon the true meaning of the clauses in dispute, which he did in 1880, holding that the sovereignty of Nicaragua over the Indians was limited by the right of self-government conceded to them by the treaty. From that time onward the natives enjoyed almost complete self-government. By an agreement entered into between Nicaragua and the Mosquito Indians in 1894 they were formally and voluntarily incorporated into the Republic of Nicaragua, their country becoming the Department of Velaya. The population of the territory in that year was about 15,000. Consult Travis, *Clayton-Bulwer Treaty* (Ann Arbor, 1893).

MOSQUITO-HAWK. The name of several animals which dart about after small flying insects, as (1) a nightjar or 'nighthawk'; (2) a dragon-fly (q.v.).

MOSQUITO LAGOON. A salt-water lagoon on the eastern coast of Florida, United States (Map: Florida, H 3). It is a continuation of Halifax River, and extends 30 miles south of Mosquito Inlet to Haulover Canal, which connects it with Indian River. It has an average width of one mile; it is shallow, and navigation even by small boats is impeded by coral beds, sandbanks, and mangrove swamps. Oysters and fish abound in its waters. A strip of land from a half mile to five miles wide separates the lagoon from the ocean.

MOSS, mōs. A town of Southeastern Norway, situated on the east shore of the Christiania Fjord, 33 miles south of Christiania, on the railroad between the capital and Frederikstad. It has a good harbor visited by steamers, and trades in wood and preserves. Population, in 1900, 8941. In 1814 the treaty was signed at Moss by which Norway consented to a union with Sweden.

MOSS (MDutch, Dutch, OHG. *mos*, Ger. *Moos*, moss; connected with Lat. *muscus*, OChurch Slav. *mŭchŭ*, Lith. *mūsaí*, Welsh *mwswg*, moss). A plant belonging to the group Musci (q.v.) of the bryophytes (q.v.).

MOSS AGATE. See Mocha Stone.

MOSSÁMEDES, mŏs-sä′mȧ-dĕs. The chief town of the District of Mossámedes, Portuguese West Africa, situated on the Atlantic coast 150 miles north of the mouth of the Kunene (Map: Africa, F 6). It is a well-built and regularly laid out town, with a fine Government building, church, hospital, and a fort. The harbor is excellent, and equipped with an iron pier, and the trade is considerable. The chief exports are rubber, cattle, and dried fish. Population, 4500.

MOSS-ANIMALS. See Polyzoa.

MOSSBUNKER (from Dutch *marsbanker*, probably from *mars*, peddler's pack, or possibly from *mas*, crowd + *bank*, bank; so called in allusion to the appearance of the fish in shoals). A name (heard about New York and New Jersey) for the menhaden (q.v.). It is said by Goode (*Fishery Industries, Sec. I.*, Washington, 1884) that the word is a relic of the early Dutch, who took it from their name for the horse mackerel of Europe, which was 'marshbanker.' It has survived in some localities in New Jersey in its original form, but is more usually cut down and changed to 'bunker' about New York and Long Island Sound.

MOSSES FROM AN OLD MANSE. A collection of tales by Nathaniel Hawthorne (1846). Many of his famous sketches are contained in it.

MOSSLEY, mŏs′lĭ. A municipal borough in Lancashire, England, on the Tame, three miles southeast of Oldham (Map: England, D 3). Its importance dates from 1840, when there were established cotton and woolen factories, mill works, and foundries. The town hall is a handsome structure. The municipality owns its markets and its gas works, and maintains recreation grounds. Population, in 1901, 13,450.

MOSSO, mȯs′sȯ, Angelo (1846—). An Italian physiologist. He was born at Turin, studied medicine there, at Florence, Leipzig, and Paris, and in 1879 was appointed professor of physiology at Turin. He invented various instruments to measure the pulse, and experimented and wrote upon the variation in the volume of the pulse during sleep, mental activity, or emotion. In 1900-01 he visited the United States and embodied the results of his observations in *Democrazia nella religione e nella scienza* (1901). Among his other works are: *Die Diagnostik des Pulses* (1879); *Sulla paura* (1884, trans. into German and French); *Die Temperatur des Gehirns* (1894); and *Der Mensch auf den Hochalpen* (1898).

MOSS PINK. A flowering plant. See Phlox.

MOSS SIDE. A manufacturing town in Lancashire, England, 1½ miles southwest of Manchester (Map: England, D 3). It is provided with gas, electric lighting, and water by the Manchester corporation. The town owns its tramways and slaughter-houses, maintains a free library, and provides for technical education. Population, in 1891, 23,800; in 1901, 26,700.

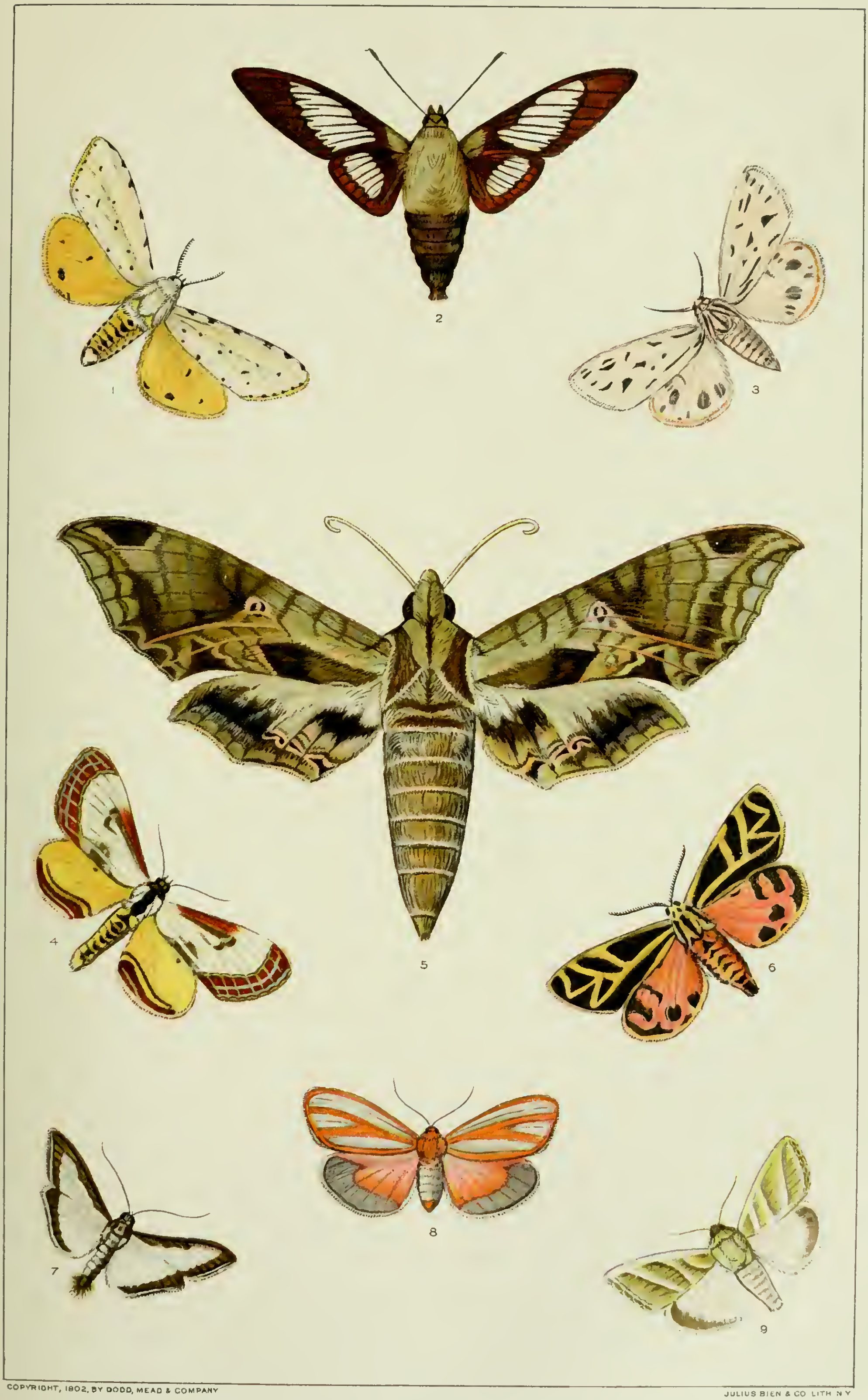
MOST, Johann Joseph (1846—). A German-American anarchist, born at Augsburg in Bavaria. He learned the trade of bookbinding, and in 1863-68 traveled as an apprentice through Germany, Austria, Italy, and Switzerland. On his return to Germany he was first a socialist writer at Mainz and afterwards editor of the *Freie Presse* in Berlin. He was several times arrested and imprisoned because of the violence of his writings. From 1874 to 1878 he was a representative of Chemnitz in the Imperial Reichstag, but in the latter year, having been expelled from the socialist organization, he went to London, where in 1879 he founded the anarchist organ *Die Freiheit.* In 1881 he was there arrested for printing editorials approving the assassination of Czar Alexander II. and sentenced to eighteen months' imprisonment. Upon his release he emigrated to New York, where he resumed the publication of his paper. In 1886, and again in 1887, he was imprisoned for inciting to violence. During the following years he continued to publish his paper, lectured, and wrote frequently in the interests of anarchy. After President McKinley's assassination, in 1901, he was arrested for publishing a seditious editorial in *Die Freiheit*, and was sentenced to one year's imprisonment. He was sent to the New York penitentiary in June, 1902. Among Most's publications are: *Der Kleinbürger und die Socialdemokratie* (1876); *Die Lösung der socialen Frage* (1876); *Most's Proletarier-Liederbuch* (1875); *Why I Am a Communist* (1890); and *Down with the Anarchists!* (1901), a pamphlet published in order to prove that the aims of anarchy are pacific.

MOSTAGANEM, mŏs′tȧ-gȧ-nĕm′. A fortified seaport of Western Algeria, in the Department of Oran, situated on a steep cliff on the Mediterranean coast 45 miles east of Oran (Map: Africa, E 1). It has flour mills and tanneries, and an active trade in wool, skins, and horses. It is connected by a branch road with the railroad from Oran to Algiers. Population, in 1901, 17,485; of commune, 18,090. Mostaganem was a large and important trade centre in the sixteenth century, but later fell into decay. It has again prospered since its capture by the French in 1833.

MOSTAR, mȯs′tär. The largest town and former capital of Herzegovina (q.v.), situated on the Narenta about 50 miles southwest of Serajevo, with which it is connected by rail (Map: Austria-Hungary, E 5). It has a number of modern buildings, but is essentially Oriental in appearance, with its numerous mosques, bazaars, and Turkish shops. There are a fine Greek cathedral, a higher gymnasium, and a number of trade schools. Tobacco and arms are the chief products. Mostar is the seat of a Roman Catholic and a Greek bishop, as well as of a mufti, and has a strong garrison. Population, in 1895, 17,020, including over 7000 Mohammedans.

MOS′TELLA′RIA (Lat., ghost). An entertaining comedy of a haunted house, by Plautus, which appears to have been adapted from the *Phasma* of Philemon. The plot is ingenious and the characters are well drawn.

MOTHS-AMERICAN



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1 SALT-MARSH CATERPILLAR MOTH — LEUCARCTIA ACRAEA
2 HUMMING-BIRD MOTH - HEMARIS THYSBE
3 ARGE MOTH - ARCTIA ARGE
4 PEARL WOOD NYMPH - EUDRYAS UNIO
5 PANDORUS SPHINX - PHILAMPELUS PANDORUS
6 TIGER MOTH - ARCTIA NAIS
7 MELON CATERPILLAR MOTH - MARGARONIA HYALINATA
8 STRIPED FOOTMAN - HYPOPREPIA MINIATA
9 TOBACCO-BUD MOTH - HELIOTHIS RHEXIAE

ALL NATURAL SIZE

MOSUL, mȯ-sōōl′. The capital of the Vilayet of Mosul, Asiatic Turkey, on the Tigris, opposite the ruins of ancient Nineveh (q.v.), and 220 miles by river northwest of Bagdad (Map: Turkey in Asia, K 4). It is surrounded by walls now almost in ruins. Of the ancient buildings only the Great Mosque remains. Mosul is the seat of a Roman Catholic mission, Dominican schools, and French and Russian consuls. Its trade, formerly much greater, is now confined to cotton, hides, wax, nuts, gum, and wool, all carried chiefly by caravans. The principal causes of its diminished importance were the rise of Abushehr (q.v.) as an emporium of trade, and the diversion of traffic by the Suez Canal. Population, about 55,000, chiefly Arabs, but comprising also Kurds, Turks, Armenians, Christians, and Jews. Mosul was an old Arabic town, taken by the Moslems in 636. It was besieged by Saladin in 1182, and was successively under Mongol. Persian, and Turkish sway. In the twelfth century it was very important, and for a time supplied Europe with its manufactures, especially muslins, which probably got their name from this town.

MOSZKOWSKI, mŏsh-kŏf′skē, Moritz (1854—). A Polish composer and pianist, born at Breslau. He studied at the Dresden Conservatory and in Berlin. At nineteen years of age he made his début as a piano virtuoso, and after successful tours throughout the principal European countries settled in Berlin, in which city he subsequently made his headquarters, although after 1897 he became almost entirely identified with the musical life of Paris. The best known of his works is *Spanish Dances*, which nowhere met with greater success than in America, and which may be said to have introduced him to the world at large; he also wrote many pieces for pianoforte, chamber music, concert studies, and waltzes. Among the larger works are: *Boabdil der Maurenkönig* (1892); incidental music to Grabbe's *Don Juan und Faust* (1896); a symphonic poem, *Jeanne d'Arc;* overtures, and concert suites.

MOTAZILITES, mȯ-tä′zĭ-lĭts. See Mutazilites; Mohammedan Sects.

MOTET′ (from It. *motetto*, diminutive of *motto*, word, from ML. *muttum*, word. grunt, from Lat. *muttire, mutire*, to mutter). A sacred vocal composition without instrumental accompaniment, in polyphonic style. As a rule the text of motets is Latin; but there are also motets with German, Italian, and English words. Although the *a capella* style is the rule, it was not always followed. Especially during the first half of the seventeenth century, which witnessed the beginnings of instrumental music, it was not unusual to add a *basso continuo*, or even a number of violin parts. In some instances we find even motets for a solo voice with instrumental accompaniment. The motet must not be confounded with the *anthem* (q.v.), in which latter form *homophony* (q.v.) is always employed. The form of the motet is very old and has undergone many changes with the various styles of music. The oldest motets were constructed on a *cantus firmus* (q.v.). From the *Ars cantus mensurabilis* of Franko of Cologne we learn that a motet had *two different* texts in the alto and tenor parts. J. S. Bach, in his motets, substitutes the Protestant chorale for the *cantus firmus*.

MOTH (AS. *moþe*, Ger. *Motte*, moth; perhaps connected with Goth. *maþa*, OHG. *mado*, Ger. *Made*, AS. *maþþu, maþa*, Eng. *mad, made*, maggot, grub). An insect of an indefinable section of the Lepidoptera (q.v.), separated from butterflies by superficial features and habits. No scientific distinction exists between these two, and the terms Rhopalocera for the former and Heterocera for the moths have been abandoned in taxonomy. Moths as a rule are nocturnal, while butterflies, as a rule, fly by day. Moths rest in most cases with the wing horizontally disposed, while butterflies hold them erect, displaying the under surface. The antennæ of moths are likely to be feathery in shape, while those of butterflies are thread-like, swollen toward the end into a 'club-head.' The nearest to a structural division is made by the fact that all so-called moths have a jugum, or 'hook and eye,' upon the fore wing by which these wings are held together in flight, while such a structure is absent from the butterflies. (See Butterflies and Moths.) All but four families of Lepidoptera, and by far the greater number of species and individuals, are moths. They are, however, less conspicuous than their relatives, on account of their generally smaller size and inconspicuous hues, but mainly because of their nocturnal habits. They are of more importance, too, in their relations with mankind than the ornamental butterflies, which do comparatively little either of harm or good beyond the delight their beauty affords. The moths, on the contrary, supply the useful product silk, on the one hand, and on the other furnish a great variety of species, which, especially in the larval stage, do enormous damage to growing crops and fruit, as well as to stored grain and food-stuffs, and to a long list of materials, in both their raw and manufactured states. The accompanying colored plate represents moths of various families, and exhibits the form and style of coloration assumed. The species figured are described elsewhere. See Butterflies and Moths.

MOTH, Brown-Tailed. A name given in New England to a species of moth (*Orgyia antiqua*), tawny brown in color, and closely related to the tussock-moth which it resembles in habits, which has been widely destructive of foliage, and has been combated by methods similar to those used against the gypsy moth (q.v.).

MOTHER ANN. A name given to Ann Lee (q.v.), the founder of the Shakers.

MOTHER BUNCH. A nickname given by Tucca to Mistress Miniver, the ale-wife, in Dekker's *Satiromastix* (1602). The name was applied later to makers of jokes, as in *Pasquil's Jests, Mixed with Mother Bunch's Merriments* (1604); and in *Mother Bunch's Closet Newly Broke Open* (1760).

MOTHER CAREY'S CHICKEN (possibly corrupted from Lat. *mater cara*, dear mother, in allusion to the Virgin Mary). A name familiarly given by sailors to the stormy petrel and other small black and white species of petrel. The name 'Mother Carey's goose,' or hen, is in like manner given to the great black petrel or 'bonebreaker' (*Ossifraga gigantea*) of the Pacific Ocean, which is a ravenous feeder on dead whales and other animal garbage, and also preys upon other sea-birds. See Petrel.

MOTHER GOOSE. The supposed author of the familiar nursery rhymes known as *Mother Goose's Melodies.* A baseless claim that the name originated in Boston was made on behalf of Elizabeth Goose, whose rhymes were printed by her son-in-law, Thomas Fleet, as *Songs for the Nursery; or, Mother Goose's Melodies* (Boston, 1719). The title appears to have come from France, where Queen Goosefoot, or Bertha au Grand Pied, the mother of Charlemagne, was regarded as the special patron of children, and her festival, January 2d, is celebrated. The most definite source is Charles Perrault's *Contes de Ma Mere l'Oye* (1697), containing ten stories, seven of which are from the *Pentamerone.* It was translated by Robert Samber in 1729. *Mother Goose's Melodies* were printed in London by John Newbery in 1760. Though the title is probably of French origin, the songs are English, some belonging to the time of Shakespeare and earlier.

MOTHER GOOSE TALES. See Nursery Lore.

MOTHER HUBBARD'S TALE, or Prosopopoia. A metrical composition by Edmund Spenser (1591), written in his youth. It is a satire on Court follies, under the guise of a story of a fox and an ape masquerading as a soldier and his servant. It purports to have been told to the poet by Mother Hubbard.

MOTHER-OF-PEARL. The shells of the large marine bivalve mollusks *Avicula* (*Meleagrina*) *margaritifera, Avicula macroptera,* and *Avicula fucnta,* which also produce the precious pearls. (See Pearl.) These shells are collected in the tropical seas, chiefly on the coast of Ceylon, Manila, Cuba, Panama, the Gulf of California, and the South Sea Islands. In 1865 extensive fishing grounds were found on the northwest coast of Australia. The shells from Panama are small and thick and are known in commerce as bullock shells. Those from Manila and Australia are finest in quality; they are disk-shaped and often as much as a foot in diameter. There are two varieties, the white, or silver-lipped, and the black-lipped. The mother-of-pearl or nacre of commerce is really the inner portion or lining of the shell, which the oyster secretes in successive layers of filmy thinness and marvelous smoothness of surface. Some fine mother-of-pearl is also produced in inland waters, chiefly in the rivers of China, Germany, and Russia. Recently the shells of a kindred Mississippi River mollusk have been used in the manufacture of pearl buttons. See Button; Pearl Oyster.

MOTHER OF PRESIDENTS. A name frequently given to the State of Virginia, which has furnished more Presidents to the Union than any other State. The following seven were born there: George Washington, Thomas Jefferson, James Madison, James Monroe, William H. Harrison, Zachary Taylor, and John Tyler. See States, Popular Names of.

MOTHER OF STATES. A name given to Virginia as the oldest of the thirteen American colonies, and because its original territory was formed into a number of States—West Virginia, Kentucky, Ohio, Illinois, and Indiana.

MOTHER SHIPTON'S PROPHECIES. A series of foretellings of events purporting to have originally been told by a woman named Agatha or Ursula Shipton, of Yorkshire, between 1486 and 1561. They appeared in chap-books or pamphlets, the earliest known of which was printed in 1641, and were continued until recent times. Charles Hindley wrote some prophecies purporting to have dated from 1448. It has been suggested that Mother Shipton was Master William Lilly, an astrologer, 1602-1681.

MOTHERWELL, mŭTH′ẽr-wĕl. A police burgh and manufacturing town in Lanarkshire, Scotland, 12 miles southeast of Glasgow (Map: Scotland, E 4). Its growth and importance are due to its iron and steel works and its neighboring collieries. It has fine municipal buildings, owns its water-works, and maintains a public park, etc. Population, in 1841, 726; in 1901, 30,423.

MOTHERWELL, William (1797-1835). A Scotch poet, born and educated in Glasgow. His first appearance in print was as editor of a volume of local poems (1819). His *Minstrelsy Ancient and Modern* (1827) won him the acquaintance of Scott. With Hogg, too, Motherwell was on friendly terms, and in 1835 the two prepared an edition of Burns's poems. Motherwell died of apoplexy in the same year, overcome by the strain of testifying before a Parliamentary committee on Orangeism. In his *Poems, Narrative and Lyrical* (1832), he utilizes Scotch and Norse mythology and occasionally shows some lyric power, as in the well-known "Jeanie Morrison," which tradition says was planned when he was only fourteen.

MOTH-FLY. Any one of the true flies of the family Psychodidæ—very small, weak flies which look like little moths and are frequently found upon windows and upon the under surfaces of leaves. They have broad wings, rather thick antennæ, and are densely clothed with hairs, even the surface of the wings being hairy. These are the only true flies, except true mosquitoes, which have hairs or scales on the wings. In the arrangement of the wing-veins these flies differ from all other Diptera, and probably represent the most generalized type in this order of insects. They differ greatly in larval habits: some live in rapidly running water, others on fallen leaves in small pools, others are found in rotten potatoes, while some live in dry cow-dung. The larvæ have both tracheal gills and open spiracles, so that theoretically they can breathe both air and the oxygen of the water. The family has a wide distribution, but only about 20 species are known in the United States.

MOTH-HUNTER. A bird, the nightjar (q.v.).

MOTILON, mō′tē-lōn′ (Sp., Cut-haired). A fierce tribe of Cariban stock (q.v.), inhabiting the mountains known as the Painted Andes, about Ocaña, in Northeastern Colombia. They were conquered in the early Spanish period and colonized in the lowlands under supervision of missionaries, but on the outbreak of a smallpox epidemic they were compelled to cut their hair to cool the fever, and were otherwise subjected to such sanitary regimen that they rebelled and fled to the mountains. They were fugitives for half a year, but returned on the subsidence of the epidemic. On a recurrence of the epidemic some years later the Indians again fled to the mountains, where they have since remained. For nearly two centuries they have been distinguished for their aggressive and untamable hostility to the whites, so that very little is definitely known of them. See YAMEO.

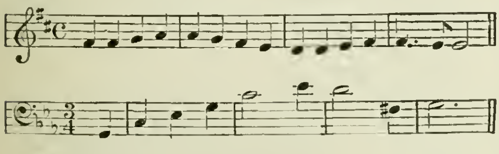
MOTION. See MECHANICS.

MOTION (Lat. *motio*, from *movere*, to move, Skt. *mīv*, to push). In law, an application to a court to obtain a direction, or order, as it is termed, in relation to some question or matter incidental or collateral to the main issues of the action. Generally, motions raise questions of both law and fact, and it often becomes a serious question as to whether a matter can be decided by the court on motion or whether there is such a controversy as will entitle the party against whom the relief is sought to a trial. A motion differs from a trial, which is the method of determining the substantive rights of the parties to an action on the main issues raised by the pleadings, whereas a motion is usually made to expedite the progress of the cause, or for summary relief preliminary to the trial of an action, and cannot bring up the entire merits of the action, and is based upon affidavits and other documents.

Where there is a question to be decided by the court on which the parties may reasonably differ, the motion can only be made after due notice to the opposite party. Generally any person interested in the subject-matter of an action is entitled to make a motion to protect his interests therein, whether he is a party to it or not. See AFFIDAVIT; DECREE; JUDGMENT; ORDER; TRIAL.

MOTION (in Music). The progression of the various voices or parts in a composition. Two voices proceed in *contrary motion* when one ascends, the other descends; in *parallel motion* when both ascend or descend; in *oblique motion* when one remains on the same tone while the other proceeds either ascending or descending. In compositions for three or more voices all three kinds of motion may appear simultaneously. Progression of voices in *parallel* motion requires the greatest care because it is here that faulty progressions (fifths, octaves) appear. For this reason the beginner would do well to lead the soprano and bass in *contrary* motion whenever possible. For examples of the different kinds of motion, see Ex. 13, under HARMONY.

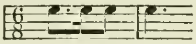
In respect to the tones of a single part a distinction is made between *conjunct* and *disjunct* motion. In the former case the notes proceed either by steps or semisteps; in the latter by intervals greater than a whole step. The following two examples from Beethoven illustrate this:



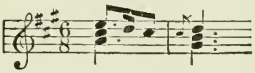
MOTIONS. A name given to a kind of puppet-shows, especially illustrating Scriptural stories. Motions throve in England in the fifteenth century.

MOTIVE (ML. *motivus*, moving, from *movere*, to move). In psychology, a general term for the conscious conditions of action (q.v.). As these conditions include always processes of two kinds, sensory and affective, the motive falls into two parts: the inducement, the sensory or 'intellectual' process, the 'reason' for action; and the incentive, the affective process which prompts to it. Thus a thief is induced to steal by the sight of the unguarded loaf; the incentive to his theft is the unpleasant feeling of hunger. The typical motive to action is the impulse (q.v.). For the use of motive in ethics, see ETHICS.

MOTIVE. In music, the original germ from which all musical form is evolved. A motive generally fills one measure, and two motives constitute the *section*. (See FORM.) The simplest form of motive is the *rhythmic* motive considered apart from the melodic and harmonic progressions, in conjunction with which it generally occurs. Thus the *rhythmic* motives underlying the principal subject of Beethoven's Symphony in A major is:



and the *complete* (rhythmic, melodic, harmonic combined) motive is:



However, there are also purely rhythmical motives which are set against other complete motives. A famous example is furnished in Beethoven's C minor Symphony, where the rhythmic motive of the principal subject is sounded on the basses against the secondary subject of the violins. In a wider sense the term *motive* is used almost synonymously with *theme*. In the use of this term musical terminology is very careless, for *motive* more frequently is applied when *theme* or *subject* should be used. Hence, in theoretical works the word *measure-motive* is adopted to denote the simplest form as explained above. The *leading motives* in Wagner's works should properly be called *leading themes*. See LEITMOTIV.

MOT'LEY, JOHN LOTHROP (1814-77). An eminent American historian, born in Dorchester, Mass., April 15, 1814. He entered Harvard College at the age of thirteen, and was graduated in the class of 1831. The two years following he spent in Germany at the universities of Göttingen and Berlin, and here he formed an intimate personal friendship with Bismarck, which continued till his death. On his return he studied law. He was married, in 1837, to Miss Mary Benjamin, of Boston. Motley's first venture in literature was a story entitled *Morton's Hope* (1839), a very unsuccessful historical-romantic novel. In 1841 he was made secretary of the American Legation at Saint Petersburg, but, owing to the severity of the climate and his regret at being separated from his family, he soon resigned. His first work revealing his real power was a review of a memoir of Peter the Great, which he wrote for the *North American Review* in 1845. Two years later he published in the same periodical a scholarly article on Balzac, and in 1849, for the same organ, a review of Talvi's *Geschichte der*

Colonisation von Neu England, a paper showing accurate knowledge of the history of New England and of the Puritan movement, and displaying philosophical insight. The same year saw the appearance of his *Merry-Mount,* an historical novel dealing with an episode in the early life of the Massachusetts Colony.

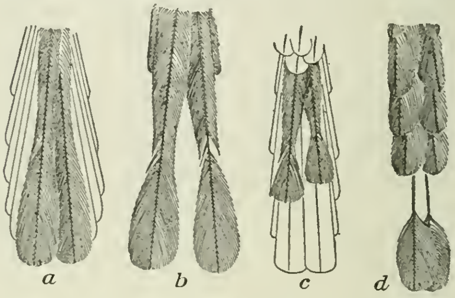
With this novel, and with an unsuccessful term in the Massachusetts Legislature, ended what may be called Motley's experimental period. He saw the true path for his genius to follow, and he was seized with the desire to write, to cite his own words, 'one particular history,' that of the Dutch. Having obtained the approbation of the historian W. H. Prescott, on whose territory he feared he might be trespassing, he began to gather material in America, and in 1851 he set sail for Holland to continue his researches. In 1856 appeared the *History of the Rise of the Dutch Republic,* a work in three volumes, published at his own expense. The same year Motley returned to Boston, where he remained about a year; then he went to England in 1858. Here he received the degree of D.C.L. from Oxford, and in 1860 he published the first two volumes of his *History of the United Netherlands.* In England he did his country good service by sending (1861) to the London *Times* two letters on the causes of the American Civil War, which helped to dissipate the British misunderstanding of American affairs. In 1861 he was appointed Minister to Austria, and in Vienna he served the United States faithfully and with tact, until misunderstanding and calumny caused him to resign in 1867. In 1868 appeared the last two volumes of the *History of the United Netherlands,* a book which sustained the high reputation of his earlier work and its own earlier volumes.

President Grant, on his election, appointed Motley Minister to England, but he recalled him in November of the following year (1870), for what appear to have been unsatisfactory reasons. Motley then retired to private life, and began work on the last of his histories. This was *The Life and Death of John of Barneveld, Advocate of Holland; with a View of the Primary Causes and Movements of the Thirty Years' War* (1874), which, in two volumes, virtually completed his plan of the history of Holland and the Dutch. It was his last work. He had suffered an incapacitating paralytic stroke in 1873, and the death of his wife in 1874 was a heavy blow. He himself lingered three years longer, and died in Dorchester, England, May 29, 1877.

Motley takes rank with the most distinguished of American historians. His work presents a finished and often brilliantly colored picture of the times and the country with which it deals. It was written only after a thorough examination and analysis of all available documents, and is philosophical as well as pictorial in its treatment. It is full of an inspiring love of freedom, has the advantage of dealing with an heroic movement, displays marked skill at characterization, and often flashes with wit. His *Correspondence* is scarcely less brilliant, and affords many glimpses of interesting personages, both American and European.

The histories are published in good English and American editions. There is a memoir by his intimate friend, Oliver Wendell Holmes (Boston, 1878); *The Correspondence of John Lothrop Motley* was edited (New York, 1889) by G. W. Curtis.

MOTMOT (onomatopoetic, in imitation of the bird's note). A bird of the family Momotidæ, related to the coraciiform bee-eaters, todies, and kingfishers. The motmots are peculiar to tropical America, and only one of the 15 species occurs as far north as the United States. They are birds of very brilliant plumage and about the size of a blue jay, but more slender in form; are solitary in habits, and live on insects, reptiles, and fruits. Their most peculiar feature is the long tail, in which the middle pair of feathers are longer than the rest, and have a peculiar shape which has caused them to be called 'racket-feathers.' The cause of the peculiarity has been greatly discussed, but there is much evidence to show that it is brought about by the birds themselves biting away the vanes from the denuded part. One species (*Momotus cœruliceps*) reaches the Mexican boundary of the United States. Consult: Belt, *Naturalist in Nicaragua* (London, 1888); Murie, *Ibis* (London, 1892). See Plate of KINGFISHERS, MOTMOTS, ETC.



TAILS OF MOTMOTS.

a, Lesson's motmot, central rectrices perfect; *b,* the same, rectrices denuded; *c,* Mexican motmot, central rectrices affected while yet growing; *d,* blue-headed motmot showing 'rackets' resulting from complete denudation of a part of the feather.

MOTOORI NORINAYA, mō'tō-ō'rĭ nō'rĭ-nä'yȧ (1730-1801). A Japanese scholar, the greatest authority, until the era of modern research, upon the customs, history, poetry, and religion of ancient Japan. He wrote many books, his most important being a commentary on the *Kojiki* (Records of Ancient Matters, the first book written in Japan). The commentary is in forty-four volumes. It was begun in 1764 and finished in 1796. Upon the publication of the first part students came to Motoori from all parts of Japan. In 1801 he lectured in Kyoto to crowds, princes and nobles being among his auditors. His influence increased after his death, and his writings are thought to have aided in bringing on the recent changes in the Empire. He is regarded as a master of literary style.

MOTOR CARRIAGES AND VEHICLES. See AUTOMOBILE.

MOTOR-GENERATOR. See DYNAMO-ELECTRIC MACHINERY.

MOTOR ORGAN (Lat. *motor,* one who moves, from *movere,* to move). A structure which when stimulated moves the parts attached. Motor organs are found at the base of leaves and leaflets in various plants, particularly members of the bean family (Leguminosæ). They are formed by the modification of the structure of the main leafstalk and of the stalks of the leaflets (Fig. 1). When the latter are short the motor organ may constitute the whole stalk. The motor organ is a cushion (pulvinus) of thin-walled tissue (parenchyma) whose centre is occupied by a strand of fibro-vascular and mechanical tissue (Fig. 2). This is in sharp contrast with the structure of the stalk elsewhere. There the outer parenchyma forms the usual cortex, the vascular and mechanical strands are distinct and often numerous, and the centre is occupied by a pith (parenchyma) of considerable volume. The central position of the strands in the motor organ obviously permits freer bending. The cells of the parenchyma are normally turgid, and by mutual pressure the organ is kept rigid, supporting the leaf or the leaflet. The action of an appropriate stimulus on the plant results in the exudation of water from the cells on one side of the pulvinus. This water passes into the intercellular spaces of the organ and the cells of course lose their turgor. Owing to the now unopposed pressure of the still turgid cells on one side of the organ, it bends more or less, the flaccid side becoming concave, and the leaf-blade is carried through a considerable arc. In the sensitive plants (Mimosa) of the tropics, contact is the usual stimulus. The whole reaction takes place very rapidly, the time from shock to response being only a fraction of a second. In other plants variations in the intensity of light cause similar but slow curvatures in the motor organs. Exactly how the exudation of water from the cells of the motor organ is brought about is not known. It is probable that the stimulus in some way alters the physical structure of the protoplasm within the affected cells so that the contained solution is allowed to filter out. See MOVEMENT.

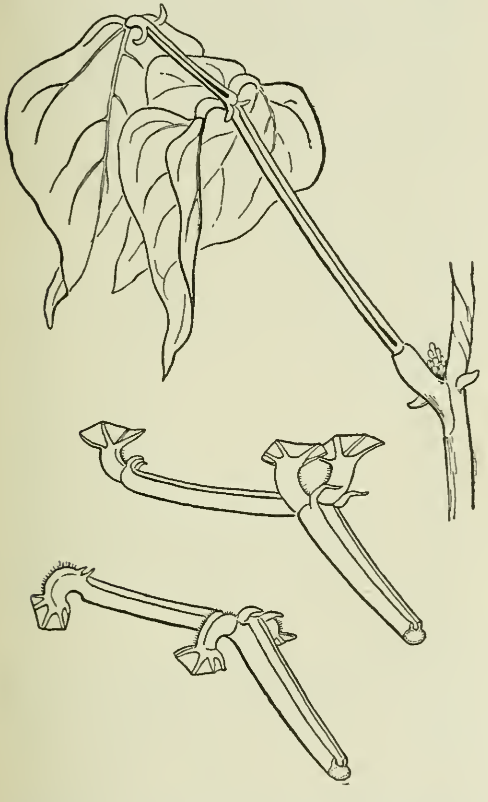


FIG. 1. MOTOR ORGANS OF LEAF OF BEAN.
The primary organ at the base of main petiole; secondary ones at the base of each leaflet; the lower figures show the curvature of these organs after stimulation (blades cut away to show more clearly).

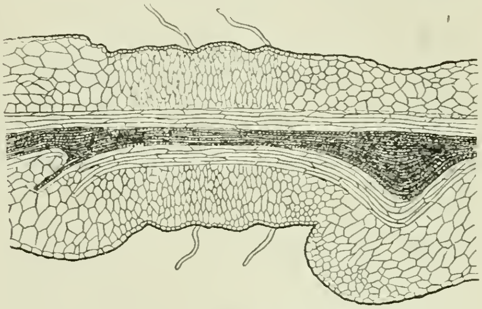


FIG. 2. LONGITUDINAL SECTION THROUGH MOTOR ORGAN OF SENSITIVE PLANT (*Mimosa pudica*).

MOTRIL, mō-trēl′. A city and port of entry in Southern Spain, in the Province of Granada, situated on the Mediterranean coast, 32 miles south by east of Granada (Map: Spain, D 4). There are ruins of old Moorish fortifications, but the greater part is well built with modern houses. Motril is chiefly an industrial town, has iron foundries, and manufactures sugar, spirits, chocolate, flour, soap, paper, cotton textiles, and pottery. The harbor is an exposed roadstead. Population, in 1900, 18,508.

MOTT, JAMES (1788-1868). An American abolitionist, born at Cowneck, Long Island. Soon after completing his education he became a teacher in a Friends' boarding-school in Dutchess County, N. Y., where he met Lucretia Coffin (see MOTT, LUCRETIA), whom he afterwards married. In 1810 he removed to Philadelphia and became a merchant. He early manifested his sympathy with the anti-slavery movement and was one of the first supporters of William Lloyd Garrison (q.v.). He was one of the organizers of the Philadelphia National Anti-Slavery Society in 1833, and in 1840 he was a delegate to the World's Anti-Slavery Convention in London. There he took a prominent part in the agitation to admit women delegates, and eight years later presided over the first national convention held in support of the Woman's Rights movement. In 1848 he joined in calling the Anti-Sabbath Convention, and after the war was actively interested in the establishment of Swarthmore College by the Philadelphia Yearly Meeting, of which he was a member.

MOTT, LUCRETIA (COFFIN) (1793-1880). An American abolitionist and woman's rights advocate, born on Nantucket Island. She was educated in the Friends' School at Nine Partners, near Poughkeepsie, N. Y., where she met James Mott (q.v.), whom in 1818 she married. She became prominent as a preacher in the Society of Friends and was chosen a minister. As a result of a visit to Virginia in 1818 she became an ardent advocate of emancipation. At the 'Separation' of 1827 which divided the Society of Friends into two hostile factions, she and her husband adhered to the liberal or Hicksite party. In 1833 she attended as an invited guest the first convention of the American Anti-Slavery Society, of which her husband was a member. Soon afterwards she helped to organize the Female Anti-Slavery Society, of which she continued one of the leaders until 1839, when it was merged in the men's organization. As the feeling against abolitionists grew in intensity, many of the more timid Quakers began to deprecate any discussion of slavery by one of their ministers, and even in her own meeting she was regarded with suspicion and dislike. In 1840, at the World's Anti-Slavery Convention in London, to which both James and Lucretia Mott had been chosen delegates, the question of the equal participation of women in the proceedings of the convention came up, and after some discussion all women were excluded. It was then that Lucretia Mott and Elizabeth Cady Stanton first discussed the woman's rights movement, which they launched eight years later at a convention in Seneca Falls, N. Y. But these two movements, abolition and woman's rights, while they received the greater share of her attention, were not the only ones in which Mrs. Mott was interested, for all that promised to uplift humanity or to break the fetters of ignorance and tradition received her warmest support. Almost to the end of her life she made frequent journeys to visit distant meetings or to attend conventions called to consider the elevation of woman, the promotion of temperance, and the establishment of universal peace. Consult Hallowell, *The Life and Letters of James and Lucretia Mott* (Boston, 1884).

MOTT, Valentine (1785-1865). An American surgeon, born at Glen Cove, N. Y. He studied medicine at Columbia College, and graduated in 1806, taking post-graduate courses in London and Edinburgh. In 1809 he was appointed to fill the chair of surgery at Columbia College, in which position he was continued after the medical department of that institution was united with the College of Physicians and Surgeons in 1813. In 1826 he was one of the founders of the Rutgers Medical College, which was disbanded four years later. He then returned to the College of Physicians and Surgeons, and in 1830 became professor of surgery at the New York University Medical College. Mott was celebrated as a skillful operator in all branches of surgery, and was the inventor of several valuable surgical instruments. He introduced an operation for immobility of the lower jaw, and in 1821 performed the first operation for osteosarcoma of that member. He performed the operation of lithotomy 165 times and amputated more than 1000 limbs. He visited Europe in 1835 and traveled in the East, publishing an account of his journey in 1842. He published also a translation of Velpeau's *Operative Surgery* and a volume of clinical lectures (1860). Many foreign distinctions were conferred on him, and he was a member of many learned societies. He died in New York.

MOTTARONE, mŏt'tȧ-rō'nȧ, Mount. A mountain in Italy on the west shore of Lake Maggiore (q.v.). It is 4892 feet high and is often called the 'Rigi of North Italy.' The view is magnificently extended. At one's feet lie Maggiore and six other lakes; across Maggiore, 60 miles to the southeast, may be seen the Cathedral of Milan; to the north rise the Alps.

MOTTEUX, mŏ'tē', Peter Anthony (1660-1718). A French-English playwright and translator, born at Rouen, in Normandy. He went to London on the revocation of the Edict of Nantes in 1685, and afterwards opened a warehouse in Leadenhall Street, where he sold 'tea, china, and Indian wares' (described in the *Spectator* No. 552). In 1693 appeared Boileau's *Ode sur la prise de Namur, avec une parodie de la même ode par le Sieur P. Motteux.* In 1694 appeared one of the two works which renown Motteux, who in eight years had mastered English. With Sir Thomas Urquhart and others he published in three volumes a translation of Rabelais (books i.-iii.), the remainder of which followed in 1708 (books iv.-v.). For the stage he wrote comedies, masques, and operas. But his fame rests wholly on his Rabelais and on his admirable version of *Don Quixote*. Motteux died on February 18, 1718, his birthday anniversary, in a brothel near Saint Clement's Church. Though several persons were held for his murder, it is more likely that he died of disease.

MOTTL, mŏt'l, Felix (1856—). An Austrian composer and musical conductor, born in Vienna. He studied at the Conservatory there under the best teachers, and won a number of prizes. In 1881 he became Court chapel-master at Karlsruhe, and conducted the philharmonic concerts till 1892. In 1886 he conducted at Bayreuth and in 1893 he was appointed general musical director at Karlsruhe. His most noteworthy undertaking was the initial production at Karlsruhe of Berlioz's great two-part opera, *Les Troyens.* His own operas, *Agnes Bernauer* (1880), and *Fürst und Sänger* (1893), were also successfully presented. His songs and minor compositions are relatively unimportant.

MOTTLED OWL. See Owl; Dichromatism in Birds.

MOTTO (It., a saying). In heraldry, a word or short sentence which forms an accompaniment to a coat-of-arms, crest, or household badge. Mottoes were originally the battle-cries of the knights who used them. They were attached to the badge when the family had one, or to the crest where there was no badge. See Heraldry.

MOTUCA (mȯ-tōō'kȧ) **FLY.** A gad-fly (q.v.) which abounds in parts of Brazil, and makes in biting a large and deep cut which may bleed considerably. As this fly (*Hadrus lepidotus*) sometimes settles in numbers on human beings, it is deservedly feared.

MOUBATA BUG. An African 'tick.' See Mite; Tick.

MOUCHERON, mōōsh'rôɴ', Frederik de (1634-86). A Dutch landscape painter, born at Edam. He studied under Jan Asselyn at Amsterdam, and then went to Paris. Afterwards he lived at Antwerp, and in 1659 settled at Amsterdam. His landscapes are mainly views in Italy—which he never visited—with figures by Lingelbach, Van der Velde, and Helmbreker. His son and pupil, Isaak (1670-1744), was born at Amsterdam. He was an excellent engraver. The works of both these artists are to be found in many of the European galleries.

MOUCHEZ, mo͞o'shā'. Amédée (1821-92). A French astronomer, born at Madrid. He studied in the French Naval Academy and served in the navy until 1878, when he succeeded Leverrier as head of the National Observatory. He had already shown himself an able and industrious scientist in the coast surveys of Brazil and Algeria, and as organizer of the expedition to the island of Saint Paul to observe the transit of Venus in 1874. In his new post he greatly improved the equipment of the observatory, brought out a score of volumes of the *Annales* and a part of the catalogues listing all stars observed since 1838, and, above all, planned the international photographic chart of the heavens. He wrote: *Côtes du Brésil* (1869-76); *Rio de la Plata* (1873); and *La photographie astronomique et la carte du ciel* (1877).

MOUFLON, mo͞of'lŏn (Fr.). A wild sheep (*Ovis musimon*), now, and perhaps always, restricted to the islands of Corsica and Sardinia, where it is confined to the highest parts of the mountains. The rams stand about 27 inches high at the shoulders, carry immense horns, and have an abundant mane about the neck, shoulders, and breast. This mane is ashy gray, but the body is rusty red, lighter on the sides and stern, and with a dark line along the spine. The belly, sides of the tail, feet, and nose are white. The females are more dun-colored, so that they are almost invisible among the rocks. During the winter flocks of several hundred formerly gathered and ranged the mountains until spring, when they separated into family parties of three or four ewes and lambs, led by an old ram; but now large flocks are uncommon. The rutting season is in midwinter; the lambs—one or two at a birth—are produced in April or May. The animals have now become very wary, and offer most excellent sport to hunters. Consult books of European natural history and sport, especially Aflalo, *Sport in Europe* (London, 1901).

The term is sometimes extended to the aoudad (q.v.), and more especially to a slightly smaller sheep (*Ovis ophion*), with lighter horns, which is confined to the mountains of Cyprus, and called the Cyprian mouflon.

MOUKDEN, mo͝ok-dĕn'. The capital of Manchuria. See Mukden.

MOULDING. See Molding.

MOULIN ROUGE, mo͞o'lăN' ro͞ozh (Fr., Red Mill). A well-known dance hall on the right bank of the Seine in Paris, which since the disappearance of the Jardin Mabille has been one of the chief places of popular amusement.

MOULINS, mo͞o'lăN'. The capital of the Department of Allier, France, 50 miles by rail northeast of Montluçon; on the Allier, here spanned by a bridge one-fourth of a mile long, with thirteen arches (Map: France, K 5). It is a well-built town, with pleasant, beautifully shaded promenades and many places of interest. The chief among these last are the Hôtel de Ville, with a magnificent library and valuable manuscripts; the Cathedral and its interesting art treasures; the Archæological Museum, the Church of the Sacred Heart, and the Lycée. The industries comprise the manufacture of glassware, cotton and woolen fabrics, and silk; there is an important trade in coal, wood, grain, and wine. Moulins was for a time the capital of Bourbonnais and the residence of the dukes of Bourbon; of the ducal castle, a fourteenth-century tower, now used as a prison, remains. Population, in 1901, 22,340.

MOULMEIN, moul-mīn'. A city in Lower Burma. See Maulmain.

MOULTING. See Molting.

MOULTON, mōl'ton, Ellen Louise (Chandler) (1835—). An American poetess, born in Pomfret, Conn., April 10, 1835. She was educated at Troy, N. Y., and before her twentieth year had edited *The Waverley Garland, a Present for All Seasons* (1853), and had written *This, That, and the Other* (1854). In 1855 she married William Moulton, a Boston publisher and journalist. Her published work is voluminous. The following titles may be named: *Juno Clifford, A Tale* (1856); *My Third Book, A Collection of Tales* (1859); *Bedtime Stories* (1873); *More Bedtime Stories* (1874); *Poems* (1878); *New Bedtime Stories* (1880); *Random Rambles* (1881); *Ourselves and Our Neighbors* (1887); *Miss Eyre from Boston, and Others* (1889); *In the Garden of Dreams: Lyrics and Sonnets* (1889); *Stories Told by Twilight* (1890); and *At the Wind's Will* (1899). She was the literary executrix of the English poet Philip Bourke Marston, and collected his poems in 1892. In 1894 she published a volume of selected poems of Arthur O'Shaughnessy. Mrs. Moulton ranks well as a sonneteer and shows skill.

MOULTON, Richard Green (1849—). An English educator and literary critic, born at Preston, England, and educated at Christ's College, Cambridge. He was university extension lecturer to Cambridge (1874-90), to the American Society for the Extension of University Teaching (1890-91), and to the London Society (1891-92), and in 1892 became professor of literature in English at the University of Chicago. His works include: *Shakespeare as a Dramatic Artist* (1885); *The Ancient Classical Drama* (1890); *Four Years of Novel Reading* (1895); *The Literary Study of the Bible* (1896); and *Introduction to the Literature of the Bible* (1901); the last two supplementary to *The Modern Reader's Bible* (1895-98), published under his editorial care.

MOULTRIE, mōl'trĭ, Fort. See Fort Moultrie.

MOULTRIE, William (1731-1805). An American soldier, prominent in the Revolutionary War. He was born in South Carolina, received an ordinary education, and in the Cherokee troubles of 1761 was a military captain. Though closely connected with many of the Loyalists, he early took sides with the Patriot Party. In 1775 he was the representative of Saint Helena Parish in the South Carolina Provincial Congress, and later in the same year was chosen colonel of a South Carolina regiment. For some time thereafter he was busily engaged in providing for the defense of Charleston, and to this end placed a battery at Haddrell's Point and (March, 1776) began the erection of a rude fort of palmetto logs on Sullivan's Island. This fort commanded the entrance to the harbor, and on June 28th was fiercely but unsuccessfully attacked by Admiral Sir Peter Parker, who was finally forced to withdraw. Moultrie had undertaken the defense against the advice and wish of his superior officer, General Charles Lee. For his success he received the thanks of Congress, and in his honor the fort was named Fort Moultrie. In September of the same year he was made a brigadier-general and was put in command of the Department of Georgia and South Carolina. He defeated the British under General Gardner at Beaufort in February, 1779, and, by obstructing the advance of Prevost in May, enabled Charleston to prepare for its defense, finally entering the city and holding chief command until the arrival of General Lincoln. On the surrender of Charleston in May, 1780, he became a prisoner, but in February, 1782, he, with several others, was exchanged for Burgoyne. He was made a major-general in October of that year, and subsequently was twice (in 1785 and in 1794) elected Governor of South Carolina. He retired to private life after his second term and died at Charleston, September 27, 1805. His *Memoirs of the Revolution as far as it related to the States of North and South Carolina* (2 vols., 1802) was written in part while he was a prisoner, and was finished in later years.

MOUND-BIRD. The mound-birds are a group of gallinaceous birds, with feet like those of pigeons in not having the hallux raised above the other toes, and related to the American curassows (q.v.). They form a family, the Megapodidæ, which, as is indicated by the name, are characterized by the possession of unusually large feet. Although the family contains two subfamilies, the mound-birds proper or, as they are called in Australia, 'jungle-fowl,' and the brush turkeys (q.v.), yet all these birds agree in the remarkable habit which has given them their widely known popular name. This habit is the building of a huge mound for a nest, within which the eggs are left to be hatched by heat caused by the decay of vegetable matter within the heap. These mounds vary greatly in size and shape as well as in manner of construction, and in the number and arrangement of the eggs which they contain. The simplest are where the birds excavate a hole in the sand in which the eggs are laid, and are then covered with a mixture of sand and vegetable matter. Such is the habit of the 'lowan,' or 'mallee-bird' (*Megacephalon maleo*), of Celebes. In most cases, however, the birds scratch up grass, leaves, turf, etc., and with their large feet throw this material together in a heap. The female digs down into such a heap from the top and lays an egg, which is so placed that it is nearer the outside than the top of the mound. Just how the young escape from the mound when the egg hatches is still uncertain, but it is probably by digging through to the side. The young are well developed, feathered, and able to fly as soon as they leave the mound. The number of eggs laid by each female is still a matter of doubt; from four to twenty are found in each mound, and there is no doubt that several females often lay in the same heap. The eggs are white when first laid, but soon become stained by the vegetable matter in which they lie. They are remarkably large for the size of the bird and are ellipsoidal rather than oval; they measure from 3 to 4.3 inches in length, according to the species. The birds resort to the same mound season after season, but add fresh material at every egg-laying time. Consequently the mounds increase with age and may be in use for many years. They are usually more or less truncatedly conical or crater-like in form, but may have one of the horizontal diameters much longer than the others. The largest one on record was reported to be about 50 feet in diameter and some 14 feet high.

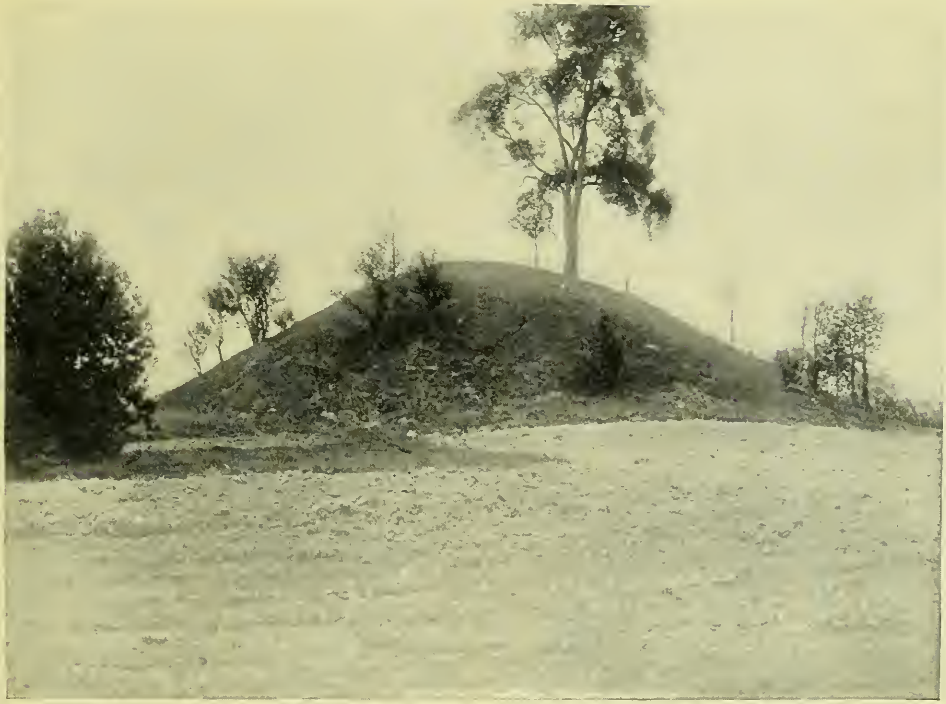
The mound-birds themselves are plainly colored and vary in size from a small fowl to a small turkey. They are shy and retiring and are not often seen. They frequent scrub and undergrowth along the seacoast or on the banks of streams emptying into the sea. The mounds are built in open spaces in the thick scrub or on unfrequented parts of the shore. The birds fly little and heavily, and are not easily flushed, but sometimes seek shelter in trees. They are said to be noisy at night and to have hoarse call-notes which they use during the day. All the Megapodidæ are inhabitants of the Australasian region and are not found north of Celebes; the majority of the species are Australian. The one best known on that continent is the 'scrub-hen,' or 'mound-turkey,' of Queensland (*Megapodius tumulus*). Another smaller one is the leipoa (*Leipoa ocellata*). The 'brush-turkeys' of New Guinea and neighboring islands belong to the genus Talegalus.

Consult Gould and other authorities on the ornithology of Australia (see BIRD). See, also, Campbell, "Mound-Building Birds" (with photographic illustrations of 'mounds'), in *Bird Lore*, vol. v. (New York, 1903).

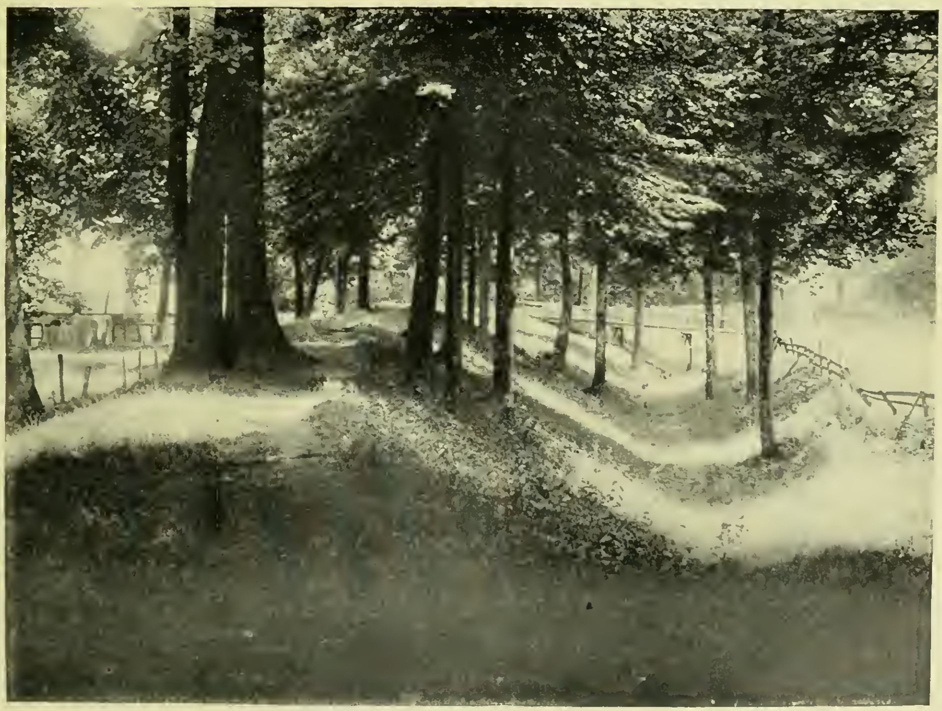
MOUND-BUILDERS. Specifically, a hypothetical race or people at one time supposed to have antedated the Indian tribes as inhabitants of the Ohio and Mississippi valleys; but the 'Mound-Builders' of the Mississippi Valley are now regarded merely as the ancestors and representatives of the tribes found in the same region by Spanish, French, and English pioneers. The custom of erecting mounds has been widespread; most primitive peoples are known to have erected mounds either habitually or in some stage of their development. Most of the mounds of the typical regions in Central North America are mortuary or sacrificial. The chief contents are skeletons, with ceremonial and other objects buried with the bodies, while the structures are wholly of earth; in a few cases house-like structures form the nucleus of the mound. In the Southwestern United States, in Central America, and elsewhere in the Western Hemisphere, as in the Old World, the mounds are sometimes crumbled ruins of structures of adobe, or sun-dried brick.

MOUND CITY. The county-seat of Pulaski County, Ill., eight miles north of Cairo; on the Ohio River, and on the Cleveland, Cincinnati, Chicago and Saint Louis Railroad and a branch of the Illinois Central (Map: Illinois, C 6). It has a trade in lumber, ship-building interests, and manufactures of lumber, staves, furniture, pumps, etc. In the national cemetery here are 5310 graves, 2732 of unknown dead. Population, in 1900, 2705.

MOUNDS'VILLE. A city, named in honor of its most striking attraction, and the county-seat of Marshall County, W. Va., 11 miles south of Wheeling; on the Ohio River, and on the Baltimore and Ohio and the Ohio River railroads (Map: West Virginia, D 2). It is the seat of



MOUND, ADAMS COUNTY, OHIO



CIRCULAR EARTHWORK, OHIO

the State penitentiary, and has a fine court house, and a famous relic of the mound-builders, a massive structure of conical form, in which two burial vaults containing skeletons and copper ornaments were discovered by excavations of 1838. The city is in an agricultural and coal-mining region, has important commercial interests as a result of its shipping facilities, and extensively manufactures glass, lumber products, enameled ware, bricks, cigars, grain cradles, flour and feed, foundry products, leather, etc. The government is vested in a mayor, elected every two years, and a unicameral council. Population, in 1890, 2688; in 1900, 5362.

MOUNET-SULLY, mo͞o'nȧ'sụ'lė' (1841—). A French tragedian, whose real name is Jean Sully Mounet. He was born at Bergerac, February 27, 1841, and at twenty-one entered the Conservatoire. After beginning his career at the Odéon, he served in the Franco-Prussian War, and in 1872 he made his début at the Théâtre Français, where in about two years he became a member of the company. Admirably gifted by nature, he is famous for the power and passion of some of his impersonations. His successes include many of the rôles in the classic repertoire. Among them are his Achille in *Iphigénie* and his Hippolyte in *Phèdre*, and also characters in more modern works like those of Victor Hugo. Perhaps his most notable achievement, however, was his performance of *Œdipus the King* in the fêtes at the old Roman Theatre of Orange, a performance repeated in Paris at the Théâtre Français (1888). His Hamlet also counts among his most serious efforts. Consult Matthews, *The Theatres of Paris* (New York, 1880).

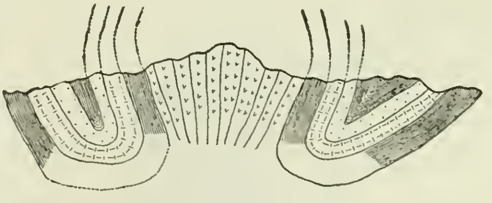
MOUNIER, mo͞o'nyȧ', JEAN JOSEPH (1758-1806). A French politician and author, born in Grenoble (Isère). He became judge at Grenoble in 1783, secretary of the estates of Dauphiné in 1788, and in 1789 was elected Deputy in the States-General. There he unsuccessfully advocated the system of two legislative chambers, a subject which he also expounded in his *Considérations sur les gouvernements* (1789). He was elected president of the National Assembly in 1789, but soon afterwards resigned because of the decision to remove the Assembly to Paris. He withdrew to Switzerland and thence to Weimar, published his *De l'influence attribuée aux philosophes, aux francs-maçons et aux illuminés sur la révolution de la France* (1801). and in 1801 returned to France, where Bonaparte appointed him prefect of Ille-et-Vilaine (1802) and councilor of State (1805). His further publications include *Recherches sur les causes qui ont empèche les Français de devenir libres* (1794). Consult De Lanzac de Laborie, *Un royaliste libéral en 1789* (Paris, 1887).

MOUNT FOR GUNS. See COAST ARTILLERY; GUNS, NAVAL; ORDNANCE.

MOUNT, WILLIAM SIDNEY (1807-68). An American genre and portrait painter. He was born at Setauket, Long Island, November 26, 1807, and studied at the National Academy, New York, of which he was made a member in 1832. His first works to gain repute were the "Daughter of Jairus," exhibited in 1828, a full length portrait of Bishop Onderdonk, and a number of clever children portraits. It was not until the exhibition of "Husking Corn" that his special talent for genre painting was recognized. Mount was the forerunner of a whole school of genre artists; he had a keen eye for humor, and was one of the first Americans to portray the negro character successfully. Among his best paintings are: "Bargaining for a Horse;" "The Fortune-Teller," and a portrait of James Rivington, in the New York Historical Society; "Raffling for a Goose" (1837), Metropolitan Museum; "A Long Story" (1837), Corcoran Gallery, Washington; "Turn of the Leaf," Lenox Library, New York. Mount died at his home in Long Island, November 19, 1868.

MOUNTAIN (OF. *montaigne, muntaigne*, Fr. *montagne*, from ML. *montanea, montana*, mountain, from Lat. *montanus*, mountainous, from *mons*, mount). A term somewhat loosely used for a high prominence on the earth's surface with steep slopes. The distinction between mountain and hill is merely one of size. A plateau is distinguished from a mountain by its broader top and sometimes by its gentler slopes. Where a mountain forms a linear elevation it is called a range, ridge, chain, or sierra. Where the ridges are grouped in parallel lines, or *en échelon*, the groups are called mountain chains, systems, or cordilleras. These terms are sometimes given more precise meanings. *Mountain ridge* is sometimes confined to a series of parallel ranges, all of which were formed within a single geosyncline, or on its borders. *Mountain system* is applied to a number of parallel or consecutive ranges formed in separate geosynclines of approximately similar dates of upheaval. *Mountain chain* is applied to two or more systems of the same general region of elevation, but of different dates of origin. *Cordillera* is applied to several mountain chains in the same part of the continent. Most of the names applied to parts of mountains explain themselves. Crest, peak, knob, pinnacle, needle, valley are familiar to all. A gorge or canyon or clove is distinguished from a valley by its steep slopes and narrow bottom; a park is a broad valley; a col or saddle is an exceptionally low point in a crest; a cirque is a steeply walled, outward facing amphitheatre near the crest of the range.

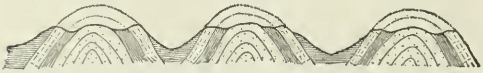
TYPES AND ORIGIN OF MOUNTAINS. Mountains are formed (1) by uplift, (2) by circumdenudation or land sculpture, and (3) by eruptive agencies; and mountains formed in these three ways have characteristic and distinguishing forms.



FAN STRUCTURE, ALPS.

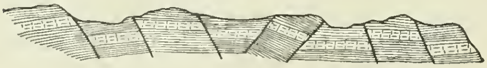
(1) By far the larger number of mountains due to uplift are in the form of folds or wrinkles in the earth's crust. These folds take on a great variety of form and arrangement. Usually a number are parallel, but not coextensive in their longer directions, lapping by one another *en échelon*. They may be upright or overturned at various angles. They may be compressed

along the limbs and spread out at the crest in such a way that the strata on both sides of the axial plane of the fold dip toward this plane, a type of folding called the *fan fold,* sometimes the *Alpine structure,* because of its excellent development in the Alps. On the major folds with this variety of attitude may be imposed smaller folds, just as smaller waves are superimposed on the greater waves of a body of water. Again, the folds are themselves folded in directions transverse to their longer directions. Examples of mountain systems representing folds of the earth's crust are the Alps, the Jura, the Appalachian system, the Coast Ranges, and most of the Rocky Mountains.



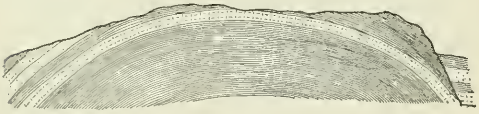
SYMMETRICAL FOLD, JURA MOUNTAINS.

Another type of uplift is shown in the Basin Ranges of Nevada, Idaho, Arizona, and New Mexico, and is known as the *Basin Range structure.* Here the uplift is not accompanied by any horizontal compression. The rocks apparently have been uplifted vertically in great blocks owing their outlines to joints or faults, while others remain stationary or go down. Not infrequently a series of such blocks is tilted in a monoclinal manner, corresponding edges of different blocks going up and the opposite edges going down, the elevated edges thus making mountains, and the depressed edges valleys.



FAULTED STRUCTURE, BASIN RANGE.

Still another type of uplift is shown in the Uinta Mountains of Utah, where a great mass of rock has been apparently lifted vertically above the adjacent rocks with only a gentle arching.



BROAD MONOCLINE, UINTA MOUNTAINS.

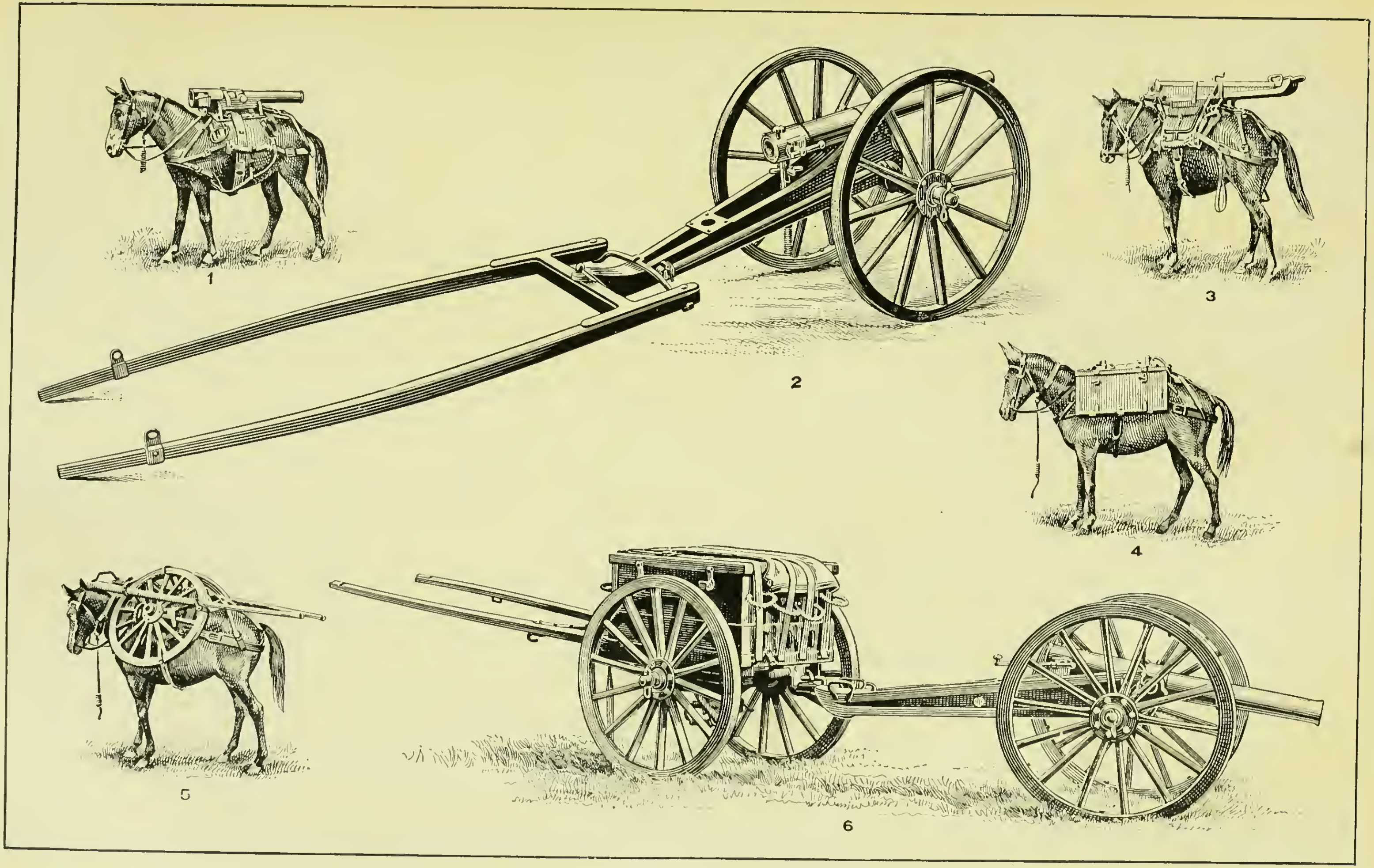
Two theories have been proposed to explain mountains of the fold type, the so-called gravitation theory, and the contraction theory. It has been observed that mountains formed by folding or faulting are for the most part composed of great thicknesses of sediments which were deposited in the same general geosyncline, i.e. in the same great depression of the earth, or perhaps which were deposited in areas which became geosynclines due to subsidence of the area under the weight of the sediments. It is supposed that the load of sediments may cause the isogeotherms to rise, that is, causing the rocks at a certain level to have a higher temperature than they otherwise would have. This, perhaps combined with the injection of igneous rocks, which are sometimes observed to occur in such areas, causes the rocks to expand, resulting in folds or mountains. To this there are a number of objections. The expansion possible by this cause is not sufficient to explain the amount of folding observed, and furthermore it does not explain the occurrence of the folds in parallel ridges. The contraction theory is briefly this: The cooling of the earth is proceeding more rapidly in the interior than at the cool exterior. This causes more rapid contraction of the interior than of the exterior, and the crust, in its tendency to make itself smaller in order to fit the smaller nucleus, becomes wrinkled and corrugated. The wrinkles become located along points of weakness. These are likely to be under the geosynclines where great sedimentation has occurred, where, as above seen, the temperature is supposed to be higher.

(2) When an area is elevated above the sea the natural forces of erosion, wind, water, changes of temperature, etc., begin their attack upon the land, and slowly cut it down, the waters collecting in rills, brooks, and rivers, cutting small and large valleys with a variety of forms and distribution due to the varying hardness and the structure of the materials cut through. If carried far enough this process will ultimately bring the elevated area to sea level. At certain stages in the process certain areas, because of their hardness or structure, may stand high above the surrounding areas which have been worn away, and may be called mountains. In so far as mountains have already been formed by folding and elevation, subsequent erosion only modifies their shapes, but where uplift has not left the land in mountain form subsequent denudation may bring it to this point. Mountains formed or modified in this way have a variety of shapes. When the strata are horizontal a hard layer at the top may resist erosion sufficiently long to make the mountain a flat or table top mountain. Hard volcanic material about a volcano may resist erosion more than the surrounding material, and the area thus stand as a lava-topped mountain. If the strata are much folded erosion cuts down along lines of least resistance, usually following the softer strata, leaving the edges of the harder ones as ridges. This state of affairs appears in the Appalachian system, a system owing its present features to folding and elevation combined with differential denudation along softer layers.

(3) Mountains formed by eruption of igneous rocks are of common occurrence. Volcanic mountains formed by lavas occurring either singly or grouped in lines are well known. Vesuvius, Rainier, Hood, Saint Helen's, and Shasta are examples of these. The volcanic materials may be so grouped as to form an upland of considerable extent, as the Cascade range. Eruptions of igneous rocks which never reach the surface also form mountains by bulging up the strata above them. Going upward toward the surface they find it easier at a certain point to spread out in a globular form (called laccolite), arching the strata above them, than to break through the overlying strata and come to the surface. The mountain thus formed is a dome with a nucleus of igneous material. The Henry and Huerfano mountains of the Western United States are of this type.

MOUNTAINS AND CLIMATE. Mountains fulfill important uses in the economy of nature, especially in connection with the water system of the world. They are at once the great collectors

MOUNTAIN ARTILLERY



1 TWELVE-POUNDER MOUNTAIN GUN ON MULE
2. TWO-POUNDER HOTCHKISS MOUNTAIN GUN

3, 4, and 5. MOUNTAIN GUN CARRIAGE AND AMMUNITION CHESTS PACKED ON MULES
6. TWELVE-POUNDER HOTCHKISS MOUNTAIN GUN

and distributors of water. In the passage of moisture-charged winds across them, the moisture is precipitated as rain or snow. When mountain ranges intersect the course of constant winds and abstract the moisture, they produce a moist country on the windward side, and a comparatively dry and arid one on the leeward. This is exemplified in the Andes, the precipitous western surface of which has a different aspect from the sloping eastern plain; and so also the greater supply of moisture on the southern sides of the Himalayas brings the snow-line 5000 feet lower than on the northern side. Above a certain height the moisture falls as snow, and a range of snow-clad summits would form a more effectual separation between the plains on either side than would the widest ocean, were it not that transverse valleys are of frequent occurrence, which open up a pass, or way of transit, at a level below the snow-line. But even these would not prevent the range being an impassable barrier if the temperate regions contained as lofty mountains as the tropics. Mountains also show considerable vertical variation in their life and climate zones. It is well known that, other things being equal, the air is one degree cooler for every 300 feet of ascent, and also that the rate of precipitation increases upward. At a certain elevation rain gives way to snow. Corresponding to these varying conditions of temperature and moisture is the distribution of the vegetation, which is commonly in well-defined zones, each zone distinguished by its species from the zones above and below. Near the top of many mountains the vegetation ends altogether, and the top of the mountain is barren.

Age of Mountains. The age of most folded mountain systems has been determined by the structure of the sediments of known age which compose them, and their relation to other sediments of known age. For instance, the Appalachian system of the Eastern United States, composed mainly of Paleozoic rocks, is much contorted, while rocks of Mesozoic age rest against this mountain system in relatively undisturbed layers. It is clear that the main uplift of the mountain system followed the deposition of the Paleozoic rocks, and preceded that of the Mesozoic rocks. The age of volcanic mountains is determined by the relations of the volcanic materials of surrounding sedimentary rocks of known age. The mountain systems of the world were formed at various times. Some of them have represented areas of weakness where several mountain-making movements have occurred, as in the Pyrenees, Alps, Jura, and Himalayas. Others have been cut down by denudation to their very roots, and do not now appear as mountains. The greatest and loftiest mountains of elevation have for the most part received their greatest uplift in comparatively recent geological times.

Consult: Elie de Beaumont, *Notice sur les systèmes de montagnes* (Paris, 1852); Geikie, *Mountain Architecture* (London, 1877); Reclus, *The History of a Mountain* (New York, 1881); Suess, *Das Antlitz der Erde* (Leipzig, 1885-88); Reade, *The Origin of Mountain Ranges* (London, 1887); Geikie, *Earth Sculpture* (New York, 1898); Davis, *Physical Geography* (Boston, 1898); Von Lendenfeld, *Die Hochgebirge der Erde* (Freiburg, 1899); Lapparent, *Leçons de geographie physique* (2d ed., Paris, 1898).

MOUNTAIN, The. The name of a political faction in the French Revolution. See Montagnards.

MOUNTAIN ARTILLERY. Cannon for use in countries where the usual wheeled vehicles cannot go. Sometimes a jointed gun of considerable weight, as in the case of the English, sometimes a single piece gun—designed to be capable of being taken wherever troops may be ordered without retarding their movements. Fixed ammunition with metallic cartridge cases is used entirely.

In the United States the mountain guns are of two forms: The Hotchkiss 2-pounder, 1.65 in. calibre, and the Hotchkiss 12-pounder, 3 in. calibre. The carriage is of steel. The cartridge consists of three main portions: the cartridge case, the charge, and the projectile. Two types of projectile are used, canister and shell. The canister for the 2-pounder consists of a cylindrical tin case holding 30 hardened-lead one-ounce bullets with the interstices filled with a matrix of sulphur. The shell is of cast iron, with point percussion fuze. (See Fuze.) The 2-pounder gun weighs 121 pounds and is capable of penetrating 1.3 inches of steel at the muzzle. The 12-pounder gun weighs 218 pounds and is capable of penetrating 1.4 inches of steel at the muzzle. The English mountain gun, which is of great importance in the Indian and colonial service, is a jointed weapon of three pieces, each section weighing 960 pounds, the entire gun and carriage weighing 5160 pounds.

MOUNTAIN ASH, Rowan Tree, or Quicken Tree (*Pyrus Aucuparia; Sorbus aucuparia* of many botanists). A very ornamental European tree of the natural order Rosaceæ. It does not attain a great size; has in general a very straight erect stem; and is distinguished from the other species of Pyrus by pinnated glabrous leaves of serrated leaflets, terminated by a single leaflet; corymbs of small flowers; and small globose fruit. The wood is valued for its compactness. The inner bark and sapwood have a very peculiar smell. In the superstitions of European peasants a twig of rowan tree was supposed to have great efficacy in scaring away evil spirits. The

MOUNTAIN ASH.

generally red, sometimes yellow, fruit (rowan berries), which is acid and somewhat bitter, is sometimes used for preserves. The very nearly allied American species (*Pyrus Americana*), which has bright red fruit, is a shrub or small tree distributed from Newfoundland to Manitoba and southward in elevated regions, and often planted as an ornamental. The wood is soft, light, and little used. Somewhat similar to it is the elder-leaved mountain ash (*Pyrus sambucifolia*). a hardy species ranging north to Greenland and Alaska, but seldom found south of the Great Lake region. It differs from *Pyrus Americana* in its leaves, larger flowers, and fruits.

MOUNTAIN ASH. A coal-mining town in Glamorganshire, Wales, five miles south of Merthyr-Tydfil (Map: Wales, C 5). It has large collieries, foundries, and iron manufactures, owns its water and gas works, and maintains slaughter-houses. Population, in 1891, 17,826; in 1901, 31,100.

MOUNTAIN BEAVER. The sewellel (q.v.).

MOUNTAIN BLUEBIRD. See BLUEBIRD.

MOUNTAIN CAT. (1) In California, the cacomistle (q.v.). (2) Any of several wild cats regarded as peculiar to local mountain regions; a catamount.

MOUNTAIN CLIMBING. The awakening of man's interest in mountains is chiefly due to Rousseau, though earlier writers, while approaching them as scientists, were also susceptible to their charm. This two-fold interest led Saussure to incite J. Balmat to find a way to the summit of Mont Blanc in 1786 and to accompany him thither in 1787. From that ascent alpinism is generally dated. In London in 1857 was formed the first Alpine Club to foster "the community of feeling amongst those who in the life of the High Alps have shared the same enjoyments, the same labours, and the same dangers." This idea, in a modified form, was taken up throughout Continental Europe and advocated with such enthusiasm that more than 100,000 persons of both sexes are now enrolled in the various alpine societies. The largest of these are the German and Austrian (founded in 1862), about 55,000 members; Swiss (1863), 7000; Italian (1863), 54,000; and French (1874), 6000. In America three strong societies came into being: the Appalachian Mountain Club (q.v.) in Boston (1876). 1300 members; the Sierra Club (1892) in San Francisco, 800; and the 'Mazamas' (1894) in Portland, Ore. In these derivative societies eligibility is based upon a love of nature and of the mountain in particular rather than on alpinism proper, though most of them contain a contingent of expert climbers. The American Alpine Club (1902), with its home in Philadelphia, aims to revert to the original type, but adds to its field polar exploration and the study of glaciers.

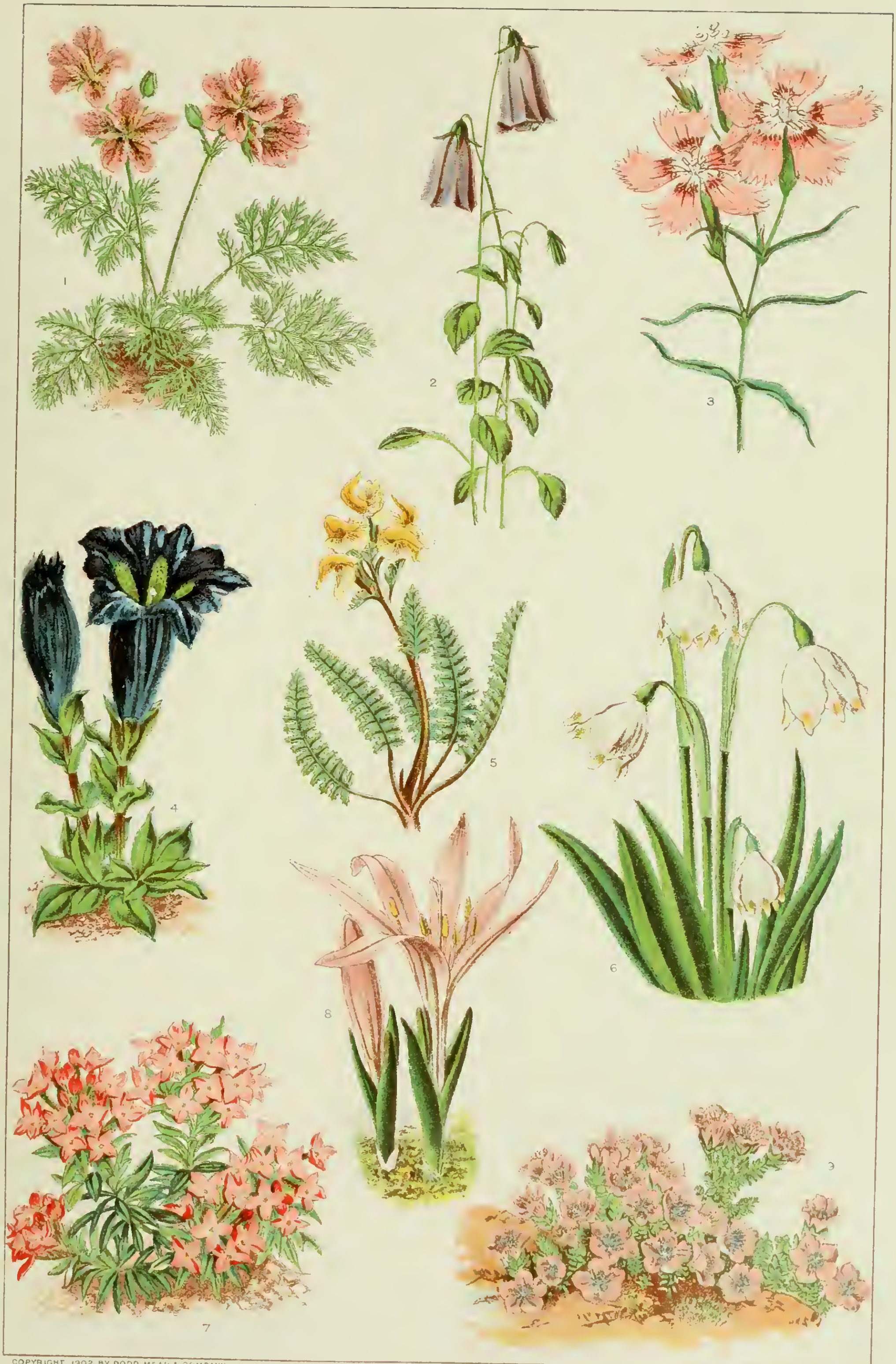
Thus cultivated, Alpine climbing has attained almost to a science. Its principles are set forth in extended manuals, such as Dent's *Mountaineering*, Badminton Library (London, 1892). It has called into existence the class of professional guides—Swiss. Tyrolese, and Italian—whose skill far exceeds that of the best amateurs. Their aid, always expedient in tours above snow line, is indispensable in attacks upon giant peaks in distant lands, such as have frequently been made within recent times.

The most dangerous accidents in mountain climbing, those which consist in falls from a great height, rarely occur when guides are taken and the party is properly roped together in a chain of mutual support. Occasionally some foothold seemingly secure gives way beneath the climber's weight; but more frequently the

NAME	Locality	Height	Year	Party
Mont Aiguille	Dauphiny	7,000	1492	Dompjulian de Beaupré
Pic du Midi	Pyrenees	9,547	15—	De Candale
Titlis *	Swiss Alps	10,627	1739	Anonymous
Mont Blanc †	“ “	15,781	1786	Balmat and Paccard
Jungfrau	“ “	13,672	1811	J. R. and H. Meyer
Finsteraarhorn	“ “	14,026	1812	H. Meyer, *et al.*
Monte Rosa ‡	“ “	15,217	1855	Smyth, *et al.*
Schreckhorn	“ “	13,385	1861	Leslie Stephen
Weisshorn	“ “	14,803	1861	J. Tyndall
Dent Blanche	“ “	14,318	1862	E. S. Kennedy, C. Wigram
Matterhorn	“ “	14,780	1865	E. Whymper, *et al.*
Gross Glockner	Tyrolese Alps	12,457	1799	
Ortler †	“ “	12,800	1804	Josele (a hunter)
Kasbek	Caucasus	16,546	1868	D. W. Freshfield, *et al.*
Elbruz †	“	18,470	1868	“ “ “
Ushba	“	15,700	1888	J. G. Cockin
Dikhtaw	“	17,000	1888	A. F. Mummery
Kabru §	Himalayas	24,015	1883	W. W. Graham
Pioneer Peak	“	22,600	1892	W. M. Conway
Koser Gunge	“	21,010	1898	Dr. W. H. and Mrs. Workman
Mount Cook †	New Zealand	13,349	1895	M. Zurbriggen (guide)
Chimborazo	Andes	20,498	1879	E. Whymper
Aconcagua	“	22,860	1897	S. Vines, Zurbriggen
Illimani	“	21,030	1898	W. M. Conway
Mount Washington †	White Mountains	6,293	1642	Darby Field
Pike's Peak	Rocky Mountains	14,147	1820	E. James, *et al.*
Hood	Cascades	11,934	1854	Stevens and Van Trump
Rainier	“	14,526	1870	Barlow, *et al.*
Saint Elias §	“	18,024	1897	Duke of the Abruzzi, *et al.*
Bonney	Selkirks	10,645	1888	W. S. Green, H. Swanzy
Sir Donald	“	10,652	1890	E. Huber, C. Sulzer
Dawson †	“	11,100	1899	C. E. Fay. H. C. Parker
Temple	Canadian Rockies	11,637	1894	S. E. Allen, W. D. Wilcox, *et al.*
Victoria	“ “	11,150	1897	J. W. Collie, *et al.*
Assiniboine	“ “	11,860	1901	J. Outram
Columbia §	“ “	....	1902	“

* The first snow peak. † The highest in range. ‡ The highest summit. § The highest thus far climbed.
(In most instances the guides are not mentioned in this list.)

MOUNTAIN PLANTS



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1 ERODIUM PETRÆUM
2 CAMPANULA PULLA.
3 DIANTHUS SEGUIERI.
4 GENTIANA ACAULIS.
5 PEDICULARIS ELONGATA.
6 LEUCOJUM VERNUM
7 DAPHNE CNEORUM.
8 BULBOCODIUM VERNUM
9 SAXIFRAGA OPPOSITIFOLIA

fall takes place because the climber is overtired, or has started too quickly, without the necessary training and hardening, in consequence of which at a critical moment some muscle fails to answer. Overexertion of either body or mind is always to be avoided; for alertness of both is essential. The rope is the sheet anchor of mountaineering, whether it be on the snow or on the equally dangerous grassy slopes. On really difficult mountains no more than three persons should be on the same rope. With the rope the ice-axe is used, and indeed is a very necessary adjunct to the climber. It consists of a steel axe with a cutting edge crosswise to the handle, like an adze and a pick. The handle is of such length that it makes a convenient staff, and is shod with a steel point. The cutting edge of the axe is employed for making steps in an ice wall, the pick for holding and aiding the climber in pulling himself up, while the axe when used as a staff or alpenstock enables the climber to hold securely, or it can be employed as a brake when descending. Accidents which come from the fall of large masses of rock, snow, or earth may be largely obviated by a careful observation of the position of the sun with regard to snowfields below upon which the path is to be taken. If the snow begins to slide, carrying the climber with it, the utmost nimbleness of resource, wit, and strength applied to the alpenstock as a brake is the only remedy that can be formulated beforehand. In ascending an ordinary *couloir* the axe must be constantly used for cutting footholds step by step.

The list on page 664 presents some of the principal first ascents since the earliest authentic records.

Consult: J. Forbes, *Travels Through the Alps* (Edinburgh, 1843); A. W. Moore, *The Alps in 1864*, from MS. copy (Edinburgh, 1902); J. Ball and E. S. Kennedy, *Peaks, Passes, and Glaciers* (London, 1859-62); G. Studer, *Ueber Eis und Schnee* (Bern, 1869-71); J. Tyndall, *Mountaineering in 1861* (London, 1862); id., *Hours of Exercise in the Alps* (ib., 1871); L. Stephen, *The Playground of Europe* (ib., 1871); E. Whymper, *Scrambles Among the Alps* (ib., 1871); id., *Travels in the Great Andes of the Equator* (ib., 1892); C. T. Dent, *Above the Snow-line* (ib., 1885); Clarence King, *Mountaineering in the Sierra Nevada* (Boston, 1886); W. M. Conway, *Climbing in the Karakoram-Himalayas* (London, 1894); id., *The Alps from End to End* (ib., 1895); id., *The Bolivian Andes* (New York, 1901); A. F. Mummery, *My Climbs in the Alps and Caucasus* (ib., 1895); E. A. Fitzgerald, *Climbs in the New Zealand Alps* (ib., 1896); id., *The Highest Andes* (ib., 1899); F. M. B. Workman, *In the Ice World of the Himalaya* (New York, 1898); C. E. Mathews, *The Annals of Mont Blanc and the Matterhorn* (London, 1898); F. De Filippi, *The Ascent of Mont Saint Elias* (London, 1900); W. D. Wilcox, *Camping in the Canadian Rockies* (New York, 1900); J. N. Collie, *Climbing in the Himalayas and Other Mountains* (Edinburgh, 1902). For recent American mountaineering, consult *Appalachia*, vols. i.-ix. (Boston, 1876-1902), and *Sierra Club Bulletin*, vols. i.-iii. (San Francisco, 1893-1903).

MOUNTAIN GAZELLE. See Gazelle.

MOUNTAIN GOAT. See Rocky Mountain White Goat.

MOUNTAIN HERRING. The Rocky Mountain whitefish (*Coregonus Williamsoni*), found in clear streams from the northern Rocky Mountain ranges to the Pacific coast. It is good food, and is esteemed by anglers, as it readily takes a fly. See Whitefish; and Plate of Whitefish, Smelts, etc.

MOUNTAIN LIMESTONE. The basal strata of the Carboniferous series in the south of England and Wales. It is highly fossiliferous and carries a few ores. Its chief use is for building stone. The term was applied to the calcareous rocks of the American Subcarboniferous, but soon fell into disuse.

MOUNTAIN LION. The name in the western part of the United States for the panther, cougar, or puma (*Felis concolor*). Early writers upon America reported that the lion was a resident of North America from the skins they saw among the Indians, which they supposed to be those of lionesses. See Puma.

MOUNTAIN MEADOWS MASSACRE. In American history, the massacre, near Mountain Meadows in Utah, in September, 1857, of a party of emigrants from Arkansas and Missouri passing through Utah on their way to Southern California. They numbered all told about 140 men, women, and children. On their way they were everywhere refused food until they reached the neighborhood of Mountain Meadows, a valley in Iron County, about 350 miles south of Salt Lake City. Here they stopped to rest their horses, and on September 7, 1857, were fired upon by Indians, and, it is alleged, by Mormons disguised. They withstood siege until September 11th, when, on promise of protection by John D. Lee (q.v.), Mormon bishop and Indian agent, they left the shelter of their wagons. All adults and children over seven years of age were killed, and seventeen younger children were distributed among Mormon families, but were afterwards restored to relatives by the United States Government. Lee was executed for this crime in 1877, and though the effort to inculpate other high officers of the Church failed, there can be little doubt that the project was known and approved by them, especially since Brigham Young (q.v.) had a short time before announced that "no person shall be allowed to pass or repass into or through or from this territory without a permit from the proper officer." H. H. Bancroft in his *History of Utah* (San Francisco, 1883) places blame on Lee entirely. Consult: Linn, *Story of the Mormons* (New York, 1902); and *Confessions of John D. Lee* (Saint Louis, 1891).

MOUNTAIN MOCKING-BIRD. See Mocking-Bird.

MOUNTAIN PLANTS. The chief features of mountain plants have been discussed under the head of Alpine Plants (q.v.). At the bases of most mountains the vegetation closely resembles that of the surrounding lowlands, but with elevation changes appear which correspond to the changes observed as the globe is traversed toward high latitudes. For example, in the mountains of Mexico the typical vegetation of the lowlands gives place with ascent to various zones of trees, including forms which are deciduous like those of the United States, then conifers like those of the Northern United States and Canada, and finally into mosses and lichens characteristic of the alpine regions. Mountains contain a large proportion of endemic plants. This is doubtless due to their relative isolation. Mountain endemism is particularly characteristic of the alpine forms, probably because the conditions for their migration are less favorable than for those farther down. Some plants characteristic of mountain habitats are shown in the accompanying plate. See Endemism.

MOUNTAIN PLOVER. A ring-plover (*Ægialitis montana*), very common throughout the Rocky Mountain region and neighboring plains, where its sandy gray plumage renders it almost invisible when it alights. It remains in the open lands, and rarely ascends above the level (8000 to 9000 feet) of the interior 'parks.' It breeds throughout its summer habitat.

MOUNTAIN QUAIL. A local name of two Californian 'partridges': (1) the 'plumed' partridge (*Oreortyx pictus*); and (2) Gambel's partridge (*Callipepla Gambeli*). See Quail.

MOUNTAIN SHEEP. The Rocky Mountain Sheep. See Bighorn.

MOUNTAIN SPINACH. See Orach.

MOUNTAIN SYSTEM. A term rather loosely used, but which properly refers to a number of parallel or consecutive mountain ranges formed during the same geological period, but in separate areas of crusted folding. Thus the Appalachian system comprises the Appalachian, Acadian, and Ozark ranges, each of which follows a common direction although lying within a different geosynclinal fold.

MOUNTAIN TEA. See Gaultheria.

MOUNT AUBURN. A well-known cemetery in Cambridge, Mass., containing the graves of many celebrated men, including Longfellow, Lowell, Charles Sumner, and Phillips Brooks. The beautiful grounds cover 125 acres.

MOUNT AYR. A town and the county-seat of Ringgold County, Ia., 75 miles south by west of Des Moines; on the Chicago, Burlington, and Quincy Railroad (Map: Iowa, C 4). It has a fine court-house and public school buildings, and is important chiefly as a trade centre for a fertile agricultural and stock-raising section. Population, in 1890, 1265; in 1900, 1729.

MOUNT CAR′MEL. A mountain range of Palestine. See Carmel.

MOUNT CARMEL. A city and the county-seat of Wabash County, Ill., 25 miles southwest of Vincennes, Ind.; on the Wabash River, and on the Southern and the Cleveland, Cincinnati, Chicago and Saint Louis railroads (Map: Illinois, E 5). It has a fine court-house and city hall. Water power is obtained from the river; and besides railroad shops of the Big Four, there are manufactories of machinery supplies, pulleys, shafting, paper, strawboard, lumber, spokes, staves, woodenware, furniture, and flour. Settled in 1818, Mount Carmel was chartered as a city in 1865. Population, in 1890, 3376; in 1900, 4311.

MOUNT CARMEL. A borough in Northumberland County, Pa., 28 miles east-southeast of Sunbury; on the Lehigh Valley, the Northern Central, and the Philadelphia and Reading railroads (Map: Pennsylvania, E 3). There are several anthracite mines here and in the vicinity, and an important coal trade is carried on. The borough has also manufactures of lumber, hats and caps, miners' lamps, shirts, cigars, etc. Population, in 1890, 8254; in 1900, 13,179.

MOUNT CAR′ROLL. A city and the county-seat of Carroll County, Ill., ten miles east of the Mississippi River; on the Chicago, Milwaukee and Saint Paul Railroad (Map: Illinois, B 1). It has a public high school library and the Frances Shimer Academy. There are valuable mineral deposits, especially iron ore, in the vicinity, which is interested mainly in agriculture and stock-raising. Population, in 1890, 1836; in 1900, 1965.

MOUNT CLEM′ENS. A city and the county-seat of Macomb County, Mich., 20 miles northeast of Detroit; on the Clinton River, at the head of navigation, and on the Grand Trunk Railroad (Map: Michigan, L 6). It is a popular summer and health resort, beautifully situated, and noted for its mineral springs, which possess curative properties for many diseases. The city has an active Chamber of Commerce, a public library, and well-equipped hotels and bath-houses. Its industrial interests are represented by a large beet-sugar factory, cooperage works, a casket manufactory, and an establishment producing carriages, wagons, sleighs, and agricultural implements. Settled in 1802, Mount Clemens was incorporated first in 1878. The government is administered, under the conventional charter of Michigan cities of the fourth class, by a mayor, annually elected, and a unicameral council. The city owns and operates the water-works. Population, in 1890, 4748; in 1900, 6576.

MOUNT DESERT, dē-zērt′ *or* dĕz′ērt. The largest of the numerous islands on the coast of Maine. It belongs to Hancock County, and is separated from the mainland on the northwest by a channel from one-half to two miles wide, and on the northeast by Frenchman's Bay (q.v.) (Map: Maine, G 7). It is 15 miles long and 8 miles broad, with an area of about 100 square miles. Its outline is very irregular, a long, narrow bay or fiord almost separating the island into two halves. The surface is rugged and mountainous, rising to a height of over 1500 feet, and presenting a line of bold cliffs along the northeast coast. The island is surrounded by a number of rocky islets, and there are several beautiful lakes in the interior, giving a varied character to the scenery, which has made Mount Desert a favorite summer resort. The island has three convenient harbors, Bar Harbor, Northeast, and Southwest, and numerous villages, varying in popularity as summer resorts, the most noted being Bar Harbor. First discovered by Champlain, who gave the island its name, Mount Desert was settled in 1608 by French Jesuits, their colony of Saint Sauveur on Somes Sound, however, being destroyed eight years later by an expedition from Virginia. A permanent settlement here (Somesville, which is thus the oldest on the island) was effected by the English in 1761. The town of Mount Desert was incorporated in 1789. Since that date the towns of Eden, Cranberry Isles (three miles from Southwest Harbor), and Tremont have been formed from the original district and incorporated, respectively, in 1796, 1830, and 1848. Population, Cranberry Isles, in 1900, 374; Eden, in 1890, 1946; in 1900, 4379; Mount Desert, in 1900, 1600; Tremont, in 1900, 2010.

MOUNTED GRENADIERS. See MOUNTED INFANTRY.

MOUNTED INFANTRY. A general term applied to foot soldiers mounted on horses, mules, camels, or on wagons for transportation only. Such were the ancient infantry carried swiftly to the battlefield in war chariots. In the sixteenth century Louis of Nassau made 500 of his cavalrymen take up behind their saddles an equal number of infantry, and Alexander of Parma, wishing to surprise the Duke of Alençon, mounted several companies of infantry on pack horses. This was followed by mounting several divisions of the infantry of that time, to which was given the name of 'dragoons,' probably from the matchlock carried, which was ornamented at the muzzle with the head of a dragon. Eventually this name 'dragoon' was given to certain cavalry which fought either mounted or dismounted. Louis XIV. established a corps of 'Mounted Grenadiers.' James II. created a similar corps in the British Army, called 'Horse Grenadiers,' who were armed with muskets and grenades; in action they dismounted, linked horses, fired, and then threw their grenades by ranks. In 1780, during the American Revolution, a body of 1500 mounted riflemen from Kentucky and North Carolina, each man armed with his own rifle and mounted on his own horse, attacked the British at King's Mountain, and after a spirited dismounted contest defeated the enemy, who lost Major Ferguson killed, 300 others killed and wounded, and 800 men and a quantity of arms and ammunition captured. Napoleon in Egypt mounted a body of selected infantry on camels, as did forty years later the British in India, in which their camel-infantry covered forty miles daily for six days. Again, in the Sudan campaign camels were used with success. In Tongking and Algeria the French often mount their infantry, sometimes allotting one mule to two soldiers, by which plan they have accomplished 140 miles in three days. The best authorities agree that mounted infantry should be used for the sole purpose of moving quickly to the place where they are required for duty as infantrymen, not hesitating, if necessary, to sacrifice the means of transportation.

During the war in South Africa (1899-1902) the Boer army was almost entirely composed of mounted infantry or riflemen. These were men accustomed to the saddle and the use of firearms from boyhood, versed in the arts of the hunter, in the science of woodcraft, and familiar with the topography of the field of operations. Having, by cautious and noiseless approach, reached unperceived a spot near the enemy, the Boer dismounted, hoppled his horse, leaving him a short distance in rear, crept forward, and from a secure position opened fire upon the unsuspecting foe. If forced to retire, he did so quietly and quickly to take up a new position. From impregnable natural fortifications small bodies of these mobile troops often repulsed vastly superior British forces supported by artillery. In operating against the British cavalry the Boers advanced toward it on horseback up to within 500 meters, then dismounted and opened fire. In battle the Boers left the reins thrown over their horses' necks and dragging on the ground; the horses did not move until their riders returned; these animals were of a great variety of size and breed, from the stolid Basuto pony to the blooded stallion.

The British under Lord Roberts had a force of about 3000 mounted infantry, originally organized into two brigades of five regiments each, of which 2000 men were regulars and the remainder colonials. Owing to the want of instruction in mounted field duties, this force (with the exception of the colonial contingent) was not very useful.

During the American military operations in the Philippines small detachments of regular infantry mounted on active native ponies were found useful in expeditions where rapid marches were necessary during the rainy season or as a temporary substitute for cavalry.

In those European countries where large cavalry establishments are maintained and traditional methods are deeply rooted, there will be provision for three classes of mounted troops; one on large, heavy horses trained in 'shock tactics' and for ceremonial purposes; another on lighter horses for scouting and pursuit of an enemy; a third, of infantrymen armed with long-range rifles on small, active horses for escort, convoy, and picket duty. In the United States all of these duties are performed by a single class. To give greater mobility to infantry without impairing its fire action, it may be mounted temporarily on anything that will transport it rapidly to the place where it is needed in advance of its comrades on foot; this kind of mounted infantry must be employed in masses, never individually.

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MOUNTED POLICE. See MILITARY POLICE for description of various military and semi-military organizations of this nature.

MOUNT FOREST. A town of Wellington County, Ontario, Canada, on a branch of the Saugeen River, 73 miles northeast of London (Map: Ontario, C 4). It has manufacturing industries, and is at the junction of the Grand Trunk and Canadian Pacific railways. Population, in 1891, 2214; in 1901, 2019.

MOUNT'FORT, WILLIAM (1660?-92). An English actor and playwright. As early as 1678 he was playing in London. After 1682 he was a member of the company at the Theatre Royal, and was the creator of many parts in the drama of the time, besides writing and adapting several plays, such as *The Injur'd Lovers, or the Ambitious Father* (publ. 1688); *Successful Strangers* (1690); *King Edward the Third* (1691); and *Greenwich Park* (1691). According to the common account of his death, he was assassinated, December 9, 1692, by Capt. Richard Hill, a jealous admirer of Mrs. Bracegirdle. Consult: Cook, *Hours With the Players* (London, 1881); Galt, *Lives of the Players* (London, 1831); Cibber, *Apology*, ed. Lowe (London, 1889).

MOUNT GIL'EAD. A village and the county-seat of Morrow County, Ohio, 47 miles north by east of Columbus; on the Whetstone River, and on the Toledo and Ohio Central, and the Cleveland, Cincinnati, Chicago and Saint Louis railroads (Map: Ohio, E 4). It has a public school library. There are some manufactures and a trade with the surrounding agricultural country. Population, in 1890, 1329; in 1900, 1528.

MOUNT HOL'LY. A town and the county-seat of Burlington County, N. J., 19 miles east by north of Philadelphia; on Rancocas Creek and on the Pennsylvania Railroad (Map: New Jersey, C 4). It has the Burlington County Hospital, Children's Home, and the Burlington County Lyceum of History and Natural Science, founded in 1876, which possesses a library of 6500 volumes. The industries are represented by several extensive shoe factories, and by foundries, canneries, a hammock factory, etc. Population, in 1890, 5376; in 1900, 5168.

MOUNT HOLYOKE COLLEGE. An undenominational woman's college in South Hadley, Mass., founded by Mary Lyon as a seminary in 1837 and chartered as a college in 1888. In addition to the regular undergraduate courses, provision is made for graduate work, and special courses are open to teachers. The four years' course consists of two years of prescribed work and two years elective, and leads to the degree of B.A. The college offers a large number of scholarships and two graduate fellowships. During the collegiate year 1902-03 the college had 83 instructors and officers, and an enrollment of 671. The campus includes 150 acres, attractively laid out, and contains seven dormitories; Mary Lyon Hall occupying the site of the original building destroyed by fire in 1896, and including the chapel and offices of administration; a well-equipped gymnasium; an observatory; Lydia Shattuck Hall for chemistry and physics; Lyman Williston Hall for natural sciences; Dwight Memorial Art Building, opened in 1902; and the library, with a permanent fund of $10,000, containing 23,000 volumes and 3800 pamphlets. Its productive funds amounted to $613,000, and its gross income to $168,000. The buildings and grounds were valued at $862,000, and the whole college property at $1,450,000.

MOUNT MOR'GAN. A municipality of Raglan County, Queensland, Australia, 23 miles southwest of Rockhampton, and 404 miles north of Brisbane by rail (Map: Australia, G 7). It is noted for the abundance and richness of the gold deposits found on the mountain-summit and inclosed in a rock mass largely composed of iron ore and siliceous sinter. The yield of gold in 1900 was 187,352 ounces, valued at $3,758,550. Population, in 1901, 6280.

MOUNT OF OLIVES. See OLIVES, MOUNT OF.

MOUNT OF OLIVES. An oratorio by Beethoven, originally *Christus am Oelberg* (1803), produced in 1814. In deference to the sentiment against representing Christ as a character in a performance, David was substituted in his place, and the name of the oratorio was changed in 1842 to *Engedi.*

MOUNT PLEASANT. A city and the county-seat of Henry County, Iowa, 28 miles west by north of Burlington; on the Chicago, Burlington, and Quincy Railroad (Map: Iowa, F 4). It is the seat of the State Hospital for the Insane, the Iowa Wesleyan University (Methodist Episcopal), opened in 1844, and the German College (Methodist Episcopal), opened in 1873. It has also several secondary institutions, a conservatory of music, and a public library. Mount Pleasant is the centre of a productive farming country, and is an important shipping point for live stock, especially horses. There are grain elevators and manufactories of flour, lumber, carriages, and wagons, agricultural implements, brick and tile, etc. Limestone is extensively quarried in the vicinity. The water-works and electric light plant are owned by the municipality. Population, in 1890, 3997; in 1900, 4109.

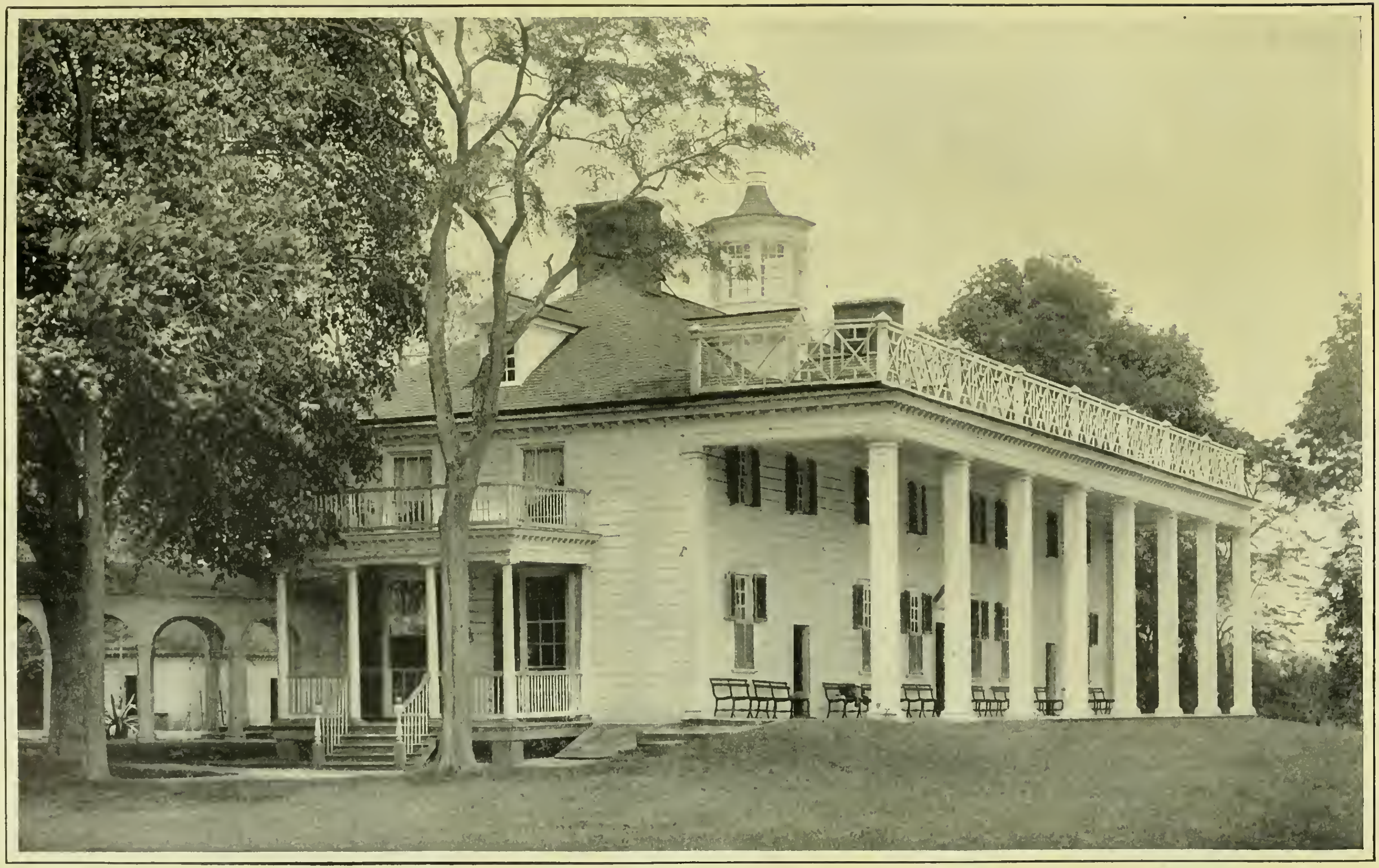
MOUNT PLEASANT. A city and the county-seat of Isabella County, Mich., 53 miles west by north of Saginaw; on the Chippewa River, and on the Ann Arbor and the Pere Marquette railroads (Map: Michigan, J 5). It is the seat of the Central State Normal School and of a United States Government Indian school, and has a handsome court-house. A fertile agricultural region surrounds the city, and there are manufactures of lumber and various lumber products, flour, woolen goods, plows, foundry products, gasoline engines, brick and tile, wagons, etc. The water-works are owned and operated by the municipality. Population, in 1890, 2701; in 1900, 3662.

MOUNT PLEASANT. A borough in Westmoreland County, Pa., 11 miles south of Greensburg, the county-seat; on the Baltimore and Ohio and the Pennsylvania railroads (Map: Pennsylvania, B 3). It is the seat of the Western Pennsylvania Classical and Scientific Institute (Baptist). The borough is the centre of an extensive coke-making industry, and manufactures also flour, lumber, iron, foundry products, glass, etc. Population, in 1890, 3652; in 1900, 4745.

MOUNT SAINT MARY'S COLLEGE. A Roman Catholic college at Emmitsburg, Md., founded in 1808. Its material interests are under the control of a board of directors, of whom the Archbishop of Baltimore is president. In addition to the regular college work, it has a preparatory and a scientific and business course, with a total registration in 1902 of 220 students and 15 instructors. It confers the degree of B.A. The library contains 27,000 volumes. The buildings and grounds are valued at about $200,000. The income was about $50,000.

MOUNT-STE'PHEN, GEORGE STEPHEN, Baron (1829—). A Canadian capitalist, born at Dufftown, Banffshire, Scotland. He came to Canada in 1850 and entered the dry goods business in Montreal. He succeeded there as a cloth manufacturer, and became wealthy, but was conspicuous chiefly for his share in carrying through to completion the long-delayed Canadian Pacific Railway, of which he became president in 1881. For his services in this connection he was knighted by Queen Victoria (1886), and the following year he and Sir Donald Smith gave $500,000 each for the building of the Victoria Hospital in commemoration of her Majesty's jubilee. In 1888 he went to reside in England, and in 1891 he was created first Baron Mount-Stephen,

MOUNT VERNON



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MOUNT VERNON

a title taken from a peak in the Rocky Mountains named for him during the construction of the Canadian Pacific Railroad.

MOUNT STER'LING. A town and the county-seat of Brown County, Ill., 38 miles east of Quincy; on the Wabash Railroad (Map: Illinois, B 4). It has manufactures of flour, wagons, brick, drain tile, etc., and in the vicinity, which is interested chiefly in agriculture, are coal and clay deposits. The water-works are owned by the municipality. Population, in 1890, 1655; in 1900, 1960.

MOUNT STERLING. A city and the county-seat of Montgomery County, Ky., 33 miles east of Lexington; on the Chesapeake and Ohio Railroad (Map: Kentucky, H 2). It has a public library and several private educational institutions. The city controls important commercial interests, and among its industrial establishments are planing mills, flouring mills, machine shops, and a distillery. Population, in 1890, 3629; in 1900, 3561.

MOUNT VERNON. The home and burial-place of George Washington, in Fairfax County, Virginia; on the right bank of the Potomac, 15 miles south of Washington, D. C. The Washington mansion, beautifully situated on an eminence, commanding a view of the river, is of wood, two stories high, ninety-six feet long, and thirty feet deep. It was built in 1743 by Washington's elder brother, Lawrence, who called it Mount Vernon, after Admiral Vernon, under whom he had served in the British Navy. A high piazza runs along the front of the house, which has six rooms of moderate size on the ground floor, containing many objects of historical interest. The tomb to which Washington's remains were removed from the old family vault in 1831 stands a few hundred yards from the house, near a wooded ravine. Mount Vernon, which had been much enlarged by Washington, was by him bequeathed to Bushrod Washington, upon whose death it came into the hands of John A. Washington, his nephew, who sold it in 1858 to the Ladies' Mount Vernon Association, which holds it in trust as a place of national interest. Consult: Lossing, *The Home of Washington and Its Associations, Historical, Biographical, and Pictorial* (new ed., New York, 1865); and Wineberger, *Home of Washington at Mount Vernon and Its Associations* (Washington, 1866).

MOUNT VERNON. A city and the county-seat of Jefferson County, Ill., 76 miles east by south of Saint Louis, Mo.; on the Chicago and Eastern Illinois, the Southern, the Louisville and Nashville, and the Wabash, Chester and Western railroads (Map: Illinois, D 5). It has an attractive Supreme Court building, and is engaged principally in agriculture, coal mining, and in the manufacture of cars, machine-shop products, axe handles, lumber, flour, etc. There are also a large grain elevator, marble works, and a tie-preserving establishment. Mount Vernon was laid out in 1819 and was incorporated first in 1872. The government is administered under the original charter of incorporation, which provides for a mayor, elected every two years, and a unicameral council. Population, in 1890, 3233; in 1900, 5216.

MOUNT VERNON. A city and the county-seat of Posey County, Ind., 18 miles west by south of Evansville; on the Ohio River, and on the Louisville and Nashville and the Evansville and Terre Haute railroads (Map: Indiana, B 5). It has a fine court-house and the Alexandrian Public Library. There are manufactories of flour, hominy, lumber, foundry, and machine-shop products, engines, carriages, etc. Mount Vernon is a commercial centre of considerable importance for a fertile region in which coal is abundant. Population, in 1890, 4705; in 1900, 5132.

MOUNT VERNON. A town in Linn County, Iowa, 16 miles east by south of Cedar Rapids; on the Chicago and Northwestern Railroad (Map: Iowa, F 3). Cornell College (Methodist Episcopal), opened in 1857, is situated here. The town is surrounded by a rich farming region, and has considerable trade. Population, in 1890, 1259; in 1900, 1629.

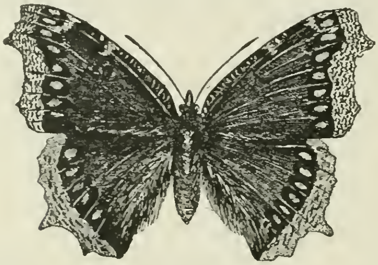
MOUNT VERNON. A city in Westchester County, N. Y., on Eastchester Creek, an arm of Long Island Sound, and the Bronx River, and on the New York Central and Hudson River and the New York, New Haven and Hartford railroads (Map: New York, G 5). It is chiefly a residential suburb of New York City, which it adjoins on the north. It has some handsome streets paved with macadam and asphalt, and in the more elevated sections of the city, which command fine views of the Sound, there are costly mansions. Mount Vernon maintains a public library, founded in 1896, for which a $50,000 building, the gift of Andrew Carnegie, was begun in 1903. Among the prominent edifices are the Lucas Building, which contains the city offices, the Mount Vernon Hospital, the new postoffice, and many churches and school buildings. Mount Vernon was founded in 1852 and incorporated as a village in the following year, and in 1892 was chartered as a city. The government, under the original charter, is vested in a mayor, elected every two years, and a municipal council. Most of the administrative officials are appointed by the mayor and confirmed by the council. The comptroller, receiver of taxes, assessors, and board of education, however, are chosen by popular vote. Population, in 1890, 10,830; in 1900, 21,228.

MOUNT VERNON. A city and the county-seat of Knox County, Ohio, 25 miles north by west of Newark; on the Kokosing River, and on the Baltimore and Ohio and the Cleveland, Akron and Columbus railroads (Map: Ohio, F 5). It has a fine court-house, a public library and Hiawatha Park with a picturesque lake. There are locomotive works, bridge works, Corliss engine works, a large foundry, flour and saw mills, bent-wood works, and manufactories of furniture, hoops, staves, sashes, and doors. The city is the centre of a fertile agricultural region with which it carries on a considerable trade, and near by is found natural gas in abundance. The water-works are owned by the municipality. Population, in 1890, 6017; in 1900, 6633.

MOUNT WASHINGTON. See WASHINGTON, MOUNT.

MOURNING BRIDE, THE. A play by William Congreve (1697). Alphonso, Prince of Valentia, and Almeria, daughter of the King of Grenada, are shipwrecked when about to be married, and each believes that the other has been drowned. Alphonso, taken prisoner, under an assumed name, finds Almeria at the Court of Grenada, and the wedding is eventually accomplished. The play is the source of the famous lines beginning, "Music hath charms to soothe the savage breast."

MOURNING-CLOAK. A handsome butterfly (*Euvanessa.* or *Vanessa, antiopa*), known in England as the Camberwell beauty. It appears in the United States very early in the spring, and may not infrequently be seen flying about on warm days in winter. It hibernates in the adult stage even in cold climates. According to Scudder, it ranges from the Arctic Circle to the thirtieth parallel of latitude. It is purplish brown, with wings bordered by yellow, brown, and blue. The larvæ are covered with black spines, and feed gregariously on willow, elm, poplar, and hackberry, often stripping the larger branches of leaves. The species is two-brooded and the second generation of moths appears in midsummer.



THE MOURNING-CLOAK.

MOURNING DOVE. The Carolina dove. See DOVE.

MOURZOUK, mo͞or-zo͞ok′. A town of Africa. See MURZUK.

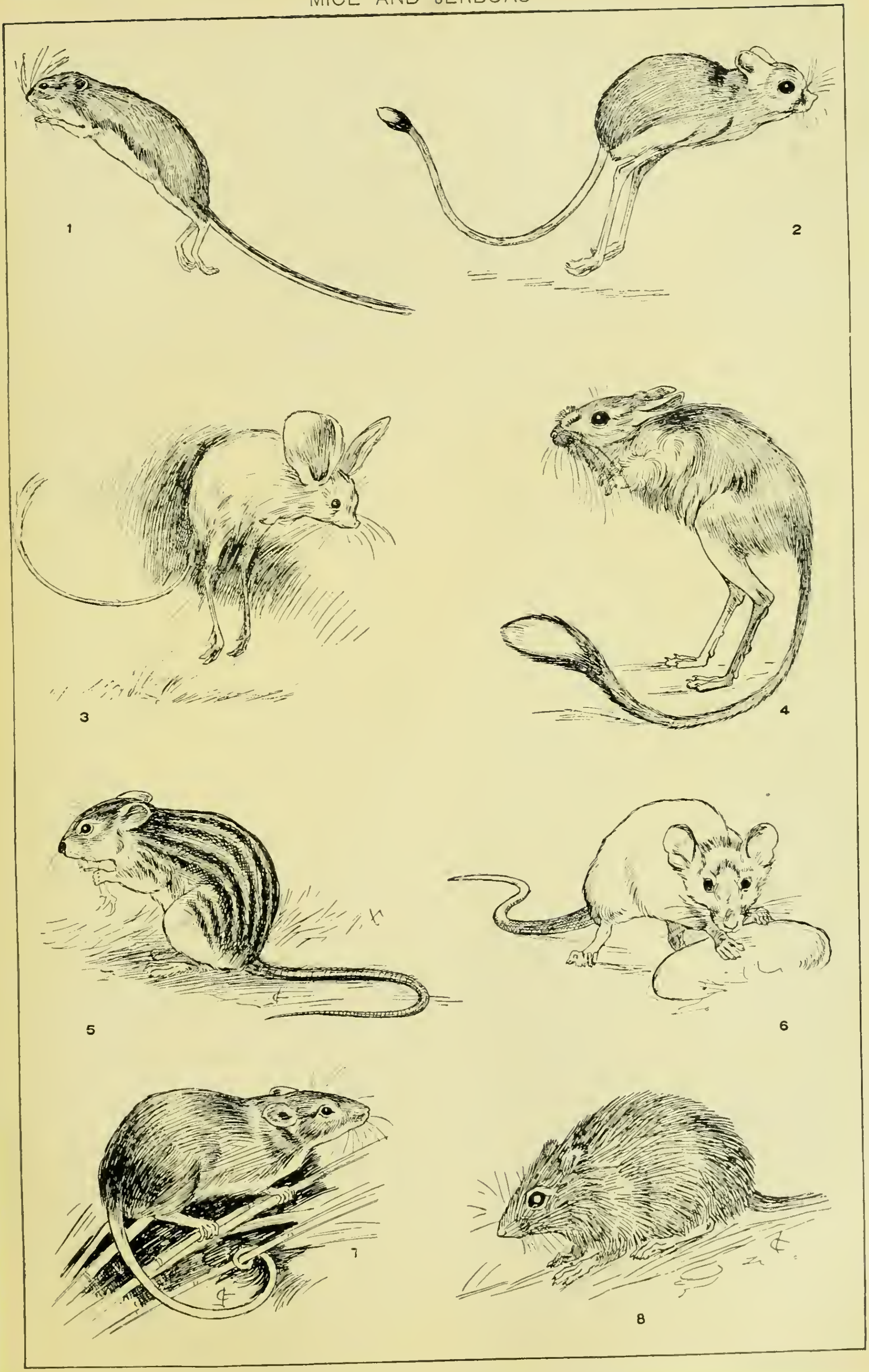
MOUSCRON, mo͞os′krōn. A town of Belgium in the Province of West Flanders, situated near the French frontier, 32 miles southwest of Ghent. It is a customs station, and manufactures furniture and cotton and woolen goods: Population, in 1890, 13,764; in 1900, 19,366.

MOUSE (AS., OHG. *mūs*, Ger. *Maus*, Lat. *mus*, Gk. *μῦς*, *mys*, OChurch Slav. *myshĭ*, Skt. *mūṣa*, mouse, from *muṣ*, to steal). The word mouse was originally applied to a small rodent mammal, *Mus musculus*, now called the house mouse, which was formerly confined to the Old World, but is now cosmopolitan in its distribution. Gradually the use of the word has extended to other small rodents, and especially in compounds to mammals not rodents, and even to birds. This troublesome little rodent is a small gray creature, with a body about three inches long and a tail half that length, the ears rather large and very delicate, and small feet. The color shows considerable variation, in some cases having a strong brown cast, while in others it becomes very pale and even fades to white. In its habits the mouse is largely nocturnal, though often seen during the day. It makes its home in sheltered nooks and crannies, where a nest of rags, paper, feathers, etc., is nicely made. Mice are very prolific, six to ten young being born at a time, and there are many broods during the year. Much has been written about the singing powers of the mouse, and the fact that it does sing is supported by the evidence of perfectly trustworthy witnesses. Mice are unquestionably fond of music, but it is not fully determined whether their ability to make it is normal or is an individual peculiarity. Some writers have gone so far as to assert that it is due only to a diseased throat.

The name mouse is applied to any representative of the genus Mus not big enough to call a rat. This genus is one of the largest of mammalian genera, including upward of 130 species, which vary considerably in size, somewhat in color, and not a little in the softness of the pelage. The upper molar teeth are always wide, with three series of tubercles, and therefore called trituberculate; in this respect Mus differs from all of the native American 'rats' and 'mice.' Another characteristic of the genus is the long, slender, rounded tail, with whorls of scales, and few hairs; in some mice this is almost prehensile. Besides the common mouse, the following may be mentioned as well-known European species of Mus: The wood mouse (*Mus sylvaticus*), which is a trifle larger than its cosmopolitan cousin, and on account of its longer tail is sometimes called the 'long-tailed field-mouse;' it is abundant in Great Britain, and is noted for the large stores of grain which it hoards. The harvest mouse (*Mus minutus*) is the smallest of British quadrupeds, the length exclusive of tail being only about 2½ inches; it occurs chiefly in the southern parts of England, and is notable for its curious globular nests, composed of grass leaves and panicles woven together and suspended between stalks of grain or tall grass; a somewhat smaller species (*Mus pumilus*) occurs in the south of Europe. Asia and Africa have many species, as the curious black-striped Barbary mouse, which looks like a miniature American ground-squirrel.

In America the name mouse is applied to a large number of small mammals, especially in such compounds as wood-mouse, field-mouse, etc. Some of these are very different from the true mice, but nearly all belong to the family Muridæ, though not to the Murinæ with the Old World mice. Many of them are voles, of the subfamily Arvicolinæ, while others are vesper-mice or 'white-footed' mice of the subfamily Cricetinæ, to which the hamsters also belong. A typical American example of this latter group is the well-known and widely distributed white-footed mouse or 'deer-mouse' (*Peromyscus leucopus*), which is found, in some one of many local races, nearly throughout North America. It is about seven inches long, of which nearly one-half is the tail. The upper surface is fawn-color of some shade, while the under parts and the feet are snowy white. The ears are rather large, and the general form and appearance delicate and graceful. It is found in all sorts of situations and even lives in houses sometimes, like the common mouse. In the Central and Southern States, another species even handsomer than this occurs, known as the golden mouse (*Peromyscus aureolus*). It is golden cinnamon above and yellowish-white beneath. The largest and in some respects the most remarkable of this group is the rice-field mouse (*Oryzomys palustris*), which is ten or eleven inches long, dark grizzly rat-color, and has very harsh pelage. It is said to be more like the true mice than any other American species. The curious little harvest-mouse (*Ochetodon humilis*) of the Southern States is

MICE AND JERBOAS



1. AMERICAN JUMPING MOUSE (Zapus Hudsonius).
2. EGYPTIAN JERBOA (Dipus Ægypticus).
3. YARKAND JERBOA (Euchoreutes naso).
4. KIRGHIZ JERBOA (Alactaga decumana).
5. BARBARY STRIPED MOUSE (Mus Barbarus).
6. HOUSE-MOUSE (Mus musculus).
7. HARVEST-MOUSE (Mus minutus).
8. MEADOW-MOUSE (Microtus Pennsylvanicus).

one of the smallest of American quadrupeds, being only four inches long, and half of that is tail. More detailed information will be found under the names of these and other mice, as Meadow-Mouse, Jumping Mouse, etc. See also accompanying Plate of Mice and Jerboas.

Consult authorities cited under Mammalia.

MOUSE-BIRD. Any bird of the African genus Colius and family Coliidæ; a coly. These birds have soft gray and white plumage, conical brightly colored bills, and long and narrow central tail feathers, and take their name not only from their ashy plumage, but from their mouse-like activity in scrambling about the branches of trees, where they hang head downward (even sleeping that way), and swing and twist like acrobats. They are enabled to do this by the striking peculiarity of structure in the feet, which have all four toes turned forward. They are fruit-eaters, go about in small bands, but fly poorly, and build their nests in dense shrubs. See Plate of Kingfishers, Motmots, etc.

MOUSE DEER. See Chevrotain.

MOUSE-EAR CHICKWEED (*Cerastium*). A genus of numerous species of plants of the natural order Caryophyllaceæ, natives of temperate and cold countries throughout the world. Some of them are among common weeds; others, having larger flowers, are occasionally planted in flower borders and on rock-work. The form and hairiness of the leaves of some species have given rise to the popular name.

MOUSE-FISH. One of the tropical frogfishes (*Pterophryne histrio*), common in the Gulf of Mexico, the colors of which are highly variable. It is related to the anglers (q.v.), and its 'bait' is its first dorsal spine, which is bifurcate. The fact that it is frequently found in the fields of sargasso-weed of the Atlantic gives it a second name, 'sargassum-fish.'

MOUSE-LEMUR. A very small woolly lemur of Madagascar, nocturnal and mouselike in its appearance and habits. It is a member of the genus Chirogale (q.v.). See Lemur; Chirogale; Plate of Lemurs.

MOUSE TOWER. A tower built on a rock in the middle of the Rhine near Bingen. According to popular tradition, it was hastily erected by Archbishop Hatto I. of Mainz (q.v.) as a refuge from the swarms of mice sent to devour him in punishment for his cruelty to the poor, whom he burned in a granary during a famine. The German name Mäuseturm is probably a popular corruption of Mautturm, toll-tower, for which the structure appears to have been originally intended, and the legend was built about the name. According to some authorities, the building was a watch tower, and the name is referred to Old German *musen*, to spy. It is now used as a signaling station for steamers.

MOUSTERIAN (mo͞o-stē′rĭ-*a*n) **EPOCH.** The name applied to a supposed epoch in European prehistoric archæology, so called from Le Moustier, in the commune of Peyzac (Dordogne), France. The epoch is assigned to the beginning of the second Glacial age, and is characterized by distinctly refined stone working, by a cold climate, and by the occurrence of the cave bear, the musk-ox, and the *Rhinoceros tichorhinus* in France. It is well represented also in Belgium, Southern Germany, Bohemia, and Southern England, not only by relics, but by human remains. Consult Mortillet, *Le préhistorique* (Paris, 1900).

MOUTH (AS. *mūþ*, Goth. *munþs*, OHG. *mund*, Ger. *Mund*, mouth; connected with Lat. *mentum*, chin, and ultimately with Skt. *mukha*, face). In an animal, the opening through which food enters the body. Not all animals have mouths, for certain parasitic forms, notably the tapeworm, lack a system for digesting food, and consequently no opening for its entrance is necessary; in such cases the food is absorbed through the surface of the animal. The simplest form of mouth is that which occurs in the Protozoa, where the food is taken into the body through a special opening, which is fairly constant in position and may be surrounded with cilia, sometimes long. Many Protozoa, as well as sponges, have no mouth in any true sense, as the food may be taken in at any part of the body-surface, and therefore the opening has no fixed position and no regular size or form. The mouth of corals, jelly-fish, sea-anemones, and other cœlenterates is simply an opening, almost always central in position, on the lower surface in free-swimming forms, on the upper surface in fixed forms. It is usually circular, but may be flattened, and in one group of jelly-fish it is divided up into four or more, sometimes innumerable, small openings, by the growing together of the lobes on its margin. In the flatworms the mouth is usually circular and is often in the centre of a sucker, but its position is variable, though it is always on the ventral side. It may be near the anterior end of the animal, but it is more often at the centre and is sometimes posterior. Among the various classes of worms the mouth is always anterior, and often terminal, though more often on the lower side of one of the first segments, or, in unsegmented forms, in a similar position. In blood-suckers it lies in the centre of a powerful sucker, and is provided with three chitinous jaws; in vegetable-eating and some carnivorous forms (nemertines) it is a simple opening without jaws, while in such active carnivorous worms, as Nereis, it is provided with powerful jaws. These jaws, however, are clearly modified segmental appendages, and are practically feet which have become modified to assist in seizing food or forcing it into the mouth. In the crustaceans, insects, spiders, and the like (arthropods) the mouth is more or less terminal, and is provided with lateral jaws; sometimes as many as eight pairs of appendages are modified to serve for this purpose. The structure and arrangement of the mouth parts in insects are very complicated, and are of great importance in classification. Roughly they may be grouped as *biting*, when there are freely movable lateral jaws which seize and cut or tear the food; *piercing*, when the various parts are more or less united to form a sharp, piercing instrument, which penetrates animal or plant membranes in search of the fluid food, which is then sucked; *sucking*, when the parts are united to form a suctorial tube, with no adaptation for piercing.

Among echinoderms the mouth shows considerable variety of form. In mollusks the mouth is generally anterior and often ventral, but it is frequently terminal. In the devil-fish, squids, and the like, it is in the centre of the foot. In the clams and other lamellibranchs there are special organs of sense, known as labial palps, on each side of the mouth, but there is no tongue, while in all other mollusks a tongue covered with teeth and known as the radula is present. The cephalopods (squids and the like) have powerful jaws, arranged like the beak of a parrot, but in all other mollusks the jaws are small and rather weak, sometimes three in number, or they may be wholly wanting, as in the lamellibranchs.

In the vertebrates we find the formation of the mouth is used by some writers to divide them into two contrasted groups, the *cyclostomes* or round-mouths, and the *gnathostomes* or jaw-mouths. The round-mouths include only three or four genera, and are characterized by the absence of jaws, the mouth serving as a sucking organ. The surface of this mouth-sucker bears characteristic horny teeth. All the other vertebrates are gnathostomes, provided with vertically moving upper and lower jaws, one or both of which, except in birds, turtles, and some whales, bear teeth. There are also a tongue and various glands, notably the salivary glands. True lips, provided with muscles, are characteristic of mammals, but are also found in dipnoid fishes. In many mammals the sides of the buccal cavity —that is, the space outside the jaws—are enlarged to form cheek-pouches, of use as food reservoirs. The origin of the vertebrate mouth has been a matter of much discussion, and is closely associated with the still more fundamental question of the origin of the skull. Apparently, however, the jaws arise as modifications of the first branchial arch, which becomes divided into two parts, the proximal giving rise to the quadrate bone, which gives rise to an anterior process, forming a sort of primary upper jaw; the distal part is the cartilage of Meckel, the basis of the lower jaw.

See TEETH; TONGUE; GLAND; SKULL.

MOUTH, DISEASES OF THE. From its situation at the portal of the digestive tract, the mucous membrane lining this cavity is peculiarly exposed to many forms of irritation and infection. The following are the principal forms of inflammation of the mouth, or *stomatitis* (Gr. *stoma*, the mouth), as it is termed by nosologists:

(1) *Acute catarrhal stomatitis*, which may extend over the mouth, including the tongue, or may occur in limited areas, is seen in children, associated with dentition or gastro-intestinal disturbances, and in adults following excessive smoking or the taking of hot or too highly seasoned food. It is a frequent concomitant of indigestion and febrile diseases, but is more commonly a complication of other diseases than an original affection. In ordinary cases a simple mouth-wash composed of a solution of borax and honey, and gentle catharsis, will effect a rapid cure.

(2) *Parasitic stomatitis*, a diffuse inflammation with the formation of patches of false membrane, is caused by a fungus—the *saccharomyces albicans*. It occurs most commonly in young children, and is described under its popular name, THRUSH.

(3) *Aphthous stomatitis*, also known as follicular or vesicular stomatitis, is an inflammation of the follicles of the mucous membrane, and is described in the article APHTHÆ.

(4) *Ulcerative stomatitis*, sometimes called *fetid* stomatitis or putrid sore mouth, generally occurs in children after the first dentition, and is associated with defective hygienic and sanitary conditions. The ulcerative process begins usually at the margin of the gums and extends along the gum lines of the jaws. The bases of the ulcers are covered with a grayish-white adherent membrane. The swelling of the adjacent parts is often so considerable as to be apparent externally. There is a copious flow of saliva, and the breath is very offensive. The ulceration may continue for weeks, or even months, but always yields to treatment. The febrile symptoms and the constipation which are usually present must be combated in the ordinary way. Perhaps the best general method of treating the disease is by the administration of small doses of chlorate of potash, and by frequently washing the mouth with a weak tepid solution of chlorinated soda.

(5) *Gangrenous stomatitis*, or *cancrum oris*, is the most severe form of stomatitis, and occurs as a rule in feeble children between two and five years old during convalescence from the acute fevers. It is characterized by a rapidly progressing gangrene, beginning on the cheeks or gums, resulting in extensive destruction of the soft tissues, at times even invading the jaw bones. The constitutional disturbance is great and the prostration extreme, and the case usually terminates in death. Treatment is unsatisfactory. Early destruction of the ulcer by the cautery, careful nourishment, and free stimulation may arrest the disease.

(6) *Mercurial stomatitis* and other diseases of the mouth are noticed in the articles SALIVATION; SCURVY; TONGUE.

MOUTON, mōō-tŏn′, ALEXANDER (1804-85). An American politician, born in what is now Lafayette Parish, La. He graduated at Georgetown College (D. C.), studied law, and was admitted to the bar in 1825. In 1826 he was elected to the Lower House of the Legislature, and was Speaker in 1831-32. He was a Presidential Elector in 1828, 1832, and 1836, and in 1837 was elected to the United States Senate. He resigned in 1842 to accept the nomination for Governor of Louisiana, was elected, and served from 1843 till the adoption of the new Constitution in 1846. He was president of the Southwestern Railway Convention in 1853 and a delegate to the National Democratic conventions in 1856 and 1860. In 1861 he presided over the convention called to consider the question of seceding from the Union. He then retired to his plantation, where he spent the remainder of his life.

MOVABLES (OF. *movable*, *mouvable*, Fr. *mouvable*, from Lat. *movere*, to move). Such subjects of property as can be transported from one place to another without injury, and which cannot be classed as real property. The term is used as contradistinguished from things immovable, or real property, but is employed in a narrower sense than the term personal property, which includes many subjects of property rights which are not real estate, and yet which cannot be said to be capable of being moved or transported in the strict sense, as choses or rights of action and growing crops in some cases.

In Scotch law, the word movables is used as contradistinguished from heritable property, and is practically synonymous with personal property in American and English law. See CHATTELS; PERSONAL PROPERTY; REAL PROPERTY.

MOVEMENT. Several modes of movement are manifested in plants and plant organs. Some of the lower forms (bacteria, algæ, and fungi) exhibit movements of locomotion in certain stages, swimming freely in the water in which they are found. The same is true of the zoöspores and conjugating sexual cells (gametes) of many plants which themselves are not motile. Also, the plasmodia of slime molds show a peculiar flowing of the protoplasm which results in motion from one place on the substratum to another. This is called amœboid movement. Another kind of movement often met with in plants is the so-called hygroscopic movement. This is shown by the awns of certain grasses and other fruits ('seeds') (Fig. 1.), by the valves of many seed-pods (Fig. 2.), by the teeth of the peristome of moss capsules, and by the elaters of liverworts, horsetails (Equisetum), etc. It is a phenomenon having no connection whatever with the vitality of the parts, being due merely to unequal swelling or shrinkage (i.e. warping) of the different tissues by reason of their unequal absorption or loss of water; and this depends on the unlike composition of the material of the cell walls.

From a physiological point of view perhaps the most important form of plant movement is that exhibited by the leaves of the so-called sensitive plants. The best example of this is found in the Mimosa of greenhouses. When this plant is jarred, struck, locally burned, or injured otherwise, its leaves suddenly collapse, even those at a distance from the shock. Its leaves are doubly compound, and in closing the pinnules rise so that the upper faces of opposite ones are brought together, the pinnæ drop downward and forward, while the whole leaf sinks (Fig. 3). If a shock be given to one pinnule, the disturbance there set up, if severe enough, is propagated to other parts of the same leaf and even to other leaves. Almost any portion of the plant can receive a stimulus in this way and pass it on to other regions. The organs which execute the visible response are motor organs (q.v.), cushions of tissue (pulvini) situated one at the base of the leaf, of each pinna, and of each pinnule. Indigenous plants which show this reaction, though not so strikingly, are the common oxalis and different species of Cassia.

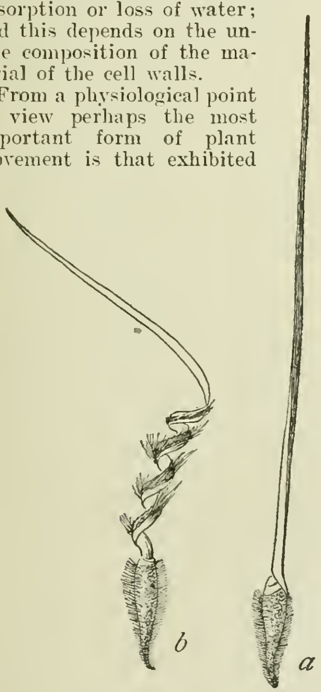


FIG. 1. FRUIT OF ERODIUM GRUINUM.

a, When wet; *b*, when dry; the straightening of *b* when tip is caught in grass and the awn absorbs moisture bores the seed containing lower part into the soil, and so 'plants' it.

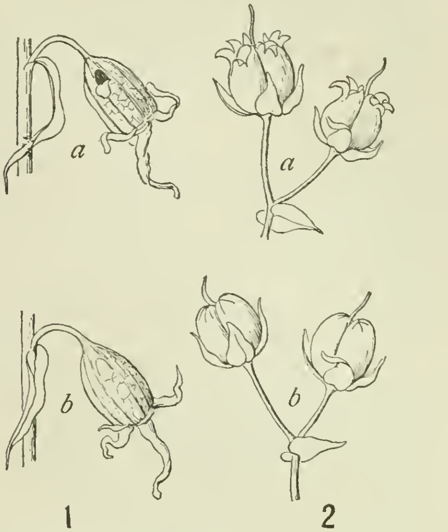


FIG. 2. HYGROSCOPIC MOVEMENTS OF THE VALVES OF SEED PODS.

1, *Campanula rapunculoides*; *a*, when dry; *b*, when wet; 2, *Linaria Macedonica*; *a*, dry; *b*, wet.

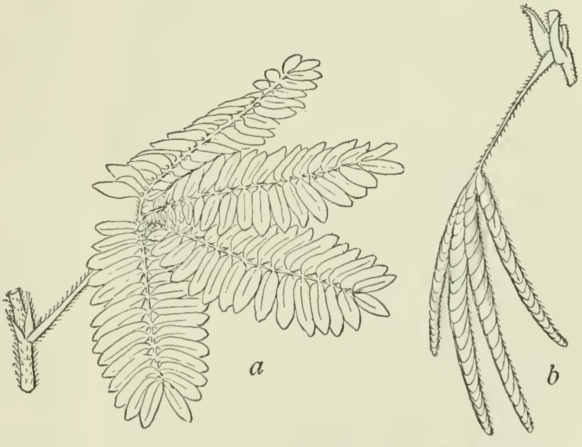


FIG. 3. LEAF OF THE SENSITIVE PLANT (*Mimosa*).

a, In light when undisturbed; *b*, after shaking.

The so-called 'sleep movements' of leaves of the pea family, Oxalis, etc., are executed by the same motor organs, which, however, are often less perfectly developed. These movements consist of changes in the position of the leaf following variations in the intensity of illumination, so that these leaves have a nocturnal and a diurnal position. Hence the misleading expression 'sleep movements.'

For a discussion of the variety of movements of plants in response to stimulation, which are brought about by unequal growth on opposite sides of an organ, see CHEMOTROPISM; ELECTROTROPISM; GEOTROPISM; HELIOTROPISM; RHEOTROPISM; THERMOTROPISM. See, also, MYXOMYCETES; LOCOMOTION; ROTATION; SLEEP OF PLANTS.

MOVEMENT. A musical term denoting a division of a cyclical composition. As early as the sixteenth century a number of dances were loosely joined together, the only rule followed being that all should be in the same key, and that the tempo (fast, slow) should alternate. This gave rise to the suite (q.v.), but the modern symphony or sonata was developed from the old overture, which consisted of three parts, a fast one followed by a slow one with the first part repeated. Gradually the three parts were separated and became distinct movements. In the sonata the first movement is always written in a particular form called sonata-form. The different movements are in different (but related) keys. The first and last are always in the same key, which is therefore spoken of as the key of the cyclical composition. When the first movement is in the minor, the last is generally in the relative major. Each movement has its own themes. Occasionally, however, a composer introduces in a later movement (generally the finale) a theme from a former movement. The number of movements depends upon the character of the composition. In works written in sonata-form the usual number is three for sonatas and four for symphonies. In suites the number varies from four to eight. See FORM; OVERTURE; SONATA; SUITE; SYMPHONY.

MOVEMENT, PERCEPTION OF. Psychologically a movement is a consciousness of a continuous change of position. It is an idea which is intimately bound up with notions of space and time, or, to speak more strictly, it is an idea which, from the point of view of system, must be treated both as an extensive and as a temporal idea, since every movement must possess a certain extent (q.v.) and a certain rate or duration (q.v.). Our idea of movement is structurally complex. It consists partly of ideas of an object in different positions, partly of certain sensations set up in the body. These sensations, both because they are easily aroused by movements, and because they serve as the most effective basis for the estimation of movements, have by many writers been grouped together under the terms 'movement sensations,' 'kinæsthetic sensations,' or, more simply, as the 'muscle sense' (q.v.). But a classification of sensations in terms of the stimuli which evoke them, or in terms of the objective processes for which they come to stand, is both inadequate and unsatisfactory; to speak of sensations of 'movement' is as unwarrantable as to speak of sensations of 'time,' 'weight,' 'resistance,' 'space,' etc. As a matter of fact, too, we are now able to isolate the components of the idea of movement psychologically and to assign their dependency upon definite bodily processes. There are three qualitatively distinct sensations within the 'muscle sense': (1) the muscle sensation proper, (2) the strain or tendinous sensation, (3) the joint or articular sensation. The latter alone is concerned in our knowledge or estimate of position, and change of position, or movement, of any member of the body. The actual liminal excursion has been found to be least in the case of the larger joints (0.22° to 0.60° for shoulder, hip, and elbow), greatest for the smaller joints (0.50° to 1.30° for knee, finger, and ankle).

But our ideas of the extent of movement are not limited to those which refer to members of our body; we can also estimate the extent of the movement of an object felt (skin) or of an object seen (eye). A stimulus moving over the skin excites end-organs of pressure which possess different 'local signs.' If the first local sign has not lapsed from consciousness when the last is reached, we are able to estimate the extent of the movement in purely cutaneous terms; otherwise we may make judgments in visual terms. The least noticeable extent of cutaneous movement depends upon the place stimulated, the intensity of the pressure, and the rate and direction of the motion. On the forehead it may amount to 10 mm. A very slow movement may pass unnoticed. Movements lengthwise of a limb are less readily noted than movements crosswise, on account of the distribution of the nerve endings in the skin. Movement is often noted before direction of movement, either because the starting point is forgotten or because the judgment 'movement' is more easily aroused than the judgment 'movement in this direction.' The visual idea of extent of movement may be variously formed. (1) If the eyes remain fixed while the object moves across the visual field, the estimation results from the stimulation of different local signs in a manner analogous to that of the purely cutaneous estimation. The least noticeable amount of movement is probably about equal to the 'minimum visible.' (See EXTENT.) (2) If the fixation point of the eyes follows the moving object, the estimation of the extent of movement of the object is made in terms of the strain, pressure, and articular sensations evoked by the movements of the eyes in their sockets, of the head upon the shoulders, or of the body as a whole. Without the aid of some fixed point of reference, such as is actually used in 'eye measurement' (see EXTENT) and convergence, estimations of this second type are extremely uncertain, on account of the occurrence of unnoticed movements of the eyes themselves.

Turning to the temporal aspect of the perception of movement, we can say in general that quick movements are more readily noted than slow, whether they appeal to joint, skin, or eye. On the skin a uniform rate in the stimulus is not perceived as a uniform rate in sensation, for a given movement appears more rapid where localization is more accurate. The slowest perceptible visual movement is at the rate of 0.0028 mm. per second. In discriminating between two different rates, the optimal speed is rather slow, because rates of movement which are at all quick are confused by the persistence of the excitation in the form of after-images.

Finally, rate of movement or, more strictly, a change in the rate of movement of the body as a whole, is perceptible, although no estimation of the extent of such a movement is possible. Upon vehicles, like elevators, boats, etc., where there is little jar, it is easy to observe that, once the speed is uniform, it is impossible to perceive any motion whatsoever; acceleration or diminution of this rate, however, sets up certain sensations due to the inertia of the body, and perhaps, too, other sensations mediated by the semicircular canals. See STATIC SENSE.

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MOVEMENT CURE. A hygienic and therapeutic system for the preservation as well as the recovery of health, introduced by Pehr Henry Ling (born in 1766), a native of Smaland, Sweden. It is a modified form of gymnastics, being systematized and specially adapted to the treatment of invalids in a reduced condition, and possesses, in many respects, advantages over ordinary gymnastics. The system consists essentially in carefully prescribed movements of the whole body or of individual groups of muscles, either with or without resistance. Ling's methods obtained wide recognition both in Europe and America. In Sweden a Royal ordinance was issued for the establishment of an institution devoted to the method of exercise. See LING.

Various modifications of this system were made from time to time, and massage and movement were gradually combined in the more modern schemes of mechano-therapy, which are designed merely to correct morbid conditions of the body by means of active or passive movements. "These movements are active when they are executed by the patient's own volition, and passive when performed upon his body or with it or upon parts of it by the will of another."

Mechano-therapy has probably reached its highest development in the ingenious inventions of Dr. Gustaf Zander, of Stockholm. About the middle of the last century Zander introduced the first of these ingenious contrivances for administering the well-known 'Swedish movements.' From crude beginnings he developed his 'system' until he had perfected over seventy varieties of apparatus, some of them weighing nearly a ton, by which the most delicate child and the most unwieldy adult can be treated with equal ease and advantage. These machines range from a simple apparatus for moving a single joint or group of muscles to complicated mechanisms which closely imitate the motions of the body performed in horseback or even camel riding—the latter technically known as 'trunk circumduction.' Zander institutes have been established in all the important cities and health resorts in Europe, and there is one in New York City.

Mechano-therapy is not designed, nor should it be resorted to, as a substitute for the natural, unconscious exercise in the open air, such as is obtained in the various outdoor recreations, but is applicable to those suffering from general weakness, or from affections of particular portions of the body, such as local paralysis or joint affections, which would render general movement painful, harmful, or impossible. Another large class of persons who are likely to find benefit are those who are afflicted with deformities, due either to habit or disease. In such cases the orthopedist often finds a valuable ally in the movement cure. The subject is intimately related to massage (q.v.). For fuller information, consult: Grafstrom, *Mechano-Therapy* (Philadelphia, 1899), and Nissen, *A B C of the Swedish System of Educational Gymnastics* (Philadelphia and London, 1891).

MOVERS, mō′vẽrs, FRANZ KARL (1806-56). A German Orientalist. He was born at Koesfeld, Prussia, and was educated at Münster and Bonn. After being settled for six years over a church in Berkum, he was in 1839 appointed professor of theology in the University of Breslau, where he remained until his death. His exhaustive and scholarly treatise on the Phœnicians, *Die Phönizier* (vol. i., 1841; vol. ii., 1849-56), is his best-known work. He also wrote *Kritische Untersuchungen über die biblische Chronik* (1834).

MO′VILLE. A seaport, market-town, and summer bathing resort, in County Donegal, Ireland, on Lough Foyle, 17 miles north-northeast of Londonderry (Map: Ireland, D 1). It is noted as a calling station of the transatlantic mail steamers from New York to Glasgow. Population, 1500.

MOVING PLANT (*Desmodium gyrans*). An East Indian plant of the natural order Leguminosæ, remarkable, as are also some other species of the same genus, for the spontaneous motion of the leaves, which are ternate, the lateral leaflets much smaller than the terminal one. These lateral leaflets are in constant motion, being elevated by a succession of little jerks till they meet above the terminal leaflet, and then moving downward by similar rapid jerks. The terminal leaflet does not remain absolutely at rest, although its movements are not like those of the lateral ones. See MOVEMENT.

MOWAT, mō′at, Sir OLIVER (1820-1903). A Canadian statesman, born in Kingston, Ontario, of Scottish parentage. In that city and in Toronto he was educated. He became a barrister (1841), practiced his profession in Toronto, was made Queen's Counsel in 1856, and the same year was a commissioner for consolidating the statutes of Canada, of Upper Canada, and afterwards of Ontario. He was a Liberal member of Parliament for South Ontario in 1857-64, a Cabinet minister in 1858, Postmaster-General in 1863-64, and Vice-Chancellor of Ontario from 1864 until 1872, when he became Prime Minister of that province and its Attorney-General, as well as a member of Parliament for North Oxford. These positions he held until 1896, when he was made Minister of Justice in the Dominion Cabinet and leader of the Senate. In 1897 he was appointed Lieutenant-Governor of Ontario.

MOWBRAY, mō′brâ, HENRY SIDDONS (1858—). An American figure painter, born of English parentage in Alexandria, Egypt. He came to the United States at an early age. In 1878 he went to Paris, where he remained several years, and became a pupil of Bonnat. He is well known as an illustrator. His technique is clever and his color well handled and brilliant. The most important of his works are "Aladdin," "Rose Harvest," "Arcadie," "Scheherezade," and "Evening Breeze."

MOWBRAY, Robert de, Earl of Northumberland. See Northumberland.

MOWER. See Reaper, Reaping.

MOWER, mō′ẽr. Joseph Anthony (1827-70). An American soldier, born at Woodstock, Vt. He fought in the ranks during the Mexican War, but rose, in 1861, to be a captain in the Regular Army. During the first year of the Civil War he took part in the military operations in Kentucky and Tennessee, rendering conspicuous service. In November, 1862, he was promoted to brigadier-general, and was placed in command of a brigade before Vicksburg (1863). In 1864 he was promoted to the rank of major-general of volunteers and commanded a division in Louisiana. Later he accompanied Sherman in the Atlanta campaign. Upon the reorganization of the army at the close of the war, he was commissioned colonel of the Thirty-ninth Infantry, and was given command of the Military Department of Louisiana.

MOWRY, mō′rĭ, William Augustus (1829 —). An American educator and historical writer, born at Uxbridge, Mass. He studied at Phillips Academy and at Brown University, and for many years was engaged in educational work in Rhode Island and Massachusetts. In 1884-85 he was editor of the *Journal of Education*, and from 1886 until 1891 of *Education*. Among his historical publications are: *A History of the United States* (1876): *First Steps in the History of Our Country* (1898); *American Inventions and Inventors* (1900); and *Marcus Whitman and Early Oregon* (1901), a work which aroused considerable controversy.

MOXA. The downy hairs of Artemisia Moxa, a plant of the natural order Compositæ; also the plant itself. The Chinese and Japanese use this substance as a cautery and a counter-irritant.

MOX′OM, Philip Stafford (1848—). An American clergyman, born at Markham, Canada. He came to the United States at an early age, and at the outbreak of the Civil War joined the Federal Army. In 1875 he entered the Rochester Theological Seminary, where he remained three years, then entered the University of Rochester, where he graduated in 1879. He was pastor of the First Baptist Church in Cleveland, Ohio, from 1879 until 1885, and of the First Baptist Church in Boston from 1885 until 1894, when he took charge of the South Congregational Church in Springfield, Mass. His publications include: *The Aim of Life* (1894); *From Jerusalem to Nicea: The Church in the First Three Centuries* (1895); and *The Religion of Hope* (1896).

MOXOS, mō′hōs, Mojos, Mohós, or Musu, mōō′sōō. A noted group of tribes occupying the Province of Moxos, on the upper region of the Mamoré and Beni rivers, in Northeastern Bolivia, and speaking a language of the widespread Arawakan stock (q.v.). By submitting themselves to the Inca Yupanqui they became incorporated with the Peruvian Empire (see Quichua), and an Inca colony was established in the province. In 1564 they repelled a Spanish invasion of their country, but in 1674 readily accepted the teaching of the Jesuit missionary Baraza, who worked among them for nearly thirty years, and succeeded in collecting them into fifteen mission villages, at the same time teaching them agriculture, weaving, and carpentry. Moxos missions grew and flourished, other neighboring tribes being also gathered into them, until in 1726 their fifteen villages numbered 30,000 Christian Indians, representing nearly thirty tribes and at least nine distinct languages, the Moxos proper predominating. With the expulsion of the Jesuits in 1767 the mission period came to an end, but the former converts maintained themselves as a civilized population and exist to-day in practically undiminished numbers. Physically they are of rather light complexion, with intelligent and handsome features. They are grave and thoughtful, honest, and devoutly religious, peaceable and civil, but carrying always an air of independence. They are successful farmers, expert boatmen, and skillful with the lariat.

MOYABAMBA, mō′yȧ-bäm′bȧ. A town of Peru. See Moyobamba.

MOYA Y CONTRERAS, mō′yȧ ē kōn-trā′-rȧs, Pedro de (c.1520-91). A Spanish prelate and administrator, born in the Diocese of Cordova. Already known as an Inquisitor in Murcia, he was sent to Mexico, became Archbishop of the City of Mexico, and established the Inquisition there in 1574. For one year, 1584-85, he was also Viceroy. After his return to Spain in 1591 he was appointed president of the Council of the Indies.

MOYOBAMBA, mō′yō-bäm′bȧ, or **MOYABAMBA.** The capital of the Department of Loreto, Peru. It is situated in the northwestern part of the department, on the River Mayo, and on a plateau of loose, sandy material, which the floods wash out, forming large ravines penetrating the town (Map: Peru, B 5). The town consists mainly of isolated houses thatched with palm leaves and scattered over a large area. The principal industry is the manufacture of Panama hats. Moyobamba has some trade with Brazil by way of the Amazon, with which the Mayo communicates through the Huallaga, but otherwise it is practically cut off from communication with the rest of Peru. Population, in 1895, 10,000.

MOYSE, mwäz, Hyacinthe (1769-1801). A Haitian revolutionist, nephew of Toussaint L'Ouverture. His success at La Croix des Bouquets, whence he drove the whites to Port au Prince, brought on a general revolt in the south and west. In 1794 he put himself under the command of Toussaint L'Ouverture, and with him drove out the English. In 1801 he became commander of the Army of the North in the attack on Spanish San Domingo. At the close of the same year he was accused of instigating a revolt in the north; was arrested and court-martialed; and with twenty-three of his men was blown from the cannon mouth.

MOZAMBIQUE, mō′zam-bēk′. The former name of Portuguese East Africa (q.v.), now restricted to the northeastern coast of that colony.

MOZAMBIQUE. The capital of the Portuguese Province of Mozambique, situated on a small coral island separated by a strait a mile wide from the east coast of Africa, at the narrowest part of the Mozambique Channel (Map: Africa, J. 6). Its principal buildings are the Governor-General's palace, the custom-house, the hospital, and the cathedral. Mozambique was formerly a centre for the slave trade and has declined in importance since that era. There is some traffic in rice, gum, gold-dust, and timber; the shipping amounts to 150,000 tons annually. The population, in 1900, was 5500, of whom 285 were Europeans, 226 Asiatics, and the rest natives.

MOZAMBIQUE CHANNEL. The body of water between the east coast of Africa and the island of Madagascar (Map: Africa, J 6). It is about 1000 miles long, and its width ranges from 260 miles at the middle to nearly 600 miles at either end. The principal river flowing into it is the Zambezi. The Comoro Islands lie in the north entrance to the channel, and on the west shore are the ports of Beira and Mozambique.

MOZARABIC LITURGY (Sp. *Mozárabe*, from Ar. *Mustarb*, from *ta 'arrab*, to become an Arab, from *'arab*, Arab), or GOTHIC LITURGY. The ancient liturgy of the Church of Spain. The former title is derived from the name applied to the Christian inhabitants after they were subjected to the Arab domination; the latter is applied to it because it was most widely used during the Gothic period. Its main structure indicates an Eastern origin; a plausible theory regards it as having been brought by the Goths from Constantinople or Asia Minor in the fifth century, and then revised by Saint Isidore of Seville. In the second half of the eleventh century the Roman liturgy began to supersede it; but this change was stubbornly resisted. In the end six churches in Toledo were assigned to the local rite. Cardinal Ximenes made special efforts at the beginning of the sixteenth century to prevent the liturgy from falling into oblivion, and founded a chapel expressly for its use. He also caused a number of learned priests to collate the existing manuscripts, and published a revised edition, unfortunately incomplete, in 1500-02. The affinities of this liturgy with the Gallican on the one hand and the Greek on the other make its study important to liturgical scholars. Besides the edition referred to, it was reprinted by Lesley (Rome, 1755), and by Lorenzana (ib., 1804); it is in Migne, *Patrologia Latina*, lxxxv., and a new edition appeared at Toledo in 1875. Consult Neale, *Essays in Liturgiology and Church History* (London, 1863); and see LITURGY.

MO'ZART, *Ger. pron.* mō'tsärt, LEOPOLD (1719-87). A German musician, father of Wolfgang Amadeus Mozart, born at Augsburg. He was sent to study law at Salzburg, but became a chorister and afterwards a music teacher, as he played the violin well, and in 1743 was made a member of the Prince-Bishop's orchestra. In 1762 he was appointed Court composer. He produced about twelve oratorios, eighteen symphonies, six trio-sonatas, as well as serenades and concertos. Twelve of his pianoforte pieces were published under the title *Der Morgen und der Abend*. His famous violin method, almost the first of its kind, *Versuch einer gründlichen Violinschule* (1756), was often reprinted and translated, but his chief service to the world was the careful and sympathetic training of his son, the great Mozart, whose genius he judiciously fostered.

MOZART, WOLFGANG AMADEUS (1756-91). A famous German composer. He was born at Salzburg, Austria, January 27, 1756. Mozart's love for music first manifested itself when his eldest sister, 'Nannerl,' began to receive musical instructions from her father. When he was only five years old he composed little minuets and was discovered at work on a concerto. At six he had become so proficient as a performer on the piano, and his sister's progress also had been so great, that their father took them on a tour of the leading capitals of Europe, everywhere meeting with notable receptions.

In 1768 the elder Mozart again took his son to Vienna. There this boy of twelve conducted a solemn mass of his own composition, and his operetta *Bastien und Bastienne* was given at a private performance. After a brief sojourn in Salzburg, where Wolfgang was appointed concertmeister to the Archbishop, his father took him to Italy. In Rome he heard the famous *Miserere* of Allegri, which was so jealously guarded by the authorities that musicians were forbidden to copy it under pain of excommunication. After twice hearing it young Mozart wrote it out by ear. His compositions and his performances made such a profound impression that the Pope created him a Knight of the Golden Spur, and at Bologna he was elected a member of the Philharmonic Society. At Milan he received a commission to compose an opera, the result being *Mitridate re di Ponto*, which was brought out in December, 1770, and had twenty consecutive performances. His knowledge of the Italian style of singing was greatly broadened through this Italian trip, and especially through his acquaintance with the male soprano Farinelli, the greatest singer of his time.

After another brief sojourn in Salzburg he returned in August, 1771, to Milan, where he brought out his serenata *Ascanio in Alba*, in honor of the nuptials of Archduke Ferdinand, a son of Maria Theresa. The death of Archbishop Sigismund at Salzburg was a severe blow to the Mozarts; for his successor, Hieronymus, for whose installation Mozart composed *Il Sogno di Scipione* (The Dream of Scipio), showed little appreciation of his genius. Two other Italian stage works *Lucio Silla* and *La finta giardiniera* were produced in Milan, and the latter also in Munich; and on the occasion of Archduke Maximilian Francis's visit to Salzburg, in 1775, he brought out *Il re pastore*.

Disgusted with the obstacles which Hieronymus constantly threw in his way, Mozart, accompanied by his mother, again started out on his travels in September, 1777. In Mannheim he met the Weber family, which was destined to play an important part in his life. The head of this family, Fridolin von Weber, was prompter and copyist at the theatre. The eldest daughter, Josepha, afterwards Frau Hofer, was the prima donna for whom in later years Mozart wrote the "Queen of the Night" music in *The Magic Flute*. A younger daughter, Aloysia, afterwards Frau Lange, was for a time Mozart's pupil, and he promptly fell in love with her. Another daughter, Constanza, later became his wife. A trip to Paris ended tragically in his mother's death. He returned to Salzburg, stopping on his way in Munich, where Aloysia had secured a position, and where he learned that she no longer cared for him. In after years, however, this youthful sweetheart did more than any other singer to make his music famous. While in Paris he made a friend of the encyclopædist Grimm.

At Salzburg he composed the music to the tragedy *King Thamos*, and began the composition of an operetta, *Zaïde*, which was interrupted by an invitation to compose an opera for Munich. *Zaïde* was never finished, but the result of the Munich invitation was the opera *Idomeneo*, which opened a new epoch in his life, being his first masterpiece in the grand style. During a visit to Vienna in 1781, Mozart terminated once for all his relations with the boorish Hieronymus, who had grossly insulted him. He took up his residence with the Webers, who were now in Vienna. His father strongly objected to this, and he moved his lodgings. But he had fallen in love with Constanza, and in August, 1782, they were married. Notwithstanding the grinding poverty of their lot, their marriage was a happy one, for their mutual love atoned for the hardships which constantly confronted them. His marriage took place shortly after the production in Vienna of his opera *Belmonte und Constanza, oder Die Entführung aus dem Serail*. The Italian musicians of Vienna, headed by Salieri, used all means in their power to have the production fail, but it was triumphantly successful. Gluck attended one of the performances and was enthusiastic in his approval of it. Nevertheless, from this time on Mozart was constantly met by the hostile machinations of the Salieri party, which greatly imbittered his career.

The success of the opera led the Emperor to order a new opera buffa of Mozart, who, in connection with its composition, was brought together with Lorenzo da Ponte. The result was *Il nozze di Figaro*. Beaumarchais's work on which the libretto is based had been forbidden in Vienna on the ground of its immorality. Mozart, however, went to work on the score, and when part of it had been composed, Da Ponte found opportunity to have the Emperor hear it, with the result that he ordered its completion and performance. Besides this he gave the composer an order for a musical comedy, *Der Schauspieldirector*, for a garden fête at Schönbrunn. Throughout the preparations for the production of *Figaro* Salieri and his adherents were active in opposition, and the first performance, in May, 1786, came near being a failure. In January, 1787, however, it was received with immense enthusiasm at Prague, where Mozart became a popular idol. The concerts which he gave there were immensely successful, and he was engaged to write another opera. Da Ponte suggested *Don Giovanni* to him, and in April placed the libretto of the work in his hands. By September Mozart and his wife and Da Ponte were in Prague, rehearsals were taken in hand, and late in October *Don Giovanni* was produced, and was even more successful than *Figaro* had been.

During a tour undertaken in 1789 with Prince Carl Lichnowski, the destination being Berlin, Mozart stopped en route at Leipzig, where he played in the Thomaskirche and was deeply impressed with Bach's motets. In Berlin his success was such that Frederick William II. offered him a position as kapellmeister with a salary of 3000 thalers. But a few words of reassurance from the Austrian Emperor, accompanied with an order for a new opera, coupled with his own strong feeling of loyalty, unfortunately induced him to decline the King's offer, the best he had had. The opera was *Così fan tutte*, which was produced in Vienna in January, 1790. After a visit to Frankfort to attend the coronation of the new Emperor, Leopold II., he returned to Vienna. Meanwhile his old acquaintance Schikaneder was managing a theatre in Vienna. The affairs of the house being precarious, he thought to better them by producing an opera by Mozart, and so applied to him in the spring of 1791 to write a 'fairy' opera—'a piece that would attract.' Schikaneder himself furnished for Mozart the libretto to the *Zauberflöte* (*The Magic Flute*). The work was interrupted by an order to compose an opera for the coronation of Leopold as King of Bohemia at Prague, in 1791. It was *La clemenza di Tito*, written in a few weeks by a man already much overworked. It did not make much impression. *The Magic Flute* was brought out in September, 1791, under the composer's own direction, and with distinguished success.

But Mozart's constant struggle with intrigue and pecuniary necessities, and the strain to which he had subjected himself in order to meet these by constant work, had begun to tell upon him, and when, even before he had finished *The Magic Flute*, he received a mysterious commission to compose a requiem, he felt that he was writing his own swan song. It is now known that the commission came from a Count Walsegg, whose intention was to have the work performed as his own, and who therefore kept his identity from Mozart. So fixed became Mozart's idea that he must complete his *Requiem* before death overtook him that even when his wife drove out with him, so that he might be in the open air, he insisted on taking his portfolio of music paper along. It was on one of these drives that his melancholy led him to express the belief that he had been poisoned at the instigation of his Italian rivals, a suspicion which does not, however, seem to have been borne out. Feeling that he would not live long enough to finish the *Requiem* himself, he sketched out the principal features of the uncompleted part, leaving them for his pupil Süssmayer to fill out. The night before his death he gathered some of his favorite singers about him, had the score of the *Requiem* brought to his bed, and the work was sung until the "Lacrimosa" was reached, when Mozart burst into tears and closed the score. His death came at one o'clock in the morning of December 5th, and an eyewitness says that his last motion was an endeavor to imitate the kettledrums in the *Requiem*.

Although much of Mozart's music has been forgotten, he remains to the public one of the most fascinating figures in musical history. His buoyant nature, which seemed to override misfortune and intrigue and to laugh at poverty, has made him a type of the musical bohemian. Mozart is of greatest importance as an operatic composer, and as such he still ranks among the masters of music. His admirable handling of the human voice and his keen appreciation of dramatic effect have kept *Figaro, Don Giovanni*, and *The Magic Flute* in the repertory from the day they were produced. His vocal numbers not only are fine as music, but, being written with a knowledge of the voice, can be sung with telling effect by accomplished singers. With Gluck, Mozart lies at the foundation of German opera. He also was a prodigious worker in other departments of music. He produced no less than forty-one symphonies, the best known of which are those in *E flat Major* (the first symphony to employ clarinets), the *Jupiter* and the *G Minor*, church music, many works of chamber music, pianoforte compositions, and songs.

WOLFGANG AMADEUS MOZART

Bibliography. Jahn, *Life of Mozart*, translated by Townsend, with a preface by Grove (London, 1882), the standard work; Nohl, *Life of Mozart*, translated by Lalor (Chicago, 1893), an excellent short biography; *The Great German Composers* (New York, 1878); Köchel's *Chronologischthematisches Verzeichnis sämtlicher Tonwerke W. A. Mozart's* (Leipzig, 1862; suppl. 1889); *Letters*, translated from the collection of Ludwig Nohl by Lady Wallace (Boston, 1864).

MOZDOK, mŏz-dŏk′. A town in the Caucasian Territory of Terek, Russia, situated on the left bank of the Terek, 58 miles north of Vladikavkaz (Map: Russia, F 6). It has a number of Armenian and Greek churches, of which that of the Assumption attracts many pilgrims. The educational institutions include four Mohammedan schools. Gardening and the manufacturing of wine and spirits are the chief occupations. The town was founded in 1762. Population, in 1897, 14,583, consisting chiefly of Kabardins, Georgians, and other Caucasian tribes, Armenians, and about 4000 Russians.

MOZIER, mō′zhẽr, Joseph (1812-70). An American sculptor. He was born at Burlington, Vt., August 22, 1812, and in 1831 settled in New York, where he established himself as a merchant. In 1845 he retired from business to devote himself to art, and shortly after went to Italy. He studied sculpture for several years at Florence, and then went to Rome, where he spent the greater part of his professional career. Among his best works are: "Esther;" the "Wept of Wishton-Wish;" "Tacite" and "Truth," in the Mercantile Library, New York; the "White Lady of Avenel" (1866); "The Peri;" "Pocahontas;" the "Prodigal Son," Philadelphia Academy; and "Rizpah," one of his latest works. He died at Faids, Switzerland, October, 1870.

MOZLEY, mōz′lĭ, James Bowling (1813-78). An English clergyman. He was born at Gainsborough, Lincolnshire, and was sent in early youth to school at Grantham. In 1830 he was admitted to Oriel College, where he came into intimate association with the leaders of the Oxford Movement—Newman, Pusey, Keble, and Hurrell Froude. With this movement he became formally allied, though he was never among the more dogmatic of its promulgators. In 1834 he took his degree, and shortly thereafter won the Chancellor's prize for an English essay on *The Influence of Ancient Oracles on Public and Private Life*. He remained at Oxford, studying theology under the direction of Pusey and Newman, as fellow of Magdalen, until 1865, during which period he contributed, first to the *British Critic* and later to the *Christian Remembrancer*, articles suggested by the Church movement of the time. He was in full accord with Anglican teachings until the Gorham controversy of 1850 on the subject of baptism led him to attempt a reconciliation of the Christian tradition about baptism with the teachings of Calvinistic theology. His contributions to this subject were: *A Treatise on the Augustinian Doctrine of Predestination* (1855); *The Primitive Doctrine of Baptismal Regeneration* (1856); and *A Review of the Baptismal Controversy* (1862). He removed from Oxford on his marriage in 1856, and became rector of Old Shoreham, Sussex. In 1869 Gladstone appointed him Canon of Worcester, and two years later nominated him regius professor of divinity at Oxford, which post he held until his death six years later. In addition to the works already mentioned, he published his Bampton Lectures on *Miracles* (1865) and *Ruling Ideas in Early Ages* (1877). His letters, with biographical introduction, were edited by his sister (London, 1884).

MOZLEY, Thomas (1806-93). An English clergyman and journalist. He was born at Gainsborough, and attended Charterhouse School. In 1825 he entered Oriel College, Oxford. He became fellow of Oriel, and enjoyed the intimate friendship of the leaders of the Oxford Movement, the personal side of which he has given in his *Reminiscences, Chiefly of Oriel College and the Oxford Movement* (1882). In 1831 he entered the active ministry, but returned to Oriel in 1835 to assume the office of junior treasurer. In 1836 he resigned his fellowship, and became rector of Cholderton, Wiltshire, where he remained eleven years, varying his pastoral duties by writing for the *British Critic*. In 1841 he succeeded Newman as editor of that journal. In 1844 he began writing for the *Times* (London), and in 1847 he resigned his living and removed to London, formally entering upon a long literary career. Once again, in 1868, he returned to the work of the Church, but the following year found him in Rome as correspondent for the *Times*. From 1880 to 1893 he resided at Cheltenham, engaged in literary pursuits.

MOZOOM′DAR, Protap Chunder (c.1840—). A Hindu reformer and theist. He was born at Calcutta, India; studied in the native college there; was led by conviction to join the Brahmo-Somaj (q.v.), and became the editor of the *Theistic Quarterly Review* and the *Interpreter*, published in Calcutta in the interests of the association. In 1874 he visited England, and in 1883 the United States, where he was welcomed by the leading men of several Christian denominations. During his stay he published a book entitled *The Oriental Christ*, and on his second visit he read a paper before the World's Parliament of Religions on the *Brahmo-Somaj*, published in Chicago, 1893. He is the author of the *Life and Teachings of Keshub Chunder Sen* (1887), and has contributed also to British and American periodicals.

MOZYR, mô-zēr′. A town in the Government of Minsk, Russia, situated on the right bank of the Pripet, 204 miles southeast of Minsk (Map: Russia, C 4). It manufactures leather, beer, and hardware, and trades in grain, animals, and lumber. Population, in 1897, 10,762, including about 5000 Jews.

MPONGWE, m′pōn′gwê. A Bantu-speaking people living about the Gabun estuary, in French equatorial Africa. Formerly powerful, they have been broken up by the movements of other tribes, especially by the Fans (q.v.). Missionary work has been carried on among the Mpongwe for a long time, and their language, which has been reduced to writing through these efforts, is peculiarly rich, so that it has been adopted by neighboring tribes, and thus forms a trade language. The Mpongwe are above the average height and well developed; their hair is woolly, and the skin of light chocolate color. In character they are boastful and indolent. Agriculture and trading are their chief pursuits. As merchants they are untrustworthy, being known as clever swindlers. The political unit is the clan, ruled over by the head men. The so-called king is chosen from the head men by lot in a solemn conclave, and is reviled and mistreated before being proclaimed.

In arts the Mpongwe are at a low level. They are said to cook their food by boiling it in earthen vessels, apparently not being familiar with the method of roasting. As canoe-makers they are skillful, and are admirable boatmen. The canoes, usually 60 feet long, are hollowed out by fire and transported often several miles to water. Around the stations the Mpongwe are nominally Christians, but the isolated natives retain their pagan religion, with its fetish idols, charms, and belief in witchcraft.

MRICCHAKATIKA, mrĭch'ȧ-kä'tē-kä' (Skt. *mṛcchakaṭikā*, clay cart). The title of a Sanskrit play of the sixth century attributed to a king named Sudraka, but probably written for him by the poet Dandin (q.v.). The play, which is in ten acts, is one of the most exquisite of all the Sanskrit dramas. The scene is laid at Ujjain (q.v.), and its central theme is the noble love of the rich courtesan Vasantasena for a merchant named Carudatta, who has been reduced to poverty. Pursued by Sansthanaka, the King's brother-in-law, Vasantasena seeks refuge in Carudatta's house, and the pair fall in love. Escorted to her home by the merchant, she leaves her jewels with him on the pretext that she dares not keep them about her. The gems are stolen by a Brahman who is in love with Vasantasena's maid, the soubrette of the play. When Carudatta perceives this loss, he and his wife sell all that remains to them and thus make good the treasure; but the Brahman, on the advice of his sweetheart, surrenders the stolen jewels to their owner, and Vasantasena thus discovers the depth of Carudatta's love for her. In the merchant's home she sees his little son weeping because he can have but a clay cart, while a neighbor's child has one of gold. She heaps the toy full of jewels for him, and this incident, one of true pathos, gives the play its name. Again pursued by the brother-in-law of the King, she repulses him. Enraged, he chokes her into insensibility, and leaves her for dead, covering her with leaves. She is, however, discovered and revived by a Buddhist monk whom she had saved from a gambling quarrel. Sansthanaka accuses Carudatta of Vasantasena's murder. He is condemned and led forth to execution. Just as the sword is raised, Vasantasena appears, her lover is saved, and, as polygamy is possible in the Hindu drama, the lovers are united. As a picture of Hindu life of the period, luxurious and corrupt, but with noble and unselfish motives, the *Clay Cart* is of great value. The *Mricchakatika* has been edited by Stenzler (Bonn, 1847), Godabole (Bombay, 1896), Vidyasagara (Calcutta, 1898), and Parab (Bombay, 1900). It has been translated into German by Böhtlingk (Saint Petersburg, 1877), Fritze (Chemnitz, 1879), and Kellner (Leipzig, 1894); into Dutch by Vogel (Amsterdam, 1897); and into English by Wilson in his *Select Specimens of the Theatre of the Hindus* (3d ed., London, 1871). Consult Lévi, *Théatre Indien* (Paris, 1890).

MUCH ADO ABOUT NOTHING. A comedy by Shakespeare, produced in 1597-98 and printed in 1600. It was probably a recast of *Love's Labour's Won* (1590), and was known as *Benedick and Beatrice* (1613). The story of Hero and Claudio is taken probably from the tale of "Ariodante and Ginevra" in Ariosto's *Orlando Furioso*, which was translated by Beverly, and dramatized as *Ariodante and Geneuora* (1582). It is found also in Bandello's novels, and in a German play by Jacob Ayrer, *The Beautiful Phœnician* (1596). This contains some features not in the novel but used by Shakespeare, pointing to some unknown intermediate source. Otherwise the comedy is quite original, especially the inimitable Dogberry.

MUCILAGE (Lat. *mucilago*, moldy, musty juice, from *mucere*, to be moldy, from *mucus*, slime; connected with Gk. *μύξα*, *myxa*, slime, Lat. *mungere*, to blow the nose, Skt. *muc*, to release). A name applied to aqueous solutions or jelly-like preparations of vegetable gums or of dextrin (qq.v.). An excellent mucilage is made by dissolving gum arabic in hot water, filtering the solution and adding some antiseptic, to prevent fermentation and the formation of mold. The United States Pharmacopœia contains four mucilages, including *Mucilago acaciæ* and *Mucilago tragacanthæ*.

MUCIUS SCÆVOLA, mū'shĭ-ŭs sĕv'ō-lȧ. See Scævola.

MUCK. See Peat.

MÜCKE, mu̇k'e, Heinrich (1806-91). A German historical painter, born at Breslau, pupil of Schadow, first at the Berlin Academy, then at Düsseldorf, whither he had followed him. In 1829 he painted with Lessing in Castle Heltorf, near Düsseldorf, a cycle in fresco of episodes in the life of Frederick Barbarossa, and after a visit to Italy in 1833 executed a series of religious and historical paintings, chief among which were: "Saint Catharine Borne by Angels to Mount Sinai" (1836), a composition of which he subsequently had to paint five replicas, "Saint Elizabeth Distributing Alms" (1841), both in the National Gallery, Berlin; "The Virgin and Child, with David, Saint John, and Saint Aloysius," a large fresco in Saint Andrew's Church, Düsseldorf; "Chriemhilde's Dream;" "Saint Ambrose and Emperor Theodosius at Milan;" "Introduction of Christianity into the Wupper Valley," fresco in City Hall, Elberfeld; and a cycle depicting the "Life of Saint Meinrad, Count of Zollern," at Sigmaringen.

MUCK'ERS (Ger. *Mucker*, sulky person, hypocrite, from MHG. *muckzen*, *muchzen*, from OHG. *muckazzen*, to mutter; probably connected with OIr. *for-muigthe*, hidden). The popular but opprobrious name, meaning that they were hypocrites, of an extraordinary sect which sprang up at Königsberg, in Germany, in 1835. The movement seems to have originated in the dualistic and Gnostic views of John Henry Schönherr (who was born at Memel, in 1771, and died at Königsberg in 1826) concerning the origin of the universe by the combination of two spiritual and sensual principles. His followers carried out his system much more completely than himself. The most notable of them were two clergymen, Johann Wilhelm Ebel and Georg Heinrich Diestel, the former an archdeacon, who founded a society to which women—some of noble birth—attached themselves. Scandal was thereby caused, and Ebel's easily misunderstood expressions as to the proper relations of the sexes were made the basis of charges against his chastity and moral influence. His followers were accused of the grossest immorality, and a garden in Königsberg where they met acquired the name of the Seraph's Grove. The subject was brought before the courts (1839-42), and the result was that Ebel and Diestel were degraded from their offices, and the latter was further punished by imprisonment. But the sentence was dictated by strong prejudice against the accused, on account of their religious views and peculiar eccentricities, and the evidence gives no support whatever to the charge of licentiousness. The matter was revamped without proper examination by W. Hepworth Dixon in his *Spiritual Wives* (London, 1868), and thus rendered familiar to English readers. For the facts consult J. I. Mombert, *Faith Victorious*, a life of Ebel (New York, 1882).

MU'CORA'CEÆ (Neo-Lat., nom. pl., from Lat. *mucor*, mold, from *mucere*, to be moldy, from *mucus*, slime; connected with Gk. *μύξα*, *myxa*, mucus, Skt. *muc*, to release). A widely distributed order of fungi mostly microscopic, comprising what are commonly known as molds, which are found on decaying vegetable and animal matter. Phycomyces nitens grows on greasy substances. a habitat not usual with most fungi. Mucor mucedo, one of the most common, appears as a glistening mass of mycelium on fresh horse manure in moist places. It seems to flourish in decaying nitrogenous matter, evolving ammonia. From the mycelium there project toward the light slight white threads (conidiophores), whose tips soon became black, from the developed spores. The spore stalks of the common bread mold appear to be indifferent to light. If the mycelium be kept moist it develops cross-partitions which increase in number, the cells so produced swelling into a spherical form to become thick-walled resting spores; but if grown in a decoction of horse manure the mycelium bears only conidia. The principal genera are Mucor, Thamnidium, Pilobolus, Phycomyces.

MUCOUS MEMBRANE and **MUCUS.** The mucous membrane is continuous with the skin at all the orifices of the body, and lines the passages by which the internal organs communicate with the outer world. For convenience of description it may be divided into three great tracts—the alimentary mucous membrane, the respiratory mucous membrane, and the genito-urinary mucous membrane.

The *alimentary mucous membrane* commences at the lips, and not only forms the inner lining of the intestinal canal from the mouth to the anus, but gives off prolongations which after lining the ducts of the various glands (the salivary glands, the liver, and the pancreas) whose products are discharged into this canal, penetrate into the innermost recesses of these glands, and constitute their true secreting element. Besides these larger offsets, we find in the stomach and small intestine an infinite series of minute tubular prolongations, the anatomical arrangement and function of which are described in the article DIGESTION.

The *respiratory mucous membrane* begins at the nostrils, and under the name of *Schneiderian* or *pituitary membrane* (see NOSE) lines the nasal cavities, from whence it sends on either side an upward prolongation through the lachrymal duct to form the *conjunctiva* of the eye; backward, through the posterior nares (the communication between the nose and the throat), it sends a prolongation through the Eustachian tube to the middle ear (the cavity of the tympanum), and is continuous with the pharyngeal mucous membrane (which is a portion of the alimentary tract); it then, instead of passing down the œsophagus, enters and forms a lining to the larynx, trachea, and bronchial tubes to their terminations. From the continuity of these two tracts some writers describe them as a single one, under the name of the gastro-pulmonary tract.

The *genito-urinary mucous membrane* commences at the genito-urinary orifices, lines the excretory passages from the generative and urinary organs, and is the essential constituent of the glands of both. In the female it becomes continuous with the serous membrance of the abdomen at the fimbriæ of the Fallopian tubes. See KIDNEYS.

Mucous membranes line all those passages by which internal parts communicate with the surface, and by which matters are either admitted into or eliminated from the body. As a general rule they are soft and velvety, and of a more or less red color, from their great vascularity; but they present certain structural peculiarities according to the functions which they are required to discharge. In all the principal parts of the mucous tracts we find the mucous membrane to present an external layer of epithelium (q.v.) resting on a thin, transparent, homogeneous membrane, which from its position is termed the basement membrane, and beneath this a stratum of vascular tissue of variable thickness, which usually presents either outgrowths in the form of papillæ and villi, or depressions or inversions in the form of follicles or glands, or both. The follicles are almost invariably present, but the papillæ and villi are limited to the alimentary or gastro-intestinal mucous membrane. The mucous membranes constitute the medium through which nearly all the material changes are effected that take place between the living organism and the external world. Thus in the gastro-intestinal mucous membrane we find a provision for reducing the food by means of a solvent fluid poured out from its follicles; while the villi, which are closely set upon the surface of the small intestine, are specially adapted to absorb the nutrient materials thus reduced to the liquid state. The same membrane, at its lower part, constitutes an outlet through which are cast out not merely the indigestible residuum of the food, but also the excretions from numerous minute glandulæ in the intestinal wall, which result from the decomposition of the tissues, and which must be separated from them to prevent further decay. Again, the bronchio-pulmonary or respiratory mucous membrane serves for the introduction of oxygen from the air, and for the exhalation of water and carbonic acid. And, lastly, the mucous membranes are continuous with the cell-lined vesicles or tubes of the various glands, which are the instruments whereby their respective products are eliminated from the blood. Although the various kinds of epithelial cells discharge a special office in relation to the peculiar function of the mucous membrane upon which each kind occurs, yet they all serve one general purpose—namely, that of protecting the surfaces on which they are placed. This protecting power is increased by the presence of the secretion known as *mucus*, which ordinarily forms an extremely thin layer on these membranes, but when they are irritated or inflamed is secreted in very considerable quantity. (See CATARRH.) The exact mode of its formation is still a disputed question, but it is generally believed to be the product of the gradual solution of the uppermost epithelial cells. Besides acting both mechanically and chemically as a shield to highly sensitive membranes, it has other uses, among which two may be especially mentioned: (1) It communicates to the salivary, and probably to other glands, properties which are not possessed either by itself or by the pure glandular secretions; and (2) it serves to eliminate a considerable quantity of nitrogen from the system. This nitrogen is contained in the *mucin*, which forms from 2.4 to 9 per cent. of nasal and bronchial mucus. This mucin contains 12.64 per cent. of nitrogen, and is the substance which gives to mucus its viscid and tenacious character. Normal mucus is devoid of smell and taste, and faintly alkaline in reaction, and hence its constant presence in the mouth gives rise to no disagreeable sensation.

MUCUNA. See COWAGE; ANTHELMINTICS; LUMBRICOIDES.

MU'DAR (Hind. *madār*, from Skt. *mandāra*, coral-tree), *Calotropis*. A genus of East Indian shrubs of the natural order Asclepiadaceæ. The bark of the root and the thick milky juice of some species are used in the East, where they have long been credited with alterative, purgative, emetic, and sudorific properties which have attracted some attention from European physicians. Mudar is a very common and often troublesome weed in India. The commonest species, Calotropis gigantea, a large shrub, with stems often thicker than a man's leg, and broad, fleshy leaves, rapidly attains a large size on very dry sands, where almost nothing else will grow. The short, not easily spun, silky down of the pods is used for making floss and a soft, cottonlike thread, but a strong fibre, useful for cordage and fishing-lines, is obtained from the inner bark. When properly prepared it is especially well adapted to mix with various other fibres, especially silk. The thick, milky juice, collected by making incisions in the bark, is used as a substitute for caoutchouc and gutta-percha. It becomes flexible when heated.

MUD-CAT. See CATFISH.

MUD-EEL. A siren. See MUD-PUPPY.

MUDFISH. A name given to several widely different fishes which frequent muddy waters. (1) In the United States, the bowfin (q.v.). (2) In California, a small marine goby (*Gillichthys mirabilis*) which lives in shallow places that are left bare at low tide, and harbors in excavations made by itself in the mud. (3) One of the killifishes, the mummichog (q.v.), or 'mud-dabbler.' (4) Any of the lungfish or dipnoans, especially the rare *Lepidosiren paradoxa* of Brazilian swamps. (See DIPNOI, and Plate of DIPNOI AND CHIMÆRA.) This is a salamander-like creature which grows to a length of four feet or more, has the dorsal, caudal, and anal fins united into one continuous fin, and the pectoral and ventral fins produced into long jointed filaments. The head is conical, eye small, gill openings without covers, mouth small, and teeth pointed and cusped, adapted to crushing the fresh-water snails (chiefly Ampullaria) upon which it feeds. A closely related West African fish (*Protopterus annectans*), sometimes six feet long, is very abundant in the Gambia River, where it sustains a torpid existence during the dry season by burying itself in the mud, forming a sort of nest or 'case' of hardened mud about it. Many specimens have been dug out and sent, each within its clod, to Europe, and kept alive in zoölogical gardens. They grow rapidly, are active and voracious the year round, when kept in tanks in hothouses feed upon flesh and all sorts of small animals, and frequently eat each other. In the wet season they swim and crawl about the muddy rivers they inhabit, and are sought as food by the natives. Several other species are known, among them the bichir (q.v.). Their breeding habits are little known, but they are believed to be ovoviviparous. The young have external gills. Consult Lydekker, *Royal Natural History*, vol. v. (London, 1895).

MUD'FORD, WILLIAM (1782-1848). An English writer, who as editor of the London *Courier*, for a time the rival of the *Times*, exerted great influence on public opinion. Leaving the *Courier* —which declined in influence after his withdrawal, and presently was discontinued—he became editor and proprietor of the *Kentish Observer*, the organ of the Conservative Party in Kent. In 1841 he succeeded Theodore Hook as editor of *John Bull*. To *Blackwood's Magazine* he contributed many essays and tales, afterwards collected in part. Among his published volumes are *A Critical Enquiry into the Writings of Dr. Samuel Johnson . . . Nubilia in Search of a Husband* (1809); *The Contemplatist*, essays (1811); *An Historical Account of the Campaign in the Netherlands in 1815* (1817); and *Tales and Trifles from Blackwood's* (1849).

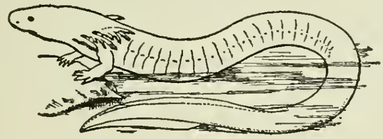
MUDGE, ENOCH (1776-1850). The first Methodist minister raised in New England. He was born at Lynn, Mass., was converted under Jesse Lee, the pioneer of Methodism in New England, and entered the ministry in 1793. He labored as an itinerant preacher in Maine until his health gave way, and in consequence he retired to Owington, Maine, in 1799. He was twice chosen State representative and had much to do with the passage of the Religious Freedom Bill. In 1816 he resumed preaching. From 1832 to 1844 he was pastor of the Seaman's Chapel at New Bedford, Mass.—His son, THOMAS HICKS MUDGE (1815-62), was graduated at Wesleyan University (1840) and Union Theological Seminary (1843); he preached in New England, was professor of sacred literature in McKendree College, Lebanon, Ill. (1857-59), and held pastorates in Saint Louis and Baldwin City, Kan.—ZECHARIAH ATWELL MUDGE (1813-88) entered the ministry in 1840 and held various pastorates in Massachusetts. He wrote much in history and biography, including *Lives* of Abraham Lincoln (1867) and Roger Williams (1871), and histories of Plymouth (1869), Salem Witchcraft (1890), and Arctic voyages (2 vols., 1875).—JAMES MUDGE (1844—), nephew of Zechariah, was graduated at Wesleyan University in 1865, entered the ministry in 1868, served as missionary in India, and has held pastorates in New England. He is the author of *Growth in Holiness Toward Perfection* (1895); *The Best of Brown-*

ing (1898); *Honey from Many Hives* (1899); and other works.

MUD-HEN. A variant of 'marsh-hen,' some species of coot, gallinule, or rail (qq.v.).

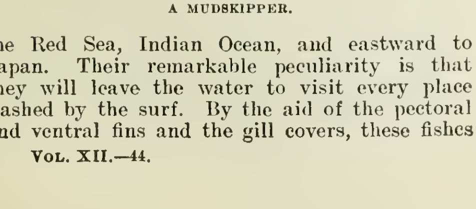
MUD-MINNOW. A small, minnow-like fish of the family Umbridæ, closely allied structurally to the pikes. They inhabit weedy streams, bogs, and ditches in the United States, and also in Austria, where they bury themselves in the mud. They are carnivorous, and extremely tenacious of life. Often when none can be seen in a pool, a swarm of these little dark green fishes may be aroused by raking through the mud. Two American species are known, the Eastern mud-minnow (*Umbra pygmæa*) and the Western 'dogfish' (*Umbra limi*).

MUD-PUPPY, or WATER-DOG. An American salamander of the family Proteidæ, characterized by having four toes on each foot and persistent larval gills. This genus was formerly called Menobranchus. Two species inhabit the central parts of the United States, of which the more common and widespread is *Necturus maculatus.* It reaches the length of one foot, is smooth, slimy, and brown-blotched, with the tufted gills dark red. These creatures remain mostly among weeds or rocks at the bottom of the water during the daytime, but at night they move about, often with quick eel-like motions (a local name is 'mud-eel'), in search of crayfish, worms, insects, frogs, etc. They spawn in April or May. Other salamanders are sometimes given the same name, especially the 'axolotl' (q.v.).


A MUD-PUPPY.

MUD-SHAD. A useless shad-like fish (*Dorsoma cepedianum*), called also 'gizzard' and 'hickory' shad, which is abundant all along the coast from Cape Cod to Mexico, and also throughout the Mississippi Valley. It grows to a length of about 15 inches, and is bluish silvery, the young having a round dark spot at the shoulder.

MUDSKIPPER. One of the curious little fishes (three to four inches long) of the goby family and genus Periophthalmus. They are sometimes called 'jumping fishes' or 'leaping fishes,' and abound on the coasts of West Africa, the Red Sea, Indian Ocean, and eastward to Japan. Their remarkable peculiarity is that they will leave the water to visit every place washed by the surf. By the aid of the pectoral and ventral fins and the gill covers, these fishes skip across the damp sand, ascend the roots of mangroves, and run up wet rocks in quest of flies. They are, says Day, essentially mud-dwelling fishes, dark brown in color, and if placed in a vessel of deep clear water will drown. This amphibious power of these fishes has been acquired without any essential change in the character of the gills; but the fish is in the habit when out of water of puffing out its cheeks with air, which is held for a short time and then renewed. Consult: Day, *Fishes of India* (London, 1878); Semper, *Animal Life* (New York, 1881).


A MUDSKIPPER.

MUD-SUNFISH. A small bass (*Acantharchus pomotis*) of little value as food, numerous in sluggish coastal streams from New York to South Carolina. It is dark green in color, with five indistinct blackish stripes lengthwise, and a black opercular spot.

MUD-TORTOISE, or MUD-TURTLE. A dark-brown turtle (*Cinosternum Pennsylvanicum*) with light dots on the head, found from Canada to Texas. See TURTLE; TERRAPIN.

MUD-WASP, or MUD-DAUBER. Any one of a group of wasps belonging to the old genus Pelopæus, now Sceliphron. They build nests of mud in sheltered places, choosing the cracks of a barn or fence or some sheltered place under the eaves of any wooden building, entering also disused rooms in houses, and sometimes even rooms that are in daily use. The nests consist of a varying number of mud cells placed side by side, usually in a single row, but sometimes in several rows. The cells before completion are packed with a food supply for the future young, and this consists almost invariably of spiders, as many spiders being placed in one cell as the cell will hold. A single egg is laid upon the last spider which has been placed in the cell, and the larva hatching from the egg eats rapidly, consuming the abdomens of the spiders first and subsequently the remainder of their bodies. All of the spiders which have been placed in the cell have been stung and paralyzed by the parent wasp, but many of them are not really dead when the larva reaches them. After the egg is laid and the nest is closed up, new cells are constructed by the same female. The mud or clay with which the nests are constructed is brought in little balls by the aid of the wasp's mandibles, and 20 or more visits are required to complete one cell; so that for the construction of a large nest of 50 cells about 1000 visits must be made by the insect. The larva reaches full growth in a short time, usually ten days or two weeks, and forms a cocoon within the mud cell, the winter being passed in the cocoon, although there may be two or more summer generations, in which case the summer pupal period is short. The group is a large one, and mud-wasps are common not only in America and in Europe, but in India and Australia. Consult: Fabre, *Insect Life* (London, 1901); Sharp, *Cambridge Natural History*, vol. vi. (London, 1901); Howard, *The Insect Book* (New York, 1902).

MUD VOLCANO. See VOLCANO.

MUEZ'ZIN, or **MUED'DIN** (Ar. *mu'adhdhin*, one who calls to prayer, from *'adhdhana*, to call to prayer, from *'adhina*, to hear). The Arabic name of the Mohammedan official attached to a mosque, whose duty it is to announce the different times of prayer. His chant (*adhān*) consists of these words, repeated at intervals: "Allah is great [four times]. I testify that there is no God but Allah [two times]. I testify that Mohammed is the apostle of Allah [two times]. Come to prayers [two times]. Come to salvation [two times]. There is no god but Allah." The Shiites also say "Come to good works," and "Prayers are better than sleep" is added before the early morning prayer (*fajr*). Besides these regular calls, two more are chanted during the night for those pious persons who wish to perform special nightly devotions. In small mosques the *'adāhn* is chanted by the imam, and when the mosque is provided with a minaret, the muezzin ascends it for his chant; in smaller mosques, the chant is made at the side. The office of muezzin is considered a meritorious one, and insures the holder's admission into Paradise.

MUFTI, mŭf′tė (Ar. *muftī*, expounder of the law). The name of a Mohammedan official who expounds the law according to the Koran and traditions; according to his decision, delivered in a memorandum called a *fetwa*, the cadi, or judge, decides the case. In Turkey the *Grand Mufti*, or *Sheikh ul-Islam*, is the head of the Moslem Church, and is appointed by the Sultan. He is the supreme chief of the ulemas or body of Mohammedan theologians. His fetwa is extremely powerful, even under certain circumstances may depose the Sultan. The title mufti is also applied to juris-consults attached to local government councils in the Turkish Empire, but the power of the muftis, with the exception of the Grand Mufti, is largely nominal.

MÜGGE, mụg′ge, THEODOR (1806-61). A German novelist, born and educated in Berlin. His liberal sentiments, expressed in various newspapers and in such pamphlets as *Die Censurverhältnisse in Preussen* (1845), led in several instances to his arrest and prosecution. During the twenty years preceding his death he wrote numerous sketches, tales, novels, and romances, which appeared in a complete edition in 1862-67 (33 vols.). Several, including *Toussaint* (1840) and *Afraja* (1854), have been translated into English by E. J. Morris. The most interesting of his writings are his Norwegian romances and sketches of travel: *Leben und Lieben in Norwegen* (1858); *Skizzen aus dem Norden* (1844); and *Nordisches Bilderbuch* (1858; 3d ed. 1862).

MUGGER. This, the common 'marsh-crocodile' of India and the Malay Islands (*Crocodilus palustris*), is not often more than 12 feet in length. Its head is rough, with a thick and rather broad snout, and each jaw contains 19 teeth on each side. It inhabits rivers, ponds, tanks, and marshes, and goes ashore only when it is obliged to move into some new water by the drying up of its pond, or wishes to bury its eggs in the sand. In extreme drought, however, it buries itself in the mud and remains dormant until the coming of the rains. This is the crocodile which is venerated by the Hindus and is kept in a half-domesticated condition in certain ponds, attended by fakirs, who worship in a neighboring temple of their cult. Consult: the writings of Indian naturalists, especially Adams, *Wanderings of a Naturalist in India* (Edinburgh, 1867); Tennent, *Natural History of Ceylon* (London, 1861); Hornaday, *Two Years in the Jungle* (New York, 1885).

MUG′LETO′NIANS. A sect that arose in London about the year 1651. The founders were two cousins, John Reeve (1608-58) and Lodowicke Muggleton (1609-98), obscure journeymen tailors, but claiming to have the spirit of prophecy. Muggleton professed to be the 'mouth' of Reeve, as Aaron was of Moses. They affirmed themselves to be the two witnesses of Revelation xi. They asserted a right to curse all who opposed them, and did not hesitate to declare eternal damnation against their adversaries. A few members of the sect still exist. They deny the doctrine of the Trinity; hold anthropomorphist opinions; and to all this add many strange doctrines of their own, as that the devil became incarnate in Eve, etc. Consult: Gordon, "The Origin of the Muggletonians," and "Ancient and Modern Muggletonians," in the *Transactions of the Liverpool Literary and Philosophical Society* for 1869-70.

MUGWORT. A popular name for various species of artemisia (q.v.).

MUGWUMP (Algonquin *mugquomp*, chief, great man). In American politics, a term originally applied to a voter nominally identified with a particular party, but claiming the right to vote with another party. It early passed into the local phraseology of some of the New England villages, being applied in its original (Indian) signification to any local magnate. Its first appearance in print seems to have been in the Indianapolis *Sentinel* in 1872. Its popular use began with an article in the New York *Sun* for March 23, 1884. In September of the same year it was first given to a political party, the Independent Republicans, who refused to ratify the nomination of James G. Blaine for the Presidency. The name was applied to them in a spirit of derision, but was accepted by them, and now regularly denotes any body of voters who profess to be independent of strict party obligations. The name Dudes and Pharisees was also applied in 1884 to those Republicans who opposed the election of James G. Blaine.

MUHAR′RAM (Ar. *muḥarram*, sacred, from *ḥarama*, to forbid). The first month of the Mohammedan year. Originally the Arabs had a solar year by means of intercalary months. The first month was called *Ṣafar I.*, and came in the autumn. It was the month of fairs, pilgrimages, and festivals, and hence acquired the epithet *al-Muḥarram*, the sacred, which in time supplanted the real designation. When in the year 10 of the Hejira Mohammed restored the lunar year, on the ground that intercalary months were an impious interference with the order of things as established by God, Muharram and all the months began to come earlier in each succeeding year. Mohammed is said to have observed the tenth day of Muharram (the *'āshūrā*) as a fast day, perhaps in imitation of the Jewish Day of Atonement on the tenth of Tishri. Later he appointed the month of Ramadan (q.v.) for fasting. The Sunnites still consider the tenth of Muharram as sacred, and keep it as a fast. The Shiites lament the death of Hosein on the first ten days of the month. (See HASAN AND HOSEIN.) Consult Wellhausen, *Reste arabischen Heidenthums* (Berlin, 1897).

MÜHLBACH, mụl′bȧG, LOUISE. The assumed name of Klara Mundt (1814-73). A German author, born in Neubrandenburg. Her work, consisting mostly of historical novels, is sensational, inartistic, distorted, but it shows a talent for lively description and narration that gave her a wide but short-lived popularity. *Friedrich der Grosse und sein Hof* and many others of her novels have been translated into English.

MÜHLBERG, mụl'bĕrк. A town in the Province of Saxony, Prussia, on the Elbe, 35 miles northwest of Dresden (Map: Prussia, E 3). It is famous as the scene of a battle in 1547, which resulted in the defeat of the Protestants under John Frederick I., Elector of Saxony, by the Emperor Charles V., and the triumph of the Catholics in Germany. Population, in 1900, 3463.

MÜHLEISEN-ARNOLD, mụl'ī-zen är'nold, JOHN (1817-81). An English clergyman, missionary, and author, born at Zell (Württemberg). He was educated in Germany, and after his removal to England was successively missionary of the Church Missionary Society in India and Abyssinia, chaplain to the Bishop of Gibraltar, and chaplain to Saint Mary's Hospital, Paddington, London (1852-61). In 1859 he founded the Moslem Mission Society in England. He was chaplain of East Ham, Essex, from 1861 to 1865, consular chaplain at Batavia, Java, from 1865 to 1871, and rector of Saint Mary's Church, Papendorf, Cape Town, South Africa, from 1876 until his death. His publications include: *Ishmael: or, A Natural History of Islamism* (1859); *English Biblical Criticism, and the Authorship of the Pentateuch, from a German Point of View* (2d ed. 1864); and *Genesis and Science, or, The First Leaves of the Bible* (2d ed. 1875).

MUHLENBERG, mū̃'len-bẽrg, FREDERICK AUGUSTUS CONRAD (1750-1801). An American clergyman and politician, son of Heinrich Melchior Muhlenberg. He was born at New Providence (now Trappe), Montgomery County, Pa., studied in Germany at the University of Halle, and upon his return to America entered the Lutheran ministry in Pennsylvania. In 1773 he became pastor of the Lutheran Church in New York City. He was an ardent patriot, and in 1776 he quitted New York and returned to his native State, at the same time abandoning the work of the Church for political activity. He was repeatedly elected to Congress. The first session of the House of Representatives in Washington's administration chose him as Speaker. He was also made chairman of the Committee of the Whole in 1795, and cast the deciding vote that saved the Jay Treaty (q.v.).

MUHLENBERG, GOTTHILF HEINRICH ERNST (1753-1815). An American clergyman and botanist, born at Trappe, Pa. He was educated at Halle and traveled in Germany and in England. On his return to America, he was ordained a Lutheran minister and became assistant pastor of a Lutheran church in Philadelphia. In 1779 he retired to the country, where he devoted himself to the study of botany; and it is as a botanist that he is best known. His chief works are: *Catalogus Plantarum Americæ Septentrionalis* (1813); and *Descriptio Uberior Graminum et Plantarum Calamariarum Americæ Septentrionalis Indignarum et Circarum* (1817).

MUHLENBERG, HEINRICH MELCHIOR (1711-87). The founder of American Lutheranism. He was born at Eimbeck, Prussia, September 6, 1711. His parents were Saxon, but having suffered greatly in the Thirty Years' War, removed to Eimbeck. The death of his father in his twelfth year threw the family into poverty and occasioned an interruption of his studies, and till his twenty-first year he toiled incessantly to assist in the support of the family. In 1735 he entered the University of Göttingen, where he remained three years. Graduating at Göttingen, he went to Halle in 1738, where, besides studying, he taught in the orphan house. He associated intimately with Francke, Cellarius, and Fabricius. Soon after his ordination application came to Germany from Pennsylvania for some one to be sent to labor among the destitute Lutherans of that colony. The faculty immediately selected Muhlenberg, who was then in his thirty-first year. He accepted the appointment, and the better to qualify himself went to London, where he acquired facility in the use of English. He reached America in 1742, to the great joy of the German Christians. His arrival marked a new era in the history of the Lutheran Church in the United States, its condition gradually improved, and frequent accessions were made to the ranks of the ministry of men educated at Halle and thoroughly devoted to their work. He took the pastoral care of the associated churches of Philadelphia, New Hanover, and New Providence (now Trappe, some 25 miles northwest of Philadelphia), which had united in calling a minister, and these three congregations were the principal scenes of his ministerial labors. The first three years of his ministry he resided in Philadelphia, the next sixteen in New Providence. In 1761 he removed to Philadelphia, but in 1776 went back to New Providence. During the War of the Revolution his sympathy with the colonists excited great opposition, and his life was often in peril. Consult his autobiography to 1743 (in German) edited by Germann (Altoona, 1881), and his *Life* by Mann (Philadelphia, 1887), and Frick (Philadelphia, 1902); also Oschsenford, *Muhlenberg College, a Quarter-Centennial Memorial Volume* (Allentown, 1892).

MUHLENBERG, JOHN PETER GABRIEL (1746-1807). A Lutheran preacher and leader in the Revolutionary War, son of Heinrich Melchior Muhlenberg (q.v.). He was born at Trappe, Pa., October 1. 1746, and sent to the University of Halle to be educated, but ran away, and passed a year as a private in the dragoons. Returning to America, 1766, he studied for the Lutheran ministry; was called to Virginia, 1771; to have a legal standing as a clergyman there, went to England, 1772, and was ordained by the Bishop of London; in same year was settled at Woodstock, Va. Soon after the beginning of the Revolutionary War, he told his congregation that there was a time to preach and a time to fight, and at the close of the services he threw off his gown, showing himself in full uniform, and read from the pulpit his commission as colonel. He had the drummers strike up for volunteers, and many of his congregation volunteered and joined his regiment, the Eighth Virginia, popularly known as the German regiment, afterwards noted for its courage and good discipline. In 1774 he was a member of the House of Burgesses, and served on the committee of safety, and two years later he sat in the State convention. He participated in the fighting at Charleston in 1776, and was made brigadier-general the following year, and placed in command of the Virginia line. He took part in the battles of the Brandywine, Germantown, and Monmouth, and in the capture of Stony Point. He defended Virginia against the expeditions of Leslie and Arnold, and was commander-in-chief there till the arrival of Steuben. Upon the invasion of Virginia by Cornwallis, he was next in command to Lafayette, and at the siege of Yorktown he was in command of the first brigade of light infantry. He retired at the close of the war with the rank of major-general. Soon after, he settled in Pennsylvania. He served in Congress in 1789-91, 1793-95, and 1799-1801. In the latter year he was chosen United States Senator, but resigned when Congress met to become Supervisor of Revenue for the District of Pennsylvania. and in 1803 he was appointed Collector of the Port of Philadelphia, in which position he died near Philadelphia, October 1, 1807. Consult his *Life* by his great-nephew, Henry A. Muhlenberg (Philadelphia, 1849).

MUHLENBERG, William Augustus (1796-1877). An American Episcopal clergyman and philanthropist. He was born in Philadelphia, and educated at the University of Pennsylvania, where he graduated in 1814. Three years later he was ordained deacon, and served as assistant to Bishop White at Christ Church, Philadelphia. Ordained priest in 1820, he was rector from 1821 to 1828 of Saint James's Church, Lancaster, Pa., where he helped to establish the first public school in the State outside of Philadelphia. He founded in 1828 at Flushing, L. I., a school afterwards known at Saint Paul's, of which he was principal until 1846. Then he was rector of the Church of the Holy Communion in New York until 1858, in the latter year becoming superintendent and pastor of Saint Luke's Hospital, which he had founded. In the later years of his life he was instrumental in establishing an industrial Christian settlement at Saint Johnland, L. I. He died in Saint Luke's Hospital, April 8, 1877. To trace his effect upon his time would be to record the origin of several of the most important movements within the Episcopal Church. Thus he made his New York parish the first free-seat church of his communion in America; he organized the first sisterhood within the same limits in 1845, known as the Sisterhood of the Holy Communion; and the important later developments in the direction of Christian unity (see Reunion of Christendom) and of liturgical enrichment and flexibility both really grew out of his memorial to the House of Bishops in 1853. Church music and hymnody also owe much to him; he published three books in this department; but his most important literary work is contained in *Evangelical Catholic Papers* (1875-77). For his life, consult biographies by Ayres (New York, 1880) and Newton (ib., 1890); also Coleman, *The Church in America* (ib., 1896).

MUHLENBERG COLLEGE. A collegiate institution at Allentown, Pa., under the control of the Evangelical Lutheran Church. incorporated in 1867. It consists of a preparatory and a collegiate department. the latter with classical and scientific courses leading to the degrees of B.A. and B.S. The total attendance in 1902 was 137. The faculty numbered 13. The college library contained 12,000. volumes. The campus of five acres and the college buildings were valued at $100,000. In 1902 a new site of 52 acres was purchased, on which new buildings were begun, at an estimated cost of $200,000. The income for the year was $16,764, and the endowment was $163,977.

MÜHLHAUSEN, mụlʹhou-zen. A town in the Province of Saxony, Prussia, on the Unstrut, 30 miles northwest of Erfurt (Map: Prussia, D 3). It is an old town with a number of churches, of which that of Saint Blasius dates from the twelfth century, and a mediæval Rathaus. It is surrounded with modern suburbs and has a gymnasium, a seminary for teachers, and a theatre. There are manufactures of woolen and linen goods, carpets, leather, and cigars. The city has considerable trade in cattle, grain, and fruit. Population, in 1890, 27,400; in 1900, 33,433. Mühlhausen appears in history as early as 925, when it was a fortified post. It rose to importance as a free city in the fourteenth century, and in the Peasants' War was the headquarters of the Anabaptist leader, Thomas Münzer, who was executed near Mühlhausen in 1525. The town was finally incorporated with Prussia in 1815.

MÜHLHEIM, mụlʹhīm. See Mülheim.

MUIR, mūr, John (1810-82). An English Sanskrit scholar. He was born in Glasgow, and educated in the University of Glasgow and the East India School at Haileybury. He engaged in the civil service in British India, in 1829-53, and devoted himself to the study of the languages, history, and antiquities of India. In 1853 he retired from the service and devoted himself to the advancement of Oriental literature, especially in its bearing upon Christianity. In 1846 he offered to the University of Cambridge a prize of £500 for the best treatise on the errors of the Hindu systems of philosophy, and on expounding the principles of Christianity to learned natives of India; and he gave, in 1862, £5000 to the University of Edinburgh for the endowment of a professorship of Sanskrit and comparative philology. Muir did much to help the spread of Christianity among the Hindus. His most important work was *Original Sanskrit Texts on the Origin and History of the People of India, Their Religion and Institutions* (1858-70).

MUIR, John (1838—). An American explorer and naturalist, born at Dunbar, Scotland. He studied at the Dunbar Grammar School and then emigrated to the United States, and entered the University of Wisconsin. After his graduation he began to explore the less known portions of the North American continent, devoting his attention particularly to the western coast and to Alaska, where the Muir Glacier is named in his honor. He published: *The Mountains of California; Our National Parks;* and a number of magazine articles on natural history; and edited *Picturesque California.*

MUIR, Matthew Moncrieff Pattison (1848—). An English chemist. He was born and educated in Glasgow. studied at the University of Tübingen, and became fellow and prelector in chemistry at Gonville and Caius College, Cambridge. Muir did much to popularize modern chemistry. He published: *Qualitative Analysis* (1874); *Elements of Thermal Chemistry* (1885); *Practical Chemistry* (with Carnegie, 1887); *The*

Alchemical Essence and the Chemical Element (1894); *The Story of the Wanderings of Atoms* (1898); and *The Story of Alchemy* (1902).

MUIR, Sir William (1819—). An English Orientalist. He was born at Glasgow, studied at the universities of Glasgow and Edinburgh, and in 1837 entered the Bengal civil service, in which he rose to high distinction. He became eminent as an Orientalist, was from 1876 to 1885 a member of the Council of India, and from 1885 to 1900 was principal of the University of Edinburgh. His publications include: *Life of Mahomet* (1858-61); *The Corân* (1878); *The Caliphate* (2d ed. 1893); and *The Mohammedan Controversy* (1897).

MUIR-MACKENZIE, m*a*-kĕn'zĭ, Montague (1847—). An English barrister and law writer. He was educated at the Charterhouse School and Brasenose, Oxford, and was a fellow of Hertford College, Oxford (1874-88). In 1873 he was called to the bar, and he was secretary to Lord Chief Justice Coleridge for the four following years. Later he became recorder of Deal (1892), and a bencher of the Middle Temple (1894). His publications are upon technical subjects, such as *Bills of Lading, Judicature Acts, Laws of Registration,* and *Bankruptcy Acts.*

MUKADDASI, mo͞o'kȧ-dä'sē. See Mokaddasi.

MUKDEN, mo͞ok-dĕn', or **MOUKDEN.** The capital of Manchuria and of the Province of Shing-king, situated in a fertile region near the Hun-ho, 110 miles northeast of Niu-chwang, its port (Map: China, F 3). It is surrounded by a brick wall and is divided into nine parts, of which the central contains the Imperial palace, the examination hall, and other administration buildings. The city is regularly and solidly built, but is of little architectural interest. It is the seat of a considerable industry, and will probably greatly increase in commercial importance with the completion of the Port Arthur-Kharbin branch of the Trans-Siberian Railway, on which it will be a station. Mukden trades chiefly in agricultural products and fur, and is the seat of the administration of Manchuria. In the vicinity of the city are the tombs of the ancestors of the present reigning family of China. The population is estimated at 250,000. The city suffered greatly during the Boxer uprising of 1900.

MUKHTAR PASHA, mo͞ok'tȧr pȧ-shä', Ahmed (1832—). A Turkish general and administrator, born at Brusa, in Asia Minor. He was educated at the Constantinople military school, was rapidly promoted, and became successively professor and governor of the school. He served in the Crimean War, as a staff officer in the Montenegrin campaign of 1862, and in 1870-71 in campaigns against the Arabs of Yemen, in which he gained the titles of pasha and marshal. He was made commander of the Second Army Corps (1873), and in 1875, at the breaking out of the troubles in Bosnia and Herzegovina, assumed command of the Turkish forces there. After his defeat at the Duja Pass in the Montenegrin campaign of 1876, Mukhtar was sent to Erzerum, to take charge of the operations against Russia on the outbreak of war with that country in 1877. On April 29th he was defeated and driven from Kars; but in a number of severely contested battles during the following months, his troops displayed great courage, and regained the position, defeating the Russians severely near Erzerum on June 25th, and compelling them in July to raise the siege of Kars. On October 14-15th at Aladja Dagh, the Russians gained an important victory over Mukhtar, driving him back to Kars, and soon afterwards to Erzerum. In November Kars was stormed by the Russians, and before the end of the year Mukhtar was recalled. He put down the Cretan insurrection in 1878 and was put in command on the Greek frontier in 1879. In 1885 he was appointed Turkish High Commissioner in Egypt.

MULA, mo͞o'lȧ. A town of Southeastern Spain, in the Province of Murcia, situated on a branch of the Segura, 18 miles west of the city of Murcia (Map: Spain, E 3). The place is unimportant, but has some reputation on account of the warm sulphurous baths known as Baños de Mula, some three miles east. Population, in 1900, 12,733.

MULAT'TO. See Mixed Races.

MULBERRY (OHG. *mōrberi, mūrberi*, Ger. *Maulbeere*, mulberry, from Lat. *morum*, Gk. *μῶρον, mōron, μόρον, moron*, mulberry + *berry*, AS. *beri, berige*, OHG. *beri*, Ger. *Beere*, Goth. *basi*, berry), *Morus.* A genus of trees of the natural order Urticaceæ, natives of temperate and warm climates, with deciduous leaves, unisexual flowers in short, thick spikes, a four-parted perianth, containing either four stamens or one pistil with two styles, the perianth of the female flowers becoming succulent and closing over the small pericarp to form with other flowers of the spike an aggregate fruit. There have been about 100 species described, but much confusion exists among them, and some authors have reduced them to ten or even less. The common mulberry, or black mulberry (*Morus nigra*), a long-lived native of the middle parts of Asia introduced into cultivation in Europe more than a thousand years ago, and now almost naturalized there, is a low, much branched tree, with thick, rough bark and broad, unequally serrated and very rough heart-shaped leaves. It is not hardy in the United States as far north as New York, and is seldom seen except in the South and in California, where some of the improved varieties are grown. The fruit, which is purplish-black, with dark-red juice, fine aromatic flavor, and subacid sweet taste, is often procured in prodigious quantities and is much esteemed for dessert, for preserving, and for wine-making. The wood is employed in cabinet-work, but is not of much value. The leaves are sometimes used for feeding silkworms. It is propagated by seed, suckers, layers, or cuttings, and succeeds best in a rich light soil. The white mulberry (*Morus alba*) has been planted in Southern Europe since 1540, in India and China, where it is native, from time immemorial for its leaves, which are the best food for silk-worms. In North America it has been extensively planted and in places exists in a half wild state as trees a foot or more in diameter. (See Kenrick, William.) The fruit is almost white, and much less palatable than that of the former, although there is great difference among the many varieties. The best variety for feeding silk-worms, on account of its rapid growth and abundant leaves, is that called the Philippine mulberry. A variety, tatarica, called the Russian mulberry, is a hardy, rapid grower, well adapted to hedges, windbreaks, small timber, and ornamental plantings, for which purpose it has been extensively planted in the Western United States. *Morus multicaulis*, by some considered a variety of *Morus alba*, once grown extensively in the United States to feed silk-worms, is seldom seen now. In India the white mulberry is treated as a bush, and cut down twice a year, the stripped shoots being thrown away. Its bark has long been used in China and Japan for making paper. It grows readily from cuttings. The root has a considerable reputation as a vermifuge. The red mulberry (*Morus rubra*), a native of North America, abounding from New York to Nebraska and south to the Gulf of Mexico, is the largest tree of the genus, attaining in the South a height of 70 feet and 3 feet in diameter. It endures severe frosts much better than the preceding, and is therefore preferred for cultivation in some parts of Europe. Its fruit is deep red, and almost as pleasant as the black mulberry. The wood is much more valuable, being fine-grained, strong, and adapted even for shipbuilding. Of each of these three species there are numerous named varieties which are cultivated for their fruits, but they have not received the attention in the United States that they deserve. The Indian mulberry (*Morus indica*) has black fruit of a delicate flavor, and the leaves are extensively used for feeding silk-worms in China, Cochin-China, and Bengal. *Morus alba, Morus celtidifolia*, and *Morus corylifolia*, Peruvian species; *Morus lævigata*, the species most common in the north of India; and *Morus Cashmeriana*, probably a form of *Morus indica*, a native of Cashmere, produce pleasant fruit; *Morus dulcis*, a native of the north of India, is said to be superior in flavor to all others.

RED MULBERRY (*Morus rubra*).

The paper mulberry (*Broussonetia papyrifera*), a native of India, Japan, and islands in the Pacific, frequently planted for ornament in America and Europe, differs from the true mulberry in having the female flowers collected in a globular mass. The fruit is oblong, dark-scarlet color, sweetish, but insipid. The tree is of moderate size, or, in cultivation, a bush 6 to 12 feet high with leaves either simple or lobed. The islanders of the Pacific cultivate this species with great care and make a kind of clothing from the bark. For this purpose small branches about an inch in diameter are macerated in water. The epidermis is then removed by scraping. The young shoots, treated somewhat like rag pulp in Europe, furnish much of the paper used in Japan and the East. When the shoots are cut, new ones spring up very rapidly. Silk-worms eat the leaves. See Plate of Mulberry and Liquidamber, accompanying latter title.

MULBERRY FAMILY. See Moraceæ.

MUL'CASTER, Richard (1530?-1611). An English schoolmaster, whose birthplace may have been the old border tower of Brackenhill Castle on the river Line, or perhaps Carlisle. From Eton he passed to King's College, Cambridge, and thence to Christ Church, Oxford, where he graduated M.A. in 1556. When the Merchant Taylors' School was founded in London (1561), Mulcaster was appointed its first headmaster, a post which he held till 1586. Here he probably had the poet Spenser as a pupil. Ten years later he was elected high-master of Saint Paul's School. This office he retained to the great age of seventy-eight. He died April 15, 1611. In his own time Mulcaster gained wide repute as an efficient teacher, and in recent times much attention has been given to two books: *Positions, wherein those primitive circumstances be examined, which are necessarie for the training up of children, either for skill in their book or health in their bodie* (1581); and the *Elementarie, which entreateth chefelie of the right writing of our English tung* (1582). Mulcaster strenuously advocated physical training as a part of the education of boys, and implied that there should be grammar schools for girls. He taught his boys music and singing, and permitted them to perform in masques and interludes before the Queen. Consult the reprint of the *Positions*, edited by Quick (London, 1888).

MULCH (more correctly *mulsh*, probably from AS. *molde*, earth mold; ultimately connected with Goth. *malan*, Ir. *melim*, Lith. *malti*, Lat. *molere*, to grind, Eng. *meal*). A covering of loose material such as brush, leaves, manure, straw, or earth, maintained on the surface of the soil mainly for the purpose of preventing evaporation, which it accomplishes by breaking the continuity of the capillarity in the soil and thus retarding the rise of water to the surface. Stirring the surface soil, and thus maintaining what is termed a 'soil mulch,' brings about the same result. The use of the mulch of vegetable matter is probably not so common as formerly, but the soil mulch is increasing in favor, and in arid regions where agriculture is dependent upon irrigation and conservation of moisture is a matter of great importance. In addition to checking evaporation, mulches of vegetable matter are useful in protecting the surface soil from puddling and washing, keeping the soil cool, preventing freezing, and retarding growth in the spring. Mulching is a valuable means of reclaiming washed or 'galled' lands, and for securing a growth on dry, bare spots in lawns and meadows. A mulch of barnyard manure not only conserves moisture, but furnishes acceptable plant food.

Mulching berry bushes, orchard trees, etc., on a large scale with coarse manure and refuse material is not to be recommended, because it interferes with cultivation, harbors insects, and causes the plant roots to remain near the surface, thus increasing the danger of injury by drought. Such mulches, except on a small scale and for special purposes, such as protecting small fruits from injury by late frosts by retarding growth in spring, should be replaced by thorough stirring of the soil to maintain a soil mulch. The depth and character of this soil mulch must be determined by a variety of conditions, among which are the kind and root habits of the plant and the character of the soil and climate. It is evident that any crop, such as corn, with an extensive surface root system, would be injured by the destruction of its roots if stirring were frequent and deep. Again, in arid regions the mulch must be deeper and more perfect than in regions of frequent rainfall, in order to be effective and useful.

MULDER, mo͞ol′dẽr, Gerardus Johannes (1802-80). A Dutch chemist, born at Utrecht. After obtaining the degree of doctor of medicine at the university of his native town in 1825, he commenced the practice of his profession at Amsterdam, but was soon invited to teach botany and subsequently chemistry at the medical school at Rotterdam. In 1840 he was elected professor of chemistry at the University of Utrecht, and kept this post until 1868, when he retired from active service. Mulder is best known for his researches on the proteids. Concerning the chemical nature of these substances, he advanced a theory according to which the proteids contain in common a characteristic ingredient which he named *protein.* The theory led him into a controversy with Liebig and was not accepted. He is the author of numerous excellent works on physiological and agricultural chemistry, on the chemistry of wine and beer, on diet and nutrition, etc. His *Chemistry of Vegetable and Animal Physiology* has been translated into English by Fromberg, and his *Chemistry of Wine* by Bence Jones. He also wrote an autobiography under the title *Levensschets* (published posthumously in 1881; 2d ed. 1883).

MULDER, Lodewijk (1822—). A Dutch writer, born in The Hague. He was an instructor in the Royal Military Academy at Breda in 1851-59; was then for a time employed in the Ministry of War as an editor of original documents in early Dutch history; and from 1868 to 1872 was an inspector of schools in Utrecht Province. He prepared manuals of the history of the Netherlands (1859, 12th ed. 1881), and of general history (1862, 8th ed. 1880), and wrote several plays and works of fiction, the last including his best-known work, *Jan Faessen* (2 vols., 1856), a tale of the conspiracy against Prince Maurice of Orange.

MULE (OF., Fr. *mule,* from Lat. *mulus,* mule). A hybrid animal, the offspring of the male ass and the mare, highly valued as a beast of burden. The ears are long; the head, crop, and tail resemble those of the ass rather than those of the horse; but in bulk and stature the mule approaches more nearly to the horse. The mule seems to excel both the ass and the horse in intelligence; its powers of muscular endurance are remarkable; and its sure-footedness particularly adapts it to mountainous countries. It is easily kept, endures hunger and thirst better than the horse, lives to a great age, and is comparatively free from disease. Great care is bestowed on the breeding of mules in Kentucky, Missouri, and some other Central States, in Mexico, and in Spain and Italy, and mules of particular districts are highly esteemed. In America, mules are of greatest importance in the Southern States. Texas, Missouri, Tennessee, Mississippi, and Georgia each have over 200,000. The cotton and sugar-cane plantations utilize large numbers because they are easily and cheaply kept. As in other hybrid animals generally, males are more numerous among mules than females in the proportion, it is said, of two or three to one. There is no instance on record of offspring produced by two mules; but instances occur, although rarely, of the female mule producing offspring with the horse and with the ass. The mule is very superior in size, strength, and beauty to the hinny, the offspring of the male horse and the female ass. Several breeds of jacks have been used for producing mules. The chief breeds are Andalusian, Maltese, Catalonian, Italian, and Majorcan. The Catalonian is the best of imported breeds, but in the United States the native jack, a mixture of all breeds, is most used. Black is the preferred color, and the jack should be of good size. The mare should also be well-bred and of good form and color. In the Southern States mules are divided into two classes, the smaller ones 'cotton mules,' and the larger 'sugar mules.'

MULE (in Spinning). See Spinning.

MULE DEER (so called on account of the large ears), or Blacktail. One of the principal species of North American deer (*Cervus macrotis,* or *Odocoileus hemionus*), originally ranging throughout the open regions of the western half of the United States, but by the end of the nineteenth century restricted to the upper valleys of the Missouri and Saskatchewan rivers, and to the Rocky Mountain region, and the country west and south of it from Northern Mexico to Southern British Columbia. The Southwestern specimens are considered a distinct variety. This deer appears never to have ranged east of the plains, and was always most numerous in the broken country of the West and Northwest. Its favorite haunts are the brushy high-lying valleys. Its favorite place in summer is the summits of the 'mesas,' and the pastures on the chaparral-covered hills or near the timber-line, where it goes to rest along the edge of precipices that give a wide outlook. In winter it comes lower down, and gathers into large herds in the foot-hills, after the manner of the wapiti (q.v.).

It is somewhat larger than the Eastern or Virginian deer (see Deer), and stands about 3 feet 4 inches high at the shoulder. Its body is rather heavy, and its coat is dull yellowish in summer, rather than reddish, and in winter bluish-gray. The ears are very large (suggesting the name), and heavily furred; and its antlers have a short basal snag, above which the beam projects outward and then upward, forking equally and the prongs again dividing, so that there are normally 10 points. The stern bears a yellowish-white disk, and the tail is of moderate length, round, and black at the end. The hide of this species made the best buckskin known to the Indians, and was most used by them for clothing. Its value was soon learned by the pioneers in the West; and from about 1860 to 1870 this deer was pursued so ruthlessly by hide-hunters that about 250,000 skins were sent annually to England alone, for several years. The venison also is of superior quality, and the haunts and habits of the animal, his craft and speed, make him the most interesting to the sportsmen of all the American deer. The fawns are often domesticated, and the adults thrive well in parks, and are to be seen in every zoölogical garden in the world. Consult: Caton, *Antelope and Deer of America* (New York, 1877); Mayer (ed.), *Sport with Gun and Rod* (New York, 1892); Ledekker, *Deer of All Lands* (London, 1898); Van Dyke, in Roosevelt's *The Deer Family* (New York, 1902); and the writings of travelers and sportsmen in the Western United States. See Plate of NORTH AMERICAN DEER.

MULE-KILLER. A local name in the Southern States for several species of insects and land arthropods, such as the rearhorse, wheel-bug, and whip-tailed scorpion (qq.v.).

MULEY-HASSAN, mōō′lā häs′sȧn, SIDI (1831-94). Sultan of Morocco. He succeeded his father, Sidi Muley-Mohammed, in 1873. He was energetic and warlike, and spent the greater part of his reign in the field, enforcing his authority over the unruly Berber tribes, or extending the boundaries of the Empire in the direction of the Sahara. In 1880 reports of shocking cruelties committed on the Jews in his dominion led to the calling of an international conference at Madrid, which drew up a protocol decreeing liberty of conscience in Morocco, a decision to which the Sultan acceded, but which he altogether ignored.

MUL′FORD, ELISHA (1833-85). An American Protestant Episcopal clergyman and philosophical writer, born in Montrose, Pa. He graduated at Yale in 1855, and studied for the ministry in the Union Theological Seminary, at Andover, and later at Halle and Heidelberg in Germany. A part of his career was spent in ministerial work in various charges, but from 1864 to 1877 he lived in his native town without parochial charge and engaged in study. Among his publications are: *The Nation, the Foundations of Civil Order and Political Life in the United States* (1870); and *The Republic of God: An Institute of Theology* (1881). In 1881 he settled in Cambridge, Mass., and lectured in the Episcopal Theological School there until his death.

MUL′GRAVE, CONSTANTINE JOHN PHIPPS, second Baron (1744-92). A British Arctic explorer. Entering the navy at an early age, he served in the reduction of Martinique and of Havana, and in 1765 was made post-captain. In 1768 he entered the Commons for Lincoln, and became known as one of the 'King's friends' and an opposer of the popular cause. Five years later he was commanding the *Racehorse*, which with the *Carcass* attempted the discovery of a northern route to India, but was blocked by ice at Spitzbergen. On his return he again entered active service and in the naval operations against the French off Ushant (1778) rendered conspicuous service. He published an account of his Arctic voyage in *A Voyage Toward the North Pole* (1774).

MUL′HALL, MICHAEL GEORGE (1836-1900). A distinguished statistician, born in Dublin, Ireland, September 29, 1836. He was reared at the Irish College in Rome. In 1858 he emigrated to Buenos Ayres, where he established, three years later, the *Standard*, said to be the first daily newspaper printed in English in South America. This daring and successful enterprise Mulhall kept going till 1894. Returning to England in 1878, he gave his attention to statistics. In 1884 he was elected to the British Association for the Advancement of Science. Besides numerous contributions to the *Contemporary Review*, his works include: a *Handbook of the River Plata* (1869), the first English book published in Argentina; *Rio Grande do Sul and Its German Colonies* (1873); *The English in South America* (1878). In 1880 Mulhall, who had for some time been gathering materials on his favorite subjects of statistics, brought out his *Progress of the World in Arts, Agriculture, Commerce, Manufacture, Instruction, Railways, and Public Wealth*, since the beginning of the nineteenth century. This was followed by other highly valued works on statistics: *History of Prices* (1885); *Industries and Wealth of Nations* (1896); and a *Dictionary of Statistics* (1892; 4th ed. 1899). Mulhall died December 13, 1900, in Dublin.—His wife, MRS. MARION MULHALL, is the author of *Between the Amazon and the Andes* (1883), and several essays, including the *Celtic Sources of Dante's Divine Comedy*. For this last monograph she was honored by a chair in the Arcadia of Rome.

MÜLHAUSEN, mul′hou-zen. The second largest city of Alsace-Lorraine, Germany, situated on the Ill and the Rhine-Rhone Canal, 67 miles by rail south-southwest of Strassburg (Map: Germany, B 5). It is divided into the old town, built on an island of the Ill, the new town, between the old town and the canal, and the workingmen's colony (*cité ouvrière*) in the northwest. The old town is irregularly built, and with the exception of the Rathaus, dating from the sixteenth century, and a few modern churches, has few noteworthy buildings. The new town was laid out in the middle of the nineteenth century and has a fine post-office, and a museum established by the Industrial Society. The society is housed in a fine building with natural history collections and a library. The workingmen's colony, established in 1853 by Mayor Dollfus, is provided with model dwellings and with reading rooms, schools, restaurants, baths, and other institutions belonging to a modern town. The educational institutions of Mülhausen include a gymnasium and a number of technical schools. It is the most important industrial city of Alsace-Lorraine and one of the largest textile centres of the Empire. This industry of Mülhausen dates from the middle of the eighteenth century, and the cotton mills are situated partly in the city and partly in the vicinity and especially in the adjacent settlement of Dornach. Over 80,000 persons are said to be engaged in the textile mills and in other establishments connected with the textile industry of the manufacturing district around Mülhausen. Besides cotton and woolen goods and kindred products, there are also manufactured machinery and chemicals, and the trade is extensive in local manufactures and the agricultural products of the vicinity. Population, in 1890, 76,892; in 1900, 89,012, largely Roman Catholics. Mülhausen, after belonging for a short time to the bishops of Strassburg, became a free city of the Empire in 1273. In order to maintain its independence, it entered into an alliance with the Swiss cantons of Bern and Solothurn in 1466, and in 1515 became a member of the Swiss Confederation, and was recognized as such at the Peace of Westphalia. It joined the French Republic in 1798, and passed to Germany with Alsace-Lorraine in 1871. Consult: Metzger, *La république de Mulhouse* (Lyons, 1883); Schneider, *Geschichte der Stadt Mülhausen* (Mülhausen, 1888); Heydenreich, *Aus der Geschiehte der Reichsstadt Mülhausen* (Halle, 1900); Jordan, *Der Uebergang der freien Reichsstadt Mülhausen an Preussen* (Mülhausen, 1902).

MÜLHEIM-ON-THE-RHINE, mụl'hīm, or **MÜHLHEIM.** The capital of a circle in the Rhine Province, Prussia, on the Rhine, here crossed by a bridge, nearly opposite Cologne (Map: Prussia, B 3). It has a handsome modern Gothic church, a realgymnasium, a textile school, and a commercial school. Manufactured products are wire ropes and cables, velvet, silk, machinery, wagons, chemicals. The town has a safe harbor, and trades in wine. Population, in 1890, 30,996; in 1900, 45,085. Mülheim is of ancient origin, and became a town in 1322.

MÜLHEIM-ON-THE-RUHR, or **MÜHLHEIM.** The capital of a circle in the Rhine Province, Prussia, on the Ruhr, 16 miles north of Düsseldorf (Map: Prussia, B 3). It has a church from the twelfth century, a gymnasium, and a realschule. Coal and iron are mined in the district, and there are extensive iron works, manufactures of machinery, woolen and cotton goods, leather, and glass. Population, in 1890, 27,903; in 1900, 38,292.

MULIER, Pieter, the younger, called Tempesta (1637 or 1643-1701). A Dutch landscape and marine painter, born at Haarlem, son and probably pupil of Pieter Mulier, the elder (died at Haarlem, 1670)—not, as was for a long time erroneously supposed, son of Pieter de Molyn (q.v.). After having traveled through Flanders and Holland to study the best Flemish and Dutch masters, he went to Rome and soon acquired great reputation by his remarkable pictures of storms at sea, whence his surname, given him by the Italians. In Genoa, whither he went from Rome, he was imprisoned under suspicion of having caused his wife to be murdered, and after a confinement of sixteen years made his escape to Piacenza during the bombardment of Genoa in 1684, and passed the remainder of his days in Milan. Five of his most characteristic works (three thunder storms and two landscapes with figures) may be seen in the Dresden Gallery; others in Hamburg, Brunswick, Cassel, Karlsruhe, Vienna (Museum, Academy, Liechtenstein Gallery), Saint Petersburg, in the Brera Gallery, Milan, and several other Italian collections. A portrait of himself is in the Uffizi at Florence.

MULITA, mōō-lē'tȧ (Sp., little she-mule). A small armadillo (*Tatusia hybrida*), allied to the peba, but confined to Southern South America; so called from the resemblance of its face and ears to those of a mule.

MULL. The second largest island of the Inner Hebrides, belonging to Argyllshire, Scotland. It is situated north of the Firth of Lorne, and is separated from the west coast of Scotland by the Sound of Mull, from one to three miles wide (Map: Scotland, C 3). It has an area of 347 square miles, is very irregular in shape, deeply indented with bays and sea-lochs, and consists mainly of volcanic rock with some outcroppings of granite. The island as a whole is mountainous, rising in Ben More to a height of 3185 feet. The scenery along the coast is very picturesque, and there are beautiful lakes and woods in the interior; but the scenery in the interior is not striking, the mountains being rounded in outline, and large tracts consisting of moorlands. The soil is fertile, but the stormy and humid climate is unfavorable for agriculture, and the land is chiefly used for grazing—cattle, sheep, and horses being exported. The population in 1891 was 4691; in 1900, 4711. The chief town is Tobermory, on the north coast, with a population (1901) of 1019.

MULLA'NY, James Robert Madison (1818-87). An American naval officer, born in New York City. He entered the navy as a midshipman in 1832, and in 1844 was promoted to the rank of lieutenant. During the war with Mexico he participated in the capture of Tabasco. He was commissioned commander in 1861 and captain in 1866, and during the Civil War was assigned to duty with the blockading squadron. At his own request he was transferred from the *Bienville* to the *Oneida*, that he might take part in the battle of Mobile Bay, August 5, 1864. His ship, one of the last in the line, received a terrific pounding from Fort Morgan, and was attacked by the Confederate ram *Tennessee*, which would probably have sunk it had not the monitor *Winnebago* come to the rescue. As it was, the *Oneida* was disabled by the fire from the fort, many of her crew were killed, and Commander Mullany lost his left arm. After the war and while commanding the North Atlantic squadron (1874-76) he gave material aid to Generals William H. Emory (q.v.) and Philip H. Sheridan (q.v.) at New Orleans, and during a revolution in Colombia protected American interests on the Isthmus of Panama. He became a commodore in 1870, a rear-admiral in 1874, and retired in 1879.

MULLEIN (AS. *molegn*, mullein). A name given to members of the genus Verbascum, of the natural order Scrophulariaceæ, of which there are more than 100 species, mostly large biennial or perennial herbs with rather thick tap-roots, and natives of the Eastern Hemisphere. The more or less woolly plants produce flowers upon spikes or panicles. The leaves and flowers were formerly reputed to have medicinal qualities, but are not so recognized in the United States. They contain a sort of mucilage which is obtained by boiling the leaves in water. Three European species are well-known weeds in the United States, the common mullein (*Verbascum Thapsus*), the moth mullein (*Verbascum blattaria*), and the white mullein (*Verbascum lychnitis*). In Kentucky, Verbascum phlomoides is reported as established and spreading as a weed.

COMMON MULLEIN (*Verbascum Thapsus*).

MÜLLENHOFF, mụl′len-hôf, KARL VIKTOR (1818-84). A German student of Teutonic antiquities and philology. He was born at Marne, Holstein, and after studying at Kiel, Leipzig, and Berlin, was professor at Kiel (1846-58) and at Berlin (1858-84). Müllenhoff's greatest works were: *Deutsche Altertumskunde* (1870-99), which he left unfinished, and the treatise *De Antiquissima Germanorum Poesi Chorica* (1847). Consult Scherer and Schröder, *Karl Müllenhoff* (Berlin, 1896).

MÜLLER, mụ′lẽr. A family of celebrated quartet players. They were the sons as well as pupils of the principal musician to the Duke of Brunswick, and were all of them born in the city of Brunswick. CARL FRIEDRICH (1797-1873) was first violin in the quartet and was also concertmeister to the Duke. THEODOR HEINRICH (1799-1855) was the viola player. AUGUST THEODOR (1802-75) played the cello, and FRANZ FERDINAND GEORG (1808-55) was the second violin. They were especially educated by their father for quartet work, and were conceded to have reduced the art of string quartet playing to a degree of perfection previously unknown. They were ambitious for greater fame than could be obtained within their own limited environment, and were particularly handicapped by the Duke of Brunswick, in whose employ they were, who had formulated the order that none of his musicians should participate in any musical performance outside that connected with his own corps. In 1830 they resigned their employment, and made their first appearance in Hamburg, where they met with such success that they were invited to Berlin, in which city they were received with great enthusiasm. An extended tour throughout Germany followed, and in 1837 they performed in Paris. Other successful tours made them known throughout the world. They confined their programmes almost entirely to the works of Haydn, Mozart, and Beethoven, and were also a very important influence in raising and establishing a higher standard of musical appreciation.

MÜLLER, mụ′lẽr, ANDREAS (1811-90). A German historical painter, born at Cassel. He was the son and pupil of Franz Hubert Müller (director of the Darmstadt Gallery), and afterwards studied in Munich under Schnorr and Cornelius, and in Düsseldorf under Sohn and Schadow. On his return from Italy, where he stayed in 1837-42, he executed some famous frescoes at Remagen and Sigmaringen. In these works he was assisted by his son FRANZ (1843—). From 1856 till 1882 Andreas was professor at the Düsseldorf Academy. He was noted for his skill in restoring old or damaged pictures.

MÜLLER, AUGUST (1848-92). A German Orientalist, born at Stettin, and educated at the universities of Halle and Leipzig. In 1882 he accepted the post of professor of Oriental philology at the University of Königsberg. His numerous and valuable contributions to Oriental literature include: *Die griechischen Philosophen in der arabischen Uebersetzung* (1873); *Der Islam im Morgen- und Abendland* (1885-87); *Hebräische Schulgrammatik* (1878), the syntax of which was translated into English by James Robertson. He also reëdited (1876) Caspari's *Arabische Grammatik*, which he considerably enlarged, and with Nöldeke published a *Delectus Veterum Carminum Arabicorum* (1890), furnished with copious annotations, and thus rendered useful to those who desire to become acquainted with Arabic poetry. Especially creditable is his edition (1884) of the *History of Physicians* by Ibn Useibia, with Arabic text and a critical commentary. Several of his essays are contained in the *Zeitschrift der deutschen morgenländischen Gesellschaft* and *Beiträge zur Kunde der indogermanischen Sprachen*. In 1887 he was appointed editor of the *Orientalische Bibliographie*.

MÜLLER, mụ′lâr′, CHARLES LOUIS (1815-92). A French historical painter. He was born in Paris, December 22, 1815, and was a pupil of Baron Gros and Léon Cogniet. He received a first-class medal at the Paris Exposition of 1846. Müller is best known by his masterpiece, the "Roll-Call of the Last Victims of the Reign of Terror," formerly in the Luxembourg Museum (replica in possession of J. J. Astor, New York). Other works are: "Lady Macbeth" (1849), Amiens Museum; "Charlotte Corday in Prison" (1875), Corcoran Gallery, Washington; "Primavera" (1846) and "Haydée" (1848), Lille Museum; he also decorated the Salle d'Etat in the Louvre. His pictures are skillfully composed, but the coloring and drawing are mediocre.

MÜLLER, mụ′lẽr, DAVID HEINRICH (1846—). An Austrian Orientalist, born at Buczacz, in

Galicia. He was educated in Vienna, Leipzig, Strassburg, and Berlin; became professor of Semitic philology at Vienna in 1881, and was an editor of the *Wiener Zeitschrift für die Kunde des Morgenlandes.* His very valuable works include: *Himjaritische Inschriften* (1875); *Südarabische Studien* (1877); *Die Burgen und Schlösser Südarabiens* (1879-81); *Sabäische Denkmäler* (with Mordtmann, 1883); *Epigraphische Denkmäler aus Arabien* (1889); *Die altsemitischen Inschriften von Sendschirli* (1893); *Epigraphische Denkmäler aus Abessinien* (1894); *Ezechielstudien* (1895); *Die Propheten in ihrer ursprünglichen Form* (1896); *Südarabische Alterthümer* (1899); *Die Mahri- und Sokatri-Sprache* (1901); and editions of *Kitab al Farq* (1876); of Hâmdâni, *Geography of the Arabian Peninsula* (1884-91); and of part of Tabarî, *Annales* (1888).

MÜLLER, Eduard (1828-95). A German sculptor, born at Hildburghausen. His first occupation was that of a cook in the ducal kitchen at Coburg, and he practiced his trade subsequently in Munich and Paris, and thence went to Antwerp, where, on the advice of the sculptor Geefs, he proceeded to study at the Academy in 1850. Two years afterwards he continued his studies in Brussels, and in 1857 settled permanently in Rome. Masterly composition, great truthfulness to life, and a high degree of technical perfection are the chief characteristics of his ideal figures and mythological groups, the best known of which include: "Nymph Kissing Cupid" (1862); "Faith, Love, and Hope" (1869), Schröder Mausoleum, Hamburg; "Satyr with the Mask" (1870); "The Faun's Secret" (1874); and "Eve with Her Children" (1880). His masterpiece is the group in heroic size, "Prometheus Bound and the Oceanids" (1874-79), National Gallery, Berlin, chiseled out of a single block of marble.

MÜLLER, Ferdinand von (1825-96). A German naturalist. He was born in Rostock, studied at Kiel, and in 1848 went to Australia, where he was for several years engaged in botanic explorations, and was director of the Melbourne Public Garden (1857-73). His researches on the subject of the acclimatization of plants yielded highly valuable results. Müller wrote: *Fragmenta Phytographiæ Australiæ* (1862-81); *Plants of Victoria* (1860-65); *Flora Australiana* (7 vols., 1863-70); and *Select Extratropical Plants* (1891).

MÜLLER, Friedrich (called Maler Müller) (1749-1825). A German poet, painter, and engraver, born at Kreuznach. He showed in his youth a talent for art, and began to study painting at Zweibrücken, where his fascinating personality and varied endowments won him the favor of the Court circles. In 1774 he went to Mannheim, and soon acquired a reputation as a poet. His idyls were inspired, first by Gessner, afterwards by Voss, some of them being realistic descriptions of the life of the common people in the Palatinate. He is best known as a dramatist, and as such a true representative of the 'Storm and Stress' period, whose unbalanced enthusiasm is most apparent in *Golo und Genovera.* To the theme attempted in *Fausts Leben dramatisirt* his powers were hardly adequate. In 1777 he had become electoral Court painter, and in 1778 means were provided to satisfy the artist's longing for Rome. Although he continued there his literary efforts for a time, he more especially cultivated painting, setting up Michelangelo as his idol, but falling into exaggerations and never attaining any real success. Gradually estranged from his art through failures and distress, he devoted himself to art-historical studies, became a sort of ambulant antiquary, and was much sought as a cicerone. Through the patronage of the Crown Prince of Bavaria (afterwards King Louis I.) he was enabled to pass his declining years in comparative ease. Consult Seuffert, *Der Maler Müller* (Berlin, 1877).

MÜLLER, Friedrich (1782-1816). A German engraver, born at Stuttgart. He first studied under his father, Johann Gotthard Müller, an engraver of note, and subsequently in Paris. In 1808 his engraving of "Saint John About to Write His Revelation," after Domenichino, won him a high reputation, which was maintained by his "Adam and Eve Under the Tree of Life," after Raphael. In 1814 he was appointed professor of engraving in the Dresden Academy, and the rest of his life was devoted to the execution of the plate of his greatest work, the "Madonna di San Sisto," after Raphael. His health broke down under the labor imposed by this undertaking, and he did not live to see a finished print of his work. His engravings are only eighteen in number, mostly portraits, including Schiller, Jerome Bonaparte, Jacobi, and a medallion of Napoleon I.

MÜLLER, Friedrich (1834-98). An Austrian philologist. He was born at Jemnik, Bohemia; studied in Vienna and Göttingen, and from 1866 until his death was professor of comparative philology and Sanskrit at the University of Vienna. He was a member of the Academy of Sciences, and was one of the highest authorities on comparative philology and ethnology and the relations of the two sciences. Besides contributing largely on these subjects to the *Mitteilungen der anthropologischen Gesellschaft* and the *Wiener Zeitschrift für die Kunde des Morgenlandes,* and editing these periodicals for a time, he wrote the linguistic and the ethnological parts of the *Reise der österreichischen Fregatte Novara* (1867-73); *Allgemeine Ethnographie* (1873); and a *Grundriss der Sprachwissenschaft* (1876-87).

MÜLLER, Friedrich von (1779-1849). A German statesman. He was born at Kunreuth, Bavaria; studied law at Erlangen and Göttingen, and in 1801 entered the administrative employ of Weimar. His greatest political achievement was his inducing Napoleon to keep Weimar independent (1806-07). For this he was rewarded by being ennobled and raised to the post of Privy Councilor. He wrote *Erinnerungen aus den Kriegszeiten von 1806-13* (1851). Müller became Chancellor in 1815, and from 1835 to 1848 was Deputy. On his friendship with Goethe, consult Burkhardt, *Goethes Unterhaltungen mit dem Kanzler Friedrich von Müller* (Stuttgart, 1870).

MÜLLER, Friedrich Max (commonly called Max) (1823-1900). One of the best known of recent Orientalists and philologists. He was born at Dessau, in the Duchy of Anhalt-Dessau, December 6, 1823, where his father, the poet Wilhelm Müller (q.v.), was librarian of the ducal library. Max Müller received the elements of his education at Dessau, and then went to Leipzig, where, under Hermann Brockhaus, he began the study of Sanskrit. This he soon chose as his special pursuit, and at the age of twenty he was ready for the degree of doctor of philosophy. The first fruits of his labors appeared in a translation of the *Hitōpadēsa* (1844). In 1844 he went to Berlin to study under Bopp and Schelling, and to consult the Sanskrit manuscripts there. In Paris, whither he went in 1845, he began, at the suggestion of Burnouf, to prepare an edition of the Rig-Veda, with the commentary of Sayana (q.v.). With this view he went to England, June, 1846, to examine the manuscripts in the East India House, London, and the Bodleian Library at Oxford, and, on the recommendation of the distinguished Sanskritist H. H. Wilson, the East India Company commissioned him (1847) to edit the Rig-Veda at their expense. The first volume of this great undertaking appeared in 1849, and the sixth and concluding volume was published in 1874. A second edition was issued in 1889-92. In 1850 Max Müller was appointed deputy Taylorian professor of modern languages at Oxford; in 1854 he succeeded to the professorship, and in 1858 he was elected a fellow of All Souls College. While pursuing his labors connected with the Rig-Veda he published treatises on a variety of philological topics which did more to awaken in England a taste for the science of language in its modern sense than the labors of any other single scholar. Inheriting the poetic imagination and fire of his father, he had at command such a felicity of illustration that subjects dry under ordinary treatment became in his hands attractive. The lectures which he delivered on the Hibbert Foundation on the *Origin and Growth of Religion* (1878), and the Gifford series on *Natural Religion, Physical Religion, Anthropological Religion*, and *Theosophy or Psychological Religion* (1890-92), attracted much attention. He continued to publish on literary, linguistic, and philosophical subjects up to the time of his death, which occurred at Oxford, October 28, 1900. Among his long list of works, mention may be made of a translation into German of Kalidasa's *Mēghadūta* (1847); *The Language of the Seat of War in the East* (2d ed. 1855); *Comparative Mythology* (in the "Oxford Essays" for 1856); *History of Ancient Sanskrit Literature* (2d ed. 1860); lectures on *The Science of Language* (1861; last ed. 1889); *The Science of Religion* (1870). *Chips from a German Workshop*, in four volumes, was published 1868-75; the Hibbert Lectures on the *Origin and Growth of Religion*, in 1878; *Selected Essays*, in 1881; *Six Systems of Indian Philosophy* (1899); *Auld Lang Syne* (1st and 2d series, 1899); and *Ramakrishna, His Life and Sayings* (1899). His translation of Kant's *Critique of Pure Reason*, with a scholarly introduction, appeared in two volumes (1881). He wrote a romance, *Deutsche Liebe* (12th ed. 1901). He was editor of the important series *The Sacred Books of the East;* was one of the eight foreign members of the Institute of France, a Knight of the Prussian Order, a member of the Privy Council of the Queen of England, besides being the recipient of many honorable degrees. After his death appeared his *Last Essays* (1901) and *My Autobiography* (1901), edited by his son. Consult *Life and Letters of the Right Honorable Friedrich Max Müller*, edited by his wife (London, 1903).

MÜLLER, GEORG ELIAS (1850—). A German professor of philosophy, born at Grimma, in Saxony. He was educated at the universities of Leipzig, Berlin, and Göttingen. In 1870 he entered the German army as a volunteer, and took part in the campaign against France. On returning to academic life he became privat-docent at Göttingen (1876), and professor of philosophy at Czernowitz (1880). In April, 1881, he was appointed full professor at Göttingen. He published: *Zur Theorie der sinnlichen Aufmerksamkeit* (1873); *Zur Grundlegung der Psychophysik* (1878); *Zur Theorie der Muskelcontraction* (1891); *Zur Analyse der Unterschiedsempfindlichkeit*, with L. G. Martin (1899); and *Experimentelle Beiträge zur Lehre vom Gedächtnis*, with Pilzecker (1900).

MÜLLER, GEORG FRIEDRICH (1805-98). A German evangelist and philanthropist. He was born at Kroppenstädt, Prussia, near Magdeburg, September 27, 1805. He entered the University of Halle (1825) as a divinity student, although his life was anything but exemplary. Late in that year he was converted, and in 1826 began preaching. In June, 1828, he was invited to London by the Society for Promoting Christianity among the Jews, to engage in its service for six months, and in March, 1829, reached London. He settled as pastor of Ebenezer Chapel, Teignmouth, in connection with the Plymouth Brethren; in 1832 he removed to Bristol, and was co-worker with Henry Craik. While at Teignmouth he gave up pew-rents and depended on voluntary gifts, for which a box was placed in the chapel. The result was a largely increased income, and from that time on he would take no salary, depending wholly upon voluntary gifts. In December, 1835, after a visit to the Continent, he published a proposal for the establishment of an orphan-house for destitute children bereft of both parents. Spontaneous offers of money and service were received, and the opening of the home was announced May 18, 1836. At the end of 1856 there were 297 orphans under his care. The number of orphans increased and the buildings were multiplied, until in 1875 "2000 children were lodged, fed, and educated, without a shilling of endowment, without a committee, without organization, by funds drawn from all parts of the world." In 1849 he moved the orphanage to Ashley Down, a suburb of Bristol, to specially constructed buildings. Attended by his wife, he made evangelistic tours all over the world. His *Narrative* and other books and pamphlets had a large sale, and gave information of his work. He died at Ashley Down, March 10, 1898. Consult his biography, by A. T. Pierson (New York, 1899).

MÜLLER, GERHARD FRIEDRICH (1705-83). A German historian, born at Herford, in Westphalia, and educated at Leipzig. Entering the newly established Saint Petersburg Academy, he gave instructions in history, geography, and Latin, and was soon appointed professor of history. In 1740 he went to Siberia and traveled for ten years, engaged in the study of its antiquities and geography. Of his great work on Siberia only one volume was published (1750). On his return he became historiographer to the Empire, and in 1766, after many attacks by his colleagues, was appointed keeper of the national archives. He drew up for the Government a collection of its treatises, and wrote a number of works on Russian history, in which subject he was a high authority. His most important book, a *Collection for the History of Russia*, appeared at Saint Petersburg, in nine volumes (1732-65). His work in geography and cartography was also important.

MÜLLER, mụ'lẽr, IVAN VON (1830—). A German classical philologist. He was born at Wunsiedel, in Bavaria; was professor in the University of Erlangen (1864-93), and from 1893 professor in the University of Munich. His published works are numerous; he is best known as general editor of the comprehensive *Handbuch der klassischen Altertumswissenschaft* (Munich, 1885), and also as the editor of many of the works of Galen, and as reviser of Nägelsbach's *Lateinische Stilistik* (Nuremberg, 1888).

MÜLLER, JOHANN FRIEDRICH THEODOR (known as FRITZ MÜLLER, or MÜLLER-DESTERRO) (1821-97). A German naturalist, known for his contributions to bionomics and to the evolution theory. He was born at Windischholzhausen, near Erfurt. He studied at Greifswald and Berlin. The troubles of 1848 finally drove him from home and Berlin, and he emigrated to Southern Brazil, settling at Blumenau, on the island of Santa Catharina. Here he lived the life of a colonist and pioneer until 1856, when he became a teacher of mathematics and natural history in the gymnasium at Desterro. After various changes he was in 1874 appointed *naturalista viajante* of the museum at Rio Janeiro, and lived at Itajahy. Afterwards he was suddenly dismissed from his position, without any explanation from the authorities, and returned to Blumenau.

Müller published numerous papers on jellyfishes and worms, but more particularly on crustaceans and insects, his articles appearing mostly in Wiegmann's *Archiv für Naturgeschichte, Kosmos, Natur,* and the Annals of the Rio Janeiro Museum. His single book, *Facts for Darwin,* was called out by Darwin's *Origin of Species,* and it gave him wide fame. It was written at Desterro in 1863, was published at Leipzig in 1864, and was translated, with some additions, into English in London in 1869. It was the application of Darwinian principles to certain forms of a single class, the Crustacea. In this book we have, in the chapter on the "Progress of Evolution," the first clear statement of the biogenetic law or recapitulation theory (q.v.), afterwards restated by Haeckel. Müller also proposed the theory of mimicry which bears his name. See MIMICRY.

MÜLLER, JOHANN GOTTHARD VON (1747-1830). A German line engraver, born at Bernhausen, near Stuttgart. He at first studied under the Court painter Guibal, but, developing a talent for engraving, went to Paris in 1770, where for six years he studied under Wille. He won a number of prizes there, and was elected a member of the French Academy. In 1776 Duke Charles recalled him to Stuttgart, where he taught for nine years, and whence he was summoned to Paris to engrave a portrait of Louis XVI., after Duplessis. Next in importance to this is his engraving of Trumbull's "Battle of Bunker Hill." On his return to Stuttgart he became professor of engraving. He was elected a member of the principal European academies, and was knighted in 1818. He engraved thirty-three plates in all, of which, besides those mentioned, the best are: "Madonna della Seggiola," after Raphael; "Saint Catharine with Two Angels," after Leonardo da Vinci; "Schiller," after the portrait by Graf; and "Saint Cecilia," after Domenichino.

MÜLLER, JOHANNES (1436-76). The real name of the German scientist REGIOMONTANUS (q.v.).

MÜLLER, JOHANNES (1801-58). The most masterful, accurate, and influential physiologist and morphologist of his time. He was born at Coblenz, Rhenish Prussia, July 14, 1801; began to study theology, but abandoned it for medicine, beginning his medical studies at Bonn in the autumn of 1819. While there he prepared a prize essay, *De Respiratione Fœtus* (1821). He graduated in 1822. In the spring of 1823 he went to Berlin and studied with Rudolphi, then returned to Bonn as privat-docent, to teach physiology and comparative anatomy. In 1826 he was appointed professor extraordinarius in the University of Bonn, and he was made full professor in 1830. In 1833 he was called to the University of Berlin, where he succeeded Rudolphi as professor of anatomy and physiology, and after Meckel's death he edited the *Archiv für Anatomie, Physiologie und wissenschaftliche Medicin,* and remained at Berlin until his death, which occurred April 28, 1858.

With his unusual powers of application, thoroughness, and breadth, his acuteness and penetration, young Müller opened up in different directions new fields of research. In 1826 he published an important work on the physiology of sight, and a treatise entitled *Ueber die phantastischen Gesichtserscheinungen,* and in 1827 a work based on his lectures on physiology; in 1829 his work on general pathology, and in 1833 the first part of his epoch-making *Handbook of Human Physiology,* which was completed in 1840. In 1834 he was elected a member of the Berlin Academy of Sciences. As a physiologist he was the founder of a new school, working by novel methods. To him physiology owes the foundation of Bell's law, the principle of reflex movements and other nervous activities; comprehensive and detailed views on vision and hearing; a thoroughly well-grounded knowledge of the nature of the blood, lymph, and chyle; the proof of the independence of the quality of glandular secretions from the grosser structure of the glands, and the knowledge of chondrin. Müller opposed the school of nature-philosophers and placed physiology on a sound basis. He was also a founder and leader in the new morphology. The science of comparative embryology was greatly enriched by his researches. He discovered the pronephric ducts which bear his name, and explained the nature of hermaphroditism; he made extended contributions to and laid the foundations of our knowledge of the embryology and metamorphoses of the echinoderms, and he examined into the mode of development of certain sharks, which led up to his subsequent studies on the ganoids and Amphioxus. The debt morphology owes him is shown in his discovery of the lymph-hearts of the Amphibia, the micropyle of the eggs of fishes, holothurians, and the like, the intimate structure of glands, of cartilaginous and bony tissue, of erectile tissue, of the musculature of the intestines, and the finer structure of the peritoneum.

His principal works in comparative anatomy and morphology were his *Vergleichende Ana-*

tomie der Myxinoiden (1834-43), which Carus has called 'the codex of the morphology of vertebrates.' In collaboration with Henle he published, in 1841, *Systematische Beschreibung der Plagiostomen,* and in systematic zoölogy his principal works were *System der Asteriden* (1842), with the collaboration of Troschel, and *Horæ Ichthyologicæ.* Besides these he published upward of two hundred articles, addresses, and reports, most of which appeared in the *Transactions of the Berlin Academy of Sciences* and in the *Archiv für Anatomie, etc.*

Consult the biographical notices by Du Bois-Reymond (*Abhandlungen der Berliner Akademie,* 1859), containing a list of his works; Virchow, *Johannes Müller, Eine Gedächtnisrede* (Berlin, 1858); Bischoff, *Ueber Johannes Müller und sein Verhältnis zum jetzigen Standpunkt der Physiologie* (Munich, 1858); *Proceedings of the Royal Society of London,* vol. ix., p. 556.

MÜLLER, Johannes von (1752-1809). A German historian. He was born January 3, 1752, at Schaffhausen, where his father was a clergyman and rector of the gymnasium. He studied at Göttingen under Heyne, Schlözer, Walch, and others. In 1772 he was appointed professor of Greek at Schaffhausen, and in the same year published his first work, *Bellum Cimbricum.* He now began to devote his leisure hours to the investigation of Swiss chronicles and documents. In 1780 he published the first volume of his great work, *Geschichte der Schweizer,* and in 1781 was called to the Collegium Carolinum at Cassel, as professor of statistics. In 1786 he was appointed librarian and Councilor of State to the Elector of Mainz; here he finished the second volume of his Swiss history; his *Darstellung des Fürstenbundes* (1787); and *Briefe zweier Domherren* (1787). In 1792 he went to Vienna, where the Emperor made him a member of the Aulic Council, and where he in 1800 became first Imperial librarian. In 1804 he left Vienna for Berlin, where he wrote, among other things, an additional volume of his Swiss history. Introduced to Napoleon after the battle of Jena, he was appointed by him (1807) Secretary of State in the new Kingdom of Westphalia. He died at Cassel, May 29, 1809. His works have all been replaced by more modern researches, but in their own day they were of great value. Besides those mentioned, the *Vierundzwanzig Bücher allgemeiner Geschichte,* based on lectures delivered in Geneva (1811 and often republished), are important. Müller's *Sämmtliche Werke* were published (27 vols., Stuttgart, 1810-19; new ed., 40 vols., 1831-35).

MÜLLER, Julius (1801-78). A German theologian. He was born at Brieg, Silesia, and was a brother of Karl Otfried Müller (q.v.). He studied at Breslau and Göttingen, at first devoting himself to law, but afterwards to theology. In 1825 he was appointed pastor at Schönbrunn and Rosen, near Strehlen, where he remained seven years. He was appointed in 1831 second university preacher in Göttingen, and there lectured on practical theology and pedagogics. In 1834 he became extraordinary professor of theology in Göttingen, and soon after full professor in Marburg, whence he went in 1839 to occupy a similar chair in Halle. The work on which his reputation as a theologian chiefly rests is *Die christliche Lehre von der Sünde* (1839; 6th ed. 1889; Eng. trans., from the 5th ed., Edinburgh, 1868); also *Dogmatische Abhandlungen* (1870). He afterwards published pamphlets on subjects of temporary interest, particularly in vindication of the cause of evangelical union against the attacks of the rigid Lutherans. In conjunction with Neander and Nitzsch, he edited a periodical entitled *Deutsche Zeitschrift für christliche Wissenschaft und christliches Leben.* Consult his biography, by L. Schultze (Bremen, 1879).

MÜLLER, Karl Otfried (1797-1840). A German archæologist and philologist, born at Brieg, in Silesia. He studied at Breslau and Berlin, where he was the pupil of August Boeckh. His dissertation, *Liber Ægineticorum* (1817), showed the direction of his future studies, which were devoted to the reconstruction of the history of Greek localities and races. In 1817 he was appointed a teacher at the Magdaleneum in Breslau, in 1819 professor extraordinarius of philology, and in 1823 professor ordinarius at Göttingen. In connection with his studies he traveled widely, and in 1839 secured leave of absence for a visit to Greece and Italy. A sunstroke received while he was copying inscriptions at Delphi led to an attack of fever, from which he died at Athens, where he was buried on the Hill of Colonus. His desire to reconstruct the entire ancient life naturally led Müller to a wide range of scholarly activity. His great work was to be his *Geschichte hellenischer Stämme und Städte,* of which he completed vols. i., *Orchomenos und die Minyer* (1820), and ii., *Die Dorier* (1824); a second edition of these works by Schneidewin (1844; trans. by G. C. Lewis and H. Tafnell, London, 1839). In the same field belonged his treatise, *Ueber die Wohnsitze, Abstammung und ältere Geschichte des macedonischen Volks* (1825), and his *Etrusker* (1828; 2d ed. by Deecke, 1877). His *Handbuch der Archäologie der Kunst* (1830; 3d ed. by Welcker, 1846; trans. by Leitch, London, 1850), though now antiquated in its collections, is of value from the many acute observations it contains. It was accompanied by Müller and Oesterley, *Denkmäler der alten Kunst* (Göttingen, 1834-39), which was continued and completed by Wieseler (1846-56). A third edition appeared (1877-81); a fourth edition of part ii., *Kunstmythologie,* was begun at Leipzig in 1899. His *Prolegomena zu einer wissenschaftlichen Mythologie* (1825) was based on his belief that the elements of the Greek religion were to be found in analysis of the myths, which would refer the specific names to specific places and tribes. He strongly opposed the theories of large foreign influence in Greek civilization. In the last years of his life he undertook to prepare, for the English Society for the Diffusion of Useful Knowledge, a history of Greek literature. A translation by Lewis and Donaldson from the author's manuscript, entitled *A History of the Literature of Ancient Greece,* was published in London in 1840, and with a continuation by Donaldson in 1858. The German original, *Geschichte der griechischen Litteratur bis auf das Zeitalter Alexanders* (1841; 4th ed., revised and continued by Heitz, 1882-84), was published by his brother after his death, as well as *Kleine deutsche Schriften* (1841). A collected edition of *Kunstarchäologische Werke,* in five volumes, was published in Berlin (1872-73). Müller was also prominent as an editor. His edition in Greek and German of *Æschylus's Eumenides* (Göttingen, 1833) gave rise to a fierce controversy with Gottfried Hermann and his school, while his critical editions of Varro, *De Lingua Latina* (Leipzig, 1833), and Festus, *De Significatione Verborum* (ib., 1839), were long standards and are still valuable. For his biography, consult F. Ranke (Berlin, 1870).

MÜLLER, Leopold (1834-92). An Austrian genre painter, born in Dresden, of Austrian parents. He was a pupil of Karl Blaas and of Christian Ruben at the Academy in Vienna. Obliged to support his family after his father's death, he worked eight years as an illustrator for the Vienna *Figaro.* Continuing his studies subsequently, he visited repeatedly Italy and Egypt, and made his name favorably known through a series of scenes from popular life in Italy and Hungary. Afterwards he displayed his coloristic talent to greater advantage in Oriental subjects, such as "Arabian Money-Changers," "Pilgrims to Mecca Resting," "Bedouins in Camp," "Camel Mart," "Young Copt Woman" (New Pinakothek, Munich). Other works include "The Inundation in Vienna, 1862;" "Old Little Matron" and "Last Task of the Day" (both in the Vienna Museum); and "Soldiers in the Thirty Years' War" (Prague Gallery).

MÜLLER, Lucian (1836-98). A German Latinist. He was born at Merseburg, and studied at the universities of Berlin and Halle. In 1870 he was made professor of the Latin language and literature at the Philologico-Historical Institute at Saint Petersburg. His works, which display great erudition and critical acumen, are marred by his bitter attacks on eminent scholars whose opinions differ from his own. They include his famous *De Re Metrica Poetarum Latinorum præter Plautum et Terentium* (2d ed. 1894); editions for the *Bibliotheca Teubneriana* of *Horace* (2d ed. 1879); of *Catullus* (1870); and other Latin poets; editions of *Lucilius* (1872); *Phædrus* (1877); *Ennius* (1884); *Nævius* (1885); Horace's *Odes and Epodes*, with German commentaries (1882); and Horace's *Satires and Epistles* (1841-43). His treatise entitled *Ein Horazjubiläum* (1892) contains a short autobiography.

MÜLLER, Max. See Müller, Friedrich Max.

MÜLLER, Morten (1828—). A Norwegian landscape painter, born at Holmestrand on the Christiania fjord. After studying in Düsseldorf (1847-50), first under Tidemand and Gude, then at the Academy under Schirmer, he lived in Stockholm, and in 1866 went to Christiania, where he conducted a school for painting, subventioned by the Government. In 1871 he removed again to Düsseldorf, and in 1874 was made a member of the Stockholm Academy and Court painter. The rugged grandeur of the fjords and mountainous woodland fastnesses of his native country are the favorite subjects of his characteristic landscapes, in which he combines a romantic conception of nature with purely realistic color effects. Representative examples are a "View on Christiania Fjord" (1855), and "Entrance Into Hardanger Fjord" (both in the National Gallery, Christiania); "Pine Forest in Norway" (1860, Hamburg Gallery); "Romsdal Fjord" (1876); and "Forest Lake by Moonlight" (1892).

MÜLLER, Otho Friederik (1730-84). A Danish zoölogist, born in Copenhagen. His contributions to the knowledge of Infusoria are especially valuable. He wrote: *Fauna Insectorum Friedrichsdaliana* (1764); *Flora Friedrichsdaliana* (1767); *Vermium Terrestrium et Fluviatilium, seu Animalium Infusorium, Helminthecorum et Testaceorum non Marinorum Succincta Historia* (1771); *Zoölogica Danica* (1779-1806).

MÜLLER, Otto (1816-94). A German novelist. He was born at Schotten, Hesse; was for some time connected with the Court library at Darmstadt, and edited newspapers at Frankfort and Mannheim. In 1854 he established the *Frankfurter Museum.* He was the author of *Charlotte Ackermann* (1854); *Der Stadtschultheiss von Frankfurt* (3d ed. 1878), treating of Goethe's grandparents; *Aus Petrarcas alten Tagen* (1861); *Der Majoratsherr* (1873); and *Schatten auf Höhen* (1881). Consult the biography, by Schulte vom Brühl (Stuttgart, 1895).

MÜLLER, Peter Erasmus (1776-1834). A Danish theologian and antiquary. He was born at Copenhagen, and studied at the university there, passing his theological examination in 1791. After spending some time in the German universities, he visited France and England. Returning, he wrote numerous works; was appointed professor of theology at the University of Copenhagen in 1801, and in 1830 became Bishop of Zealand, the highest ecclesiastical dignity in Denmark. He was an eminent theologian, and his theological works, including that on the Christian moral system (1808) and other volumes, are very highly valued. But his literary reputation rests upon his essays on Danish and Norse antiquities, of which the most valuable are: *Om det islandske Sprogs Vigtighed* (1813); *Kritisk Undersögelse af Danmarks og Norges Sagnhistorie* (1823-30); and, above all, his *Sagabibliothek*, or *Library of the Sagas* (1816-18).

MÜLLER, Victor (1829-71). A German historical painter, born in Frankfort. First instructed there at the Städel Institute by Steinle, he studied afterwards at the Antwerp Academy and under Couture in Paris. Soon, however, he became a follower of Courbet, whose technique, the reverse of Couture's, he adopted, and subsequently helped to promote in Germany. In 1858 he returned to Frankfort, where he soon attracted attention with a series of pictures, thoroughly realistic in conception and of great coloristic charm, but scarcely understood by a public accustomed to the sentimental trend of the Düsseldorf school of that period. He therefore, in 1866, removed to Munich, where such revolutionary departures from traditional treatment as the "Sleeping Wood-Nymph" (1863), or "Hero and Leander," were more likely to be appreciated. Out of a cycle from Shakespeare, which he painted there, "Hamlet in the Graveyard" (1869) is surpassed only by the "Balcony Scene in Romeo and Juliet" (New Pinakothek, Munich). To his influence as a colorist was due not only the introduction of the tone-element into the paintings of the Munich school, but also the truer conception of historical characters and a more wholesome observation of nature among the younger generation of artists.

MÜLLER, Wenzel (1767-1835). An Austrian composer, born at Tyrnau, Moravia. He was a pupil of Dittersdorf, and from 1813 was kapellmeister at the Leopoldstadt Theater, Vienna. He wrote more than two hundred operas, besides symphonies, cantatas, and masses. His compositions include: *Das verfehlte Rendezvous* (1783); *Das neue Sonntagskleid* (1793); *Die Schwestern von Prag* (1794); and *Asmodi oder das böse Weib und der Satan* (1834).

MÜLLER, Wilhelm (1794-1827). A German poet, excelling in popular and political songs that attracted great composers, notably Schubert, and also influenced Heine's lyric development. Müller, who was born in Dessau, October 7, 1794, studied philology and history, fought in the War of Liberation, visited Italy (1817-19), was made professor in the Gelehrtenschule at Dessau (1819), and ducal librarian there. He died in Dessau, September 30, 1827. His poems, published under the titles *Müllerlieder* (1818); *Gedichte eines Waldhornisten* (1821); *Lieder der Griechen* (1821-24); *Lieder des Lebens und der Liebe* (1824); *Lyrische Reisen* (1827), were collected with other *Works* by Schwab in five volumes (1830). A new edition by Müller's son, the Orientalist, Max Müller, appeared in 1868; the *Poems* were published in one volume (1874).

MUL'LER, William John (1812-45). An English landscape and figure painter, born at Bristol. He studied with James Pyne, landscape painter, and in 1833 exhibited for the first time at the Royal Academy, the "Destruction of Old London Bridge, Morning." He spent seven months traveling in Germany, Switzerland, and Italy, and in 1838 he visited Greece and Egypt. In 1841 he published his "Picturesque Sketches of the Age of Francis I.," and joined the Government expedition to Lycia, the results of which were paintings of Oriental life and scenery, five of which were exhibited at the Royal Academy in 1845. Among these are "The Tent," "Xanthus," the "Burial-Ground at Smyrna," and "Head of a Cingari." In the National Gallery are some fine Welsh landscapes, and a clever Lycian sketch, both in oil, and in the South Kensington Museum are several water-color drawings. Muller died at Bristol. His art was original, his selections were good, his color was pure and strong.

MÜLLER, mu̇'lĕr, Wolfgang (called Müller von Königswinter) (1816-73). A German poet and novelist, born at Königswinter on the Rhine. He studied medicine at Bonn, and practiced at Düsseldorf, but afterwards removed to Cologne, and gradualy gave up medicine to devote himself to literature. Müller's poetry finds its material in the Rhine, its beauty, its legends, and the life of its people. The more important of his books are: *Gedichte* (1847; 3d ed. 1868); *Der Rattenfänger von Sankt Goar* (1856); *Liederbuch* (1857; 4th ed. 1871); *Lorelei*, an epic cycle (1851; 4th ed. 1873); *Erzählungen eines rheinischen Chronisten* (1860-61); and *Im Rittersaal* (1874). His best-known poem is "Mein Herz ist am Rhein." Six volumes of his selected poems were published under the title *Dichtungen eines rheinischen Poeten* (1871-76). Consult Joesten, *Wolfgang Müller* (Cologne, 1895).

MÜLLER-GUTTENBRUNN, gu̇'ten-bru̇n, Adam (1852—). An Austrian author, born at Guttenbrunn, and educated at Hermannstadt and Vienna. In 1879 he removed to Vienna from Linz. His first success was *Des Hauses Fourchambault Ende* (1880), supplementing Augier's drama *Les Fourchambault*. This was followed by *Im Banne der Pflicht* (1882), the comedy *Schauspielerei* (with Laube, 1883), and *Irma* (1885). Among his novels and stories, which for the greater part appeared serially, the best-known are: *Frau Dornröschen* (1884; 3d ed. 1891); *Gescheiterte Liebe* (1889); and *Die Magyarin* (1896).

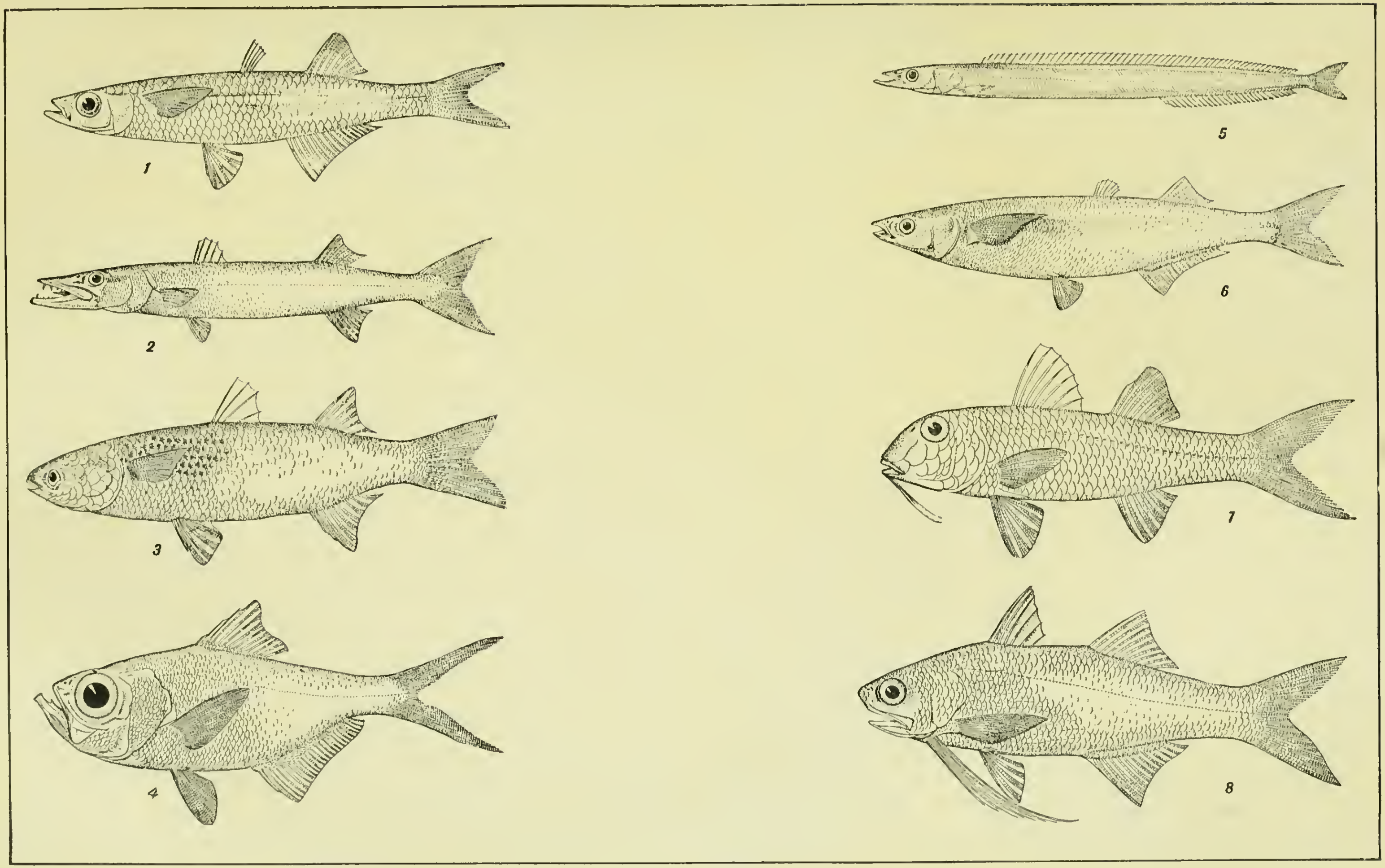
MULLET (OF., Fr. *mulet*, diminutive of *mulle*, from Lat. *mullus*, red mullet). Any one of a variety of useful fishes, principally of the family Mugilidæ. In this family the body is nearly cylindrical, with large scales and two widely separated dorsal fins, the first with four stiff spines. The mouth is small. The best-known mullets belong to the genus Mugil, of which there are many species found in all warm waters. The common or 'striped' mullet (*Mugil cephalus*) is the largest (10 to 12 pounds) and best of all. It occurs on both coasts of America, and also in Europe. It often ascends rivers, and searches for soft or fat substances for food, frequently obtained by thrusting its mouth into the mud. It is easily reared in ponds, readily answers the call which usually summons it to be fed, and was in great request among the ancients. Mullets are used fresh, salted, and smoke-dried. A preparation of their roe, called 'botarcha,' is in great esteem as a condiment in Italy and the south of France. They are often caught in the Mediterranean by angling from a rock, with a bait paste, when they have been previously attracted to the spot by macaroni thrown into the water. The white or 'blueback' mullet (*Mugil curema*) is found on both shores of America, and is of importance as a food fish. An abundant species about the Florida Keys is the 'fan-tail' mullet (*Mugil trichodon*). Mullets are very numerous in surface-swimming shoals in the lagoons of the Gulf Coast in late winter and spring, and are captured generally by means of casting nets. Among the fishermen of Spanish America, mullets are called 'liza,' 'lizita,' and 'macho,' with descriptive adjectives for the various species.

The name is also given in the Western and Southern United States to various suckers of the genus Moxostoma. Consult Goode, *Fishery Industries*, sec. i. (Washington, 1884). See Plate of Mullets and Allies.

MULLET (OF. *molette*, *mollette*, Fr. *mollette*, rowel, from Lat. *mola*, millstone). In heraldry, a charge in the form of a star, generally with five points, intended to represent a spur-rowel. See Heraldry.

MULLIGAN LETTERS. A series of letters written by James G. Blaine (q.v.) to Warren Fisher, a business associate, which, it was alleged, proved corrupt connection, on the part of Blaine, with legislation in Congress favoring the Little Rock and Fort Smith Railroad and the Northern Pacific Railroad. The letters were obtained from Fisher by one James Mulligan, a former clerk of Fisher, who had been called to Washington to testify before a committee of the House of Representatives appointed to investigate the charges against Blaine. Blaine obtained the letters from Mulligan, and on June 5, 1876, read them before the House, after defying the committee to compel him to surrender them. The

MULLETS AND ALLIES



1. GULF SILVERSIDES (Menidia peninsulæ).
2. BARRACUDA (Sphyræna barracuda).
3. COMMON MULLET (Mugil cephalus).
4. SLIMEHEAD (Beryx splendens).
5. SAND-EEL (Ammodytes Americanus).
6. CALIFORNIA 'SMELT' (Atherinopsis Californiensis).
7. AMERICAN SURMULLET (Mullus auratus).
8. GULF BARBUDO (Polydactylus Virginicus).

letters were freely used in the Presidential campaigns of 1876 and 1884 by the opponents of Blaine, who took full advantage of the suspicious sound of several detached sentences. By the adherents of Blaine it was asserted, apparently with good reason, that the letters did not in any way prove corruption or even participation in discreditable business and political transactions on the part of Blaine.

MULLINGAR, mŭl′lĭn-gär′. The capital of County Westmeath, Ireland, on the Brosna, 50 miles west by north of Dublin, with which it is connected by rail and by the Royal Canal (Map: Ireland, D 3). The most important horse and cattle fairs in Ireland are held here periodically. It has a cathedral and infantry barracks. Population, in 1901, 4500.

MULLINGER, mŭl′lĭn-gẽr, JAMES BASS (1834—). An English historian, born at Bishop Stortford. He was educated at University College, London, and at Saint John's, Cambridge, where he graduated with high honors. After lecturing at Bedford College, London, he was made librarian and lecturer on history in Saint John's College, and for four years he was lecturer on ecclesiastical history in Trinity College (1890-94). He wrote: *The Ancient African Church* (1869); *The Schools of Charles the Great* (1876); *An Introduction to English History* (with Gardiner, 1881); *The Age of Milton* (with Masterman, 1897); and a *History of Saint John's College, Cambridge* (1901).

MULLION (corrupted from *munnion*, from Fr. *moignon*, stump of an amputated limb, from OF. *moign*, from Lat. *mancus*, maimed; probably influenced by popular etymology with Eng. *mullet*, five-pointed star). The name for a vertical architectural member used to subdivide an opening, such as a window or the bay of a gallery, into two or more divisions within the main framework. It was practically unknown to all ancient styles of architecture. In the early Christian (especially Syrian), Byzantine, and Romanesque styles it occurs with increasing frequency in the very simple form of a circular shaft or colonnette (sometimes a small pier), subdividing a window into two arched openings or the bay of a gallery into two arcades.

It was in the Gothic style that the mullion received its true elaborate development through the use of tracery combined with the enormous increase in the size of windows and other openings, necessitating the multiplication of minor members. The orthodox cathedral window has three mullions forming four subordinate sections, and their profiles are varied and rich, being often a group of shafts and a composition of fillet and cavetto moldings. These Gothic mullions are exquisitely slender and far removed from the heavy pre-Gothic mullion-colonnette, though the column, in more delicate form, was also a Gothic form of mullion. The Renaissance architects abandoned the mullion, returning to the antique idea of undivided openings and equally divided arcades and colonnades. Only occasionally is a single colonnette used as a window-mullion, especially in early work.

MÜLLNER, mul′nẽr, ADOLF (1774-1829). A German dramatist and critic, born at Langendorf, near Weissenfels, Saxony. He studied law in Leipzig, and practiced it at Weissenfels until 1816. Encouraged by the success of several comedies skillfully composed after French models, he produced in 1812 a one-act tragedy, *Der neunundzwanzigste Februar*, in imitation of Werner's *Der vierundzwanzigste Februar* (1810), the first of those 'fate-dramas' with which the German stage was flooded during the following decade. Surpassing its model in the accumulation of horrors, Müllner's play lacked the innate poetry which was the redeeming feature of Werner's production. The same applies to his best-known work, *Die Schuld*, a four-act drama, based on the story of a young man, who, according to a prophecy, is destined to kill his brother. This typical 'fate-tragedy' was brought out in Vienna in 1813, and subsequently on all the principal stages of Germany, retaining its popularity for many years, although its effectiveness was due mainly to clever technical construction. Consult: Höhne, *Zur Biographie und Charakteristik Müllners* (Wohlau, 1875); and Minor, *Die Schicksalstragödie in ihren Hauptvertretern* (Frankfort, 1883).

MULOCK, mū′lŏk, DINAH MARIA. An English author. See CRAIK, DINAH MARIA.

MULOCK, Sir WILLIAM (1843—). A Canadian statesman, born in the Province of Ontario, and educated at the University of Toronto. In 1882 he was elected a Liberal member of the Dominion House of Commons, and in 1896 was made Postmaster-General in the Administration of Sir Wilfrid Laurier. The establishment of a penny postage rate between Canada and other portions of the Empire was mainly due to him, and he also advocated an all-British cable system, and the formation of better steamship facilities.

MUL′READY, WILLIAM (1786-1863). An Irish genre painter. He was born at Ennis, County Clare, April 1, 1786. His father moved to London when Mulready was a child, and he early showed artistic powers which were encouraged by the sculptor Banks, through whose influence he gained admittance to the academy schools. His education and culture were obtained in England, for he never went abroad, and as a genre painter he ranks with Wilkie. His first painting of importance, "Returning from the Ale House," appeared in 1809, while two later works, "Punch" and "Idle Boys," commanded very general attention. Mulready was elected an associate of the Royal Academy in 1815, and the following year, on the merits of his picture entitled "The Fight Interrupted," he was made Academician. From now on his works were eagerly awaited at the yearly exhibitions, their subjects being of the popular order, but painted with great carefulness and fidelity to detail. They were rather small in size, but rich in color, and closely resembled the Dutch school.

His most important works are in the South Kensington Museum and in the National Gallery. In the former are seventeen of his paintings, among them "Hampstead Heath" (1806); "Giving a Bite" (1836); "Choosing the Wedding Gown" (1846); "The Butt" ("Shooting a Cherry") (1848). In the latter are six of his paintings, including a "Snow Scene" and "Crossing the Ford" (1842). "The Bathers" is in the National Gallery, Edinburgh, and his "Wolf and the Lamb" is in possession of the King. Mulready's paintings were before the public for more than sixty years. An early marriage contracted soon after his arrival in London was productive of much unhappiness. He was, throughout his life, a successful and painstaking teacher. Mulready died in London, July 7, 1863. Consult Stephens, *Memorials of Mulready* (London, 1867).

MULTAN, or **MOOLTAN,** mōōl'tän'. The capital of a district of the Punjab, British India, 190 miles southwest of Lahore, and 4 miles from the left bank of the Chenab. the inundations of which sometimes reach the city (Map: India, B 2). It possesses railway communication with all the principal cities of India, and has. in the Indus Valley Railway, a commercial outlet from Central Asia, the Punjab. and the United Provinces, to the Arabian Sea at Karachi. Steamers ply to Hyderabad, a distance of 570 miles. The city, situated in a district remarkable for its fertility. is built on a mound consisting of the ruins of ancient cities, and is surrounded by a dilapidated wall from 40 to 50 feet high. The vicinity abounds in mosques. tombs, and shrines, attesting the city's antiquity and former magnificence. The most important of these, situated in the old fort, is the tomb of Rukn-i-Alam, 'pillar of the world,' dating from 1340, an octagonal red-brick structure covered with multicolored glazed tiles and raised mosaics, and forming a conspicuous object in the surrounding landscape, being 100 feet high and built on an elevation. The tomb of Bhawal Hakk, dating from 1264, and the tomb of Shams-i-Tabriz, are also noteworthy. The bazaars are numerous, extensive. and well stocked. and the stores are adequately supplied with European and Asiatic commodities. There are manufactures of silks, cottons, shawls, scarfs, brocades. tissues. etc.. and extensive banking interests. The local merchants are proverbially rich. Multan is a military station. with an important cantonment one and one-half miles to the east. Multan was taken by the British in the second Sikh War. in January. 1849. Population, in 1891, 74.562; in 1901, 87,394.

MULTIPLE (ML. *multiplus*, manifold, from Lat. *multus*, many + *-plus*, fold). An integral number divisible without remainder by another integral number. Thus, 35 is a multiple of 7. and also a multiple of 5. *Equimultiples* are multiples containing different numbers an equal number of times: e.g. 21 and 33 are equimultiples of 7 and 11. The *least common multiple* of several numbers is the least number containing each of them without a remainder. The least common multiple contains all prime factors not common to all of the numbers, and all common prime factors with their highest exponents. Thus. the least common multiple of $5 \cdot 7$ (i.e. 35), $3^2 \cdot 2$ (i.e. 18), and $7^2 \cdot 2^2 \cdot 5$ (i.e. 980) is $5 \cdot 7^2 \cdot 2^2 \cdot 3^2$ (i.e. 8820).

Mathematical symbols which satisfy given conditions for different numerical values are said to be 'multiple valued': e.g. $\sin^{-1}x$ (i.e. the angle whose sine is x) is two-valued between 0° and 360°; thus, if the sine equals ½. the angle has two values, 60°, 120°. (See TRIGONOMETRY.) Contacts above the first order between curves or surfaces are called 'multiple contacts.' A 'multiple point' of a curve is a singularity composed of several coincident points: e.g. if the curve crosses itself twice at the same place. the intersection is called a triple point. A double point admits of two tangents, a triple point admits of three tangents. and so on, and these are called 'multiple tangents.'

MULTIPLE POINDING. A form of action in Scotland, by which competing claims to one and the same fund are set at rest. Its purpose is to avoid double poinding or double distress; and it corresponds to what is known in England as interpleader (q.v.).

MULTIPLICATION (Lat. *multiplicatio*, from *multiplicare*, to multiply, from *multiplex*, manifold, from *multus*, many + *plicare*, to fold, Gk. πλέκειν, *plekein*, to twine). A fundamental process in arithmetic and algebra. In arithmetic, the symbols for multiplication are ., ×. In algebra, they are ., ×, and simple juxtaposition. E.g. $a \cdot b$, $a \times b$, ab, are symbols for a times b. It may be defined as the process by which a number called the *product* is formed from a number called the *multiplier*, in the same way that this multiplier is formed from unity. E.g. the num—3 may be formed from unity by the process symbolized as $-(1 + 1 + 1)$. and similarly, the product $-3 \cdot 4$ may be formed by the process $-(4 + 4 + 4) = -12$. Elementary multiplication is subject to the associative, commutative, and distributive laws (qq.v.); but there are branches of higher mathematics in which exceptions occur. (See SUBSTITUTION; QUATERNIONS.) For checks on multiplication, see CHECKING.

In a series of operations, multiplication takes precedence over addition and subtraction. E.g. $2 + 3 \cdot 6 - 4$ equals $2 + 18 - 4$, not $5 \cdot 2$. The operation of multiplication can be abbreviated by the use of logarithms (q.v.), the slide rule (q.v.). or tables of products and factors or of quarter squares. The plan of multiplication by means of Napier's rods (*Rabdologiæ sive numerationis per virgulas libri duo*, Edinburgh, 1617) has been revived through the manufacture of sets of *Réglettes multiplicatrices* planned by Genaille and Lucas (Paris. 1885). Growing out of the demand for a system by which prime numbers could be detected, there appeared. in the seventeenth century, numerous tables, of service in the theory of numbers. In 1728 Poëtius published a table of factors for numbers up to 100,000. In 1770 Lambert arranged such a table in modern form for numbers up to 102.000. Burkhardt's table (1814-17) includes factors of numbers to 36,000. and Crelle. Pase. and Glaisher have carried these to 9.000.000. The oldest of the large tables is that of Crelle (7th ed. with an introduction by Bremiker. Berlin. 1895). This gives the products to $1000 \cdot 1000$. Zimmermann's *Rechentafel* (Berlin. 1889) and Müller's *Multiplicationstabellen* (Karlsruhe. 1897) give the products to $100 \cdot 1000$. and are well arranged. For the products to $100 \cdot 100$. Jordan's *Mathematische und geodätische Hilfstafeln* (9th ed., Hanover. 1895) is one of the best. Products have also been tabulated by means of quarter squares, a relation known to the Arabs and doubtless of Hindu origin. The construction of these tables depends upon the identity $ab \equiv \frac{(a+b)^2}{4} - \frac{(a-b)^2}{4}$; thus the product of any two numbers is given by subtracting the quarter square of their difference from the quarter square of their sum. Among the various tables of this type, Laundy's (1856) contains the quarter squares of all numbers up to 100,000. Blater's (Vienna, 1887), complete to 200,000, is regarded as the best. See CALCULATING MACHINES.

MULVA'NEY. A character in Rudyard Kipling's "Soldiers Three" in *Plain Tales from the Hills* (1888). The trio are Terence Mulvaney, the Irishman, Learoyd, from Yorkshire, and Ortheris, the Cockney.

MUM. See BEER.

MUM'BO JUM'BO. A strange bugbear described by Mungo Park as common to the Mandingo towns of Africa, and used to discipline quarrelsome wives of the natives. The person assuming the character is clothed in a suit made of bark. After various rites the offender is seized by Mumbo Jumbo, stripped, tied, and whipped with his rod. The name is used in a wider sense of negro idols and fetishes.

MUM'MICHOG (North American Indian name). A small minnow-like fish of sluggish tidal streams of the Eastern United States. See KILLIFISH.

MUM'MIUS, LUCIUS (c.185-130 B.C.). A Roman commander of plebeian birth. In B.C. 146 he was elected consul and placed in command of the war against the Achæan League. The first battle was decisive. It was fought near Corinth and resulted in the complete defeat of the Grecian allies. The cities of Corinth, Thebes, and Chalcis were plundered and then destroyed by the Roman troops. As trophies of his victory, Mummius caused many of the most valuable works of art to be sent to Rome. The surname of Achaicus was given to Mummius, and a triumph was decreed. Cicero speaks of Mummius as a blunt and plain but honest man, and says that, of all his enormous plunder, none was reserved for his own use. In 141 he was again elected consul. Nothing certain is known about his later life or his death, some writers saying that he died in exile at Delos, and others that his death occurred in Rome, and that his daughter received a dowry from the Senate.

MUMMY-CASE. In ancient Egyptian embalming, the case immediately surrounding the shrouded mummy. It was in the outlines of a human body and was made to fit the corpse. There were usually two mummy-cases for each mummy. The inner one was plain, while the outer one was covered with paintings and hieroglyphs, recounting the life and deeds of the dead. The material was usually cedar. The double case was inclosed in an oblong coffin, and this in its turn in a sarcophagus. See EGYPT, section on *Manners and Customs*; EMBALMING; SARCOPHAGUS.

MUMPS (from Dutch *mompen*, to cheat, from *mommen*, to mumble), THE. A popular name of a specific inflammation of the salivary glands described by nosologists as *parotitis*. It is an infectious, contagious disease, occurring as a rule in epidemics, although isolated cases are often seen. While it chiefly attacks children and adolescents, adults are not exempt.

The disorder usually begins with a feeling of stiffness about the jaws, which is followed by pains, heat, and swelling beneath the ear. The swelling begins in the parotid, but the other salivary glands usually soon become implicated, so that the swelling extends along the neck toward the chin. One or both sides may be affected, and, in general, the disease appears first on one side and then on the other. There is seldom much fever. The inflammation is usually at its highest point in three or four days, after which it begins to decline, suppuration of the glands scarcely ever occurring. In most cases no treatment further than due attention to the bowels, and protection of the parts from cold, by the application of flannel or of cotton, is required, and the patient completely recovers in eight or ten days.

A singular circumstance connected with the disease is that in many cases the subsidence of the swelling is immediately followed by swelling and pain in the *testes* in the male sex, and in the *mammæ* in the female. The inflammation in these glands is seldom very painful or long continued, but occasionally the inflammation is transferred to the brain, when a comparatively trifling disorder is converted into a most perilous disease.

MUN, mēṅ, ADRIEN ALBERT MARIE, Count de (1841—). A French politician and author, leader of the Catholic Anti-Republican Party. He was born at Lumigny, studied at Saint Cyr, and fought in the Franco-Prussian War and against the Commune. Save for an interval (1879-81) he was a member of the House of Deputies from 1876 until 1893. Through his influence the power of the French clergy was thrown to the Boulangists. In 1892 he founded the league of the 'Sacré Cœur' and on the Pope's instructions promised to work with the Republic for reform if the Government would give up its atheism. Mun took a prominent part in the Dreyfus trial, forcing Billot, Minister of War, to concur in the judgment of the court. The French Academy elected him to its membership in 1897 to succeed Jules Simon.

MUN, THOMAS (1571-1641). An English merchant and economic writer, born in London. As a young man he was engaged in the Mediterranean trade, and in 1615 was appointed member of the committee, or director, of the East India Company. In 1621 he published *A Discourse of Trade, from England into the East Indies,* in which he defended the East India Company against the charge that it drained England of bullion. His most important book, *England's Treasure by Foreign Trade,* was published after his death in 1664. This work is the ablest of the writings of the mercantilists, and exercised great influence over the economic and political thought of the time, effectually refuting the Bullionist view, that only such foreign trade as yielded a direct balance of bullion was advantageous to the realm.

MUN'BY, ARTHUR JOSEPH (1828—). An English poet, born in Yorkshire. He graduated from Trinity College, Cambridge, and was called to the bar at Lincoln's Inn. *Verses New and Old* (1865) contained *Doris*, a lovely pastoral. *Dorothy* (1880), a country story in elegiac verse, was immensely popular in England and the United States. Since then have appeared *Vulgar Verses* (1891), written in dialect; and *Susan: A Poem of Degrees* (1893). Munby defended his realism in an appendix to *Dorothy*.

MUNCH, mṳ̆ṅk, PETER ANDREAS (1810-63). A Scandinavian historian. He was born at Christiania, Norway, and educated at the University of Christiania. He became professor of history at Christiania in 1841, and in 1861 was appointed historiographer and archivist of Norway. He maintained that three distinct dialects prevailed in the kingdoms of Norway, Sweden, and Denmark, and that the so-called Icelandic literature was really the production of ancient Norway. He held that the modern Icelanders keep one dialect, and the inhabitants of the Faroë Islands another, of the ancient Norwegian. He rejected the term 'Icelandic,' for which he substituted 'Old Norse.' He published an *Old Norse Grammar*, an *Old Norse Reading Book*, and a *History of the Norwegian People* (8 vols., 1852-63), and edited a number of Icelandic works, including the elder *Edda* (1847), and the *Royal Mirror* (1848). His collected essays, edited by Gustav Storm, were published in four volumes (Christiania, 1873-76).

MÜNCH-BELLINGHAUSEN, mụŋk bĕl′lĭng-hou′zen, Eligius Franz Josef, Baron (1806-71). An Austrian dramatist, known under the pseudonym Friedrich Halm. He was born at Cracow, studied jurisprudence, and held a number of Government offices in Austria. His first play, *Griseldis*, produced in 1834 (11th ed. 1896), was well received. It was followed by *Der Adept* (1836); *Camoens* (1837); *Imelda Lambertazzi* (1838); and *Der Sohn der Wildniss* (1843; 9th ed. 1894), a conspicuous success on all the stages of Germany, and known on the American stage under the name of *Ingomar, the Barbarian.* In 1854 appeared *Der Fechter von Ravenna*, his greatest work, which was greeted with universal applause. Of all his subsequent efforts the romantic comedy *Wildfeuer* (1864; 7th ed. 1896) alone brought him a renewal of his earlier triumphs. His collected works were published in eight volumes in 1857-64.

MÜNCHEN-GLADBACH, mụŋ′ken-glät′bäg. A town in Prussia. See Gladbach.

MÜNCHHAUSEN, mụŋk′hou-zen, Hieronymus Karl Friedrich, Baron (1720-97). An adventurous German noble, born on his father's estate, Bodenwerder, in Hanover, where he died. He served in the Russian cavalry against the Turks (1737-39), and told marvelous tales of his adventures. These were first gathered in English by Rudolph Erich Raspe (q.v.), a German exile (Oxford, 1785), as *Baron Münchhausen's Narrative of His Marvelous Travels and Campaigns in Russia.* G. A. Bürger (q.v.) rendered this into German (1786), and in that language it gained universal popularity as a monument of methodical lying unparalleled in literature. Consult: Carl Müller-Fraureuth, *Die deutschen Lügendichtungen bis auf Münchhausen* (1881), which shows that some of Raspe's tales are borrowed from Bebel's *Facetiæ* (1508), and others from Lange's *Deliciæ* (1765). Consult also Griesbach's introduction to a reprint of Bürger's translation (Stuttgart, 1890).

MUNCIE, mŭn′sĭ. A city and the county-seat of Delaware County, Ind., 55 miles northeast of Indianapolis; on the White River, and on the Cleveland, Cincinnati, Chicago and Saint Louis, the Lake Erie and Western, the Cincinnati, Richmond and Muncie, the Chicago, Indiana and Eastern, and the Chicago and Southeastern railroads, being the terminus of the last mentioned road, which maintains shops here (Map: Indiana, D 2). Intercommunication among the various lines is furnished by a belt road that encircles the city. Muncie is the seat of Palmer University, and has a public library with 13,600 volumes, a fine court-house, and a city hospital. A public library building costing $50,000 was nearing completion in 1903, and an appropriation has been made by Congress for a Government building to cost $80,000. The city is situated in the natural gas belt of the State and is near deposits of coal, advantages that have contributed to its development as an important industrial centre, noted particularly for its extensive iron and steel interests. There are also large glass works, pulp and paper mills, canneries, and manufactories of lawn mowers, silver and silver-plate goods, underwear and clothing, handles, caskets, wheels and carriage woodwork, gas engines and supplies, etc. The municipality owns an electric light plant for street lighting. Population, in 1890, 11,345; in 1900, 20,942.

MUN′DA. An ancient town of Hispania in the country of the Turdetani, in modern Andalusia. It is noted for the victory gained here by Cæsar over the sons of Pompey in B.C. 45.

MUN′DAS, or Munda-Kols. The inhabitants of Chota Nagpur, and one of the principal tribes of the Kolarian stock in Northeastern Hindustan. They are also known as Horo-hu. The Mundas are short of stature and very dolichocephalic. Monogamy is the rule, and the position of the wife is higher than with many Oriental peoples. Some writers use Munda as a general term for Kolarian (q.v.).

MUN′DAY, Anthony (1553-1633). An English poet, playwright, and compiler, born in London. In Rome he obtained material for *The Mirrour of Mutabilitie* (1579), a moralistic effort in verse, and after some experience on the English stage he wrote tracts against the Jesuits and other Roman Catholics, particularly Edmund Campion (q.v.). The best of his eighteen plays is *The Downfall of Robert, Earl of Huntingdon, Afterwards Called Robin Hood of Merrie Sherwodde* (1598-99). Munday also translated French romances, wrote 'pageants,' such as *The Triumphs of the Golden Fleece* (1623), and verse, such as *A Banquet of Daintie Conceyts* (1588).

MUNDÉ, mŭn′dā, Paul Fortunatus (1846-1902). An American gynecologist, born in Dresden. He came to the United States with his father after the revolution of 1848-49, and in 1866 graduated at the Harvard Medical School. In the same year he volunteered as surgeon in the Austro-Prussian War, and he served in a like capacity with the grade of first lieutenant in the French campaign of 1870-71. He settled in New York City in 1873 as an obstetric specialist; in 1880 became professor at Dartmouth Medical College, and in the New York Polyclinic in 1882. He edited the *American Journal of Obstetrics* (1874-92), and wrote: *Obstetric Palpation* (1880); *Minor Surgical Gynecology* (1880); *Appendix to the Midwifery of Cazeaux and Tarnier* (1884); *Pregnancy and the Puerperal State* (1887); and *Diseases of Women* (1891).

MUNDEL′LA, Anthony John (1825-97). An English statesman and philanthropist, born at Leicester, of Italian-Welsh descent. At eleven he began to learn his trade with a hosiery manufacturer; at twenty-three he was a partner with a firm in Nottingham, and he prospered in the business. He was instrumental in forming the first arbitration court for the settlement of differences between employers and employed (1866), and he was elected to Parliament for Sheffield (1868). In Parliament he directed his energies toward the improvement of laws regulating factories and education, and was particularly successful in the lightening of women's and children's labor. In 1880-85 he was vice-president of the Council of Education under Gladstone, and he succeeded in passing a compulsory education act (1881), while as president of the Board of Trade (1886 and 1892) he started a labor department of which *The Labor Gazette* was the organ. In 1894-95 he was chairman of the Poor-Law Committee; he resigned from Parliament in 1894, but was recalled the following year and died while in service.

MÜNDEN, mụn′den. A town of Southern Prussia, in the Province of Hanover, situated at the confluence of the Fulda and the Werra, 11 miles northeast of Cassel. It has a gymnasium and a palace in which a museum was opened in 1898. The chief manufactures are confectionery, hats, chemicals, and cigars. In the vicinity are coal mines and mill-stone quarries. Population, in 1900, 9236.

MUN′DEN, Joseph Shepherd (1758-1832). An English comedian, now noted especially for Charles Lamb's well-known encomium, *On the Acting of Munden.* Born in London, he began life in a commercial position, but he early found a place on the provincial stage, and in 1790 made his appearance in London. His ability to 'make faces' was famous, and he was greatest in broad farce, though in serious parts he was not without success. Among his best characters were Sir Francis Gripe, Sir Peter Teazle, Old Dornton, and Sir Robert Bramble. He retired in 1824, and died on February 6, 1832, in London. Consult: Lamb, *The Essays of Elia* (1st series, London, 1823); *Memoirs of Joseph Shepherd Munden, Comedian,* by his son (ib., 1844); Hutton, in *Actors and Actresses of Great Britain and the United States,* ed. by Matthews and Hutton (New York, 1886).

MUNDO, mụn′dō. A wild tribe in Cebú and the Panay Islands. See Philippine Islands.

MUNDT, mụnt, Klara. A German novelist, best known under her pseudonym Luise Mühlbach (q.v.).

MUNDT, Theodor (1808-61). A German novelist and critic of the 'young German' school, husband of 'Luise Mühlbach.' In 1848 he became professor of history at Breslau, and in 1850 professor and university librarian at Berlin. He became first known by his *Madonna, oder Gespräche mit einer Heiligen,* a memorial of Charlotte Stieglitz. Mundt edited, with Varnhagen von Ense, Knebel's letters and posthumous works, and also published Luther's *Politische Schriften.* He wrote books of travel and romantically historical novels: *Carmela* (1844); *Mendoza* (1847); *Die Matadore, etc.* (1850); and also *Geschichte der Weltlitteratur; Geschichte der Litteratur der Gegenwart* (1842); *Geschichte der Gesellschaft;* and a critical *Kunst der deutschen Prosa* (1837).

MÚNDURUCÚ, mo͞on′do͞o-ro͞o-ko͞o′. A powerful tribe of the great Tupian stock (q.v.), residing chiefly about the confluence of the Tapajos and Amazon, in North Central Brazil. They are variously estimated at from 30,000 to 40,000. The men are tall, athletic, broad-chested, and of light complexion, and their naked bodies are entirely covered with artistic tattooing. The women are pleasing in manner, with a natural and unconscious vivacity. Both sexes are noted for their honesty. The men practice agriculture and do beautiful feather work. The women are skillful in weaving cotton fabrics and hammocks. Besides their habit of preserving the heads of their enemies, which has gained them the name of Paiguize, or Beheaders, among the surrounding tribes, they have the custom of killing persons hopelessly ill or decrepit.

MUNGER, mŭn′gẽr, Theodore Thornton (1830—). An American clergyman. He was born at Bainbridge, N. Y., graduated from Yale College in 1851, and from the Yale Divinity School in 1855. The following year he entered upon the work of the Congregational ministry, serving first at Dorchester, Mass. He remained here until 1860, then devoted two years to travel and study, after which he resumed the ministry, locating in Haverhill from 1862 to 1870, and in Lawrence from 1871 to 1875. In the latter year he removed to California, and during the twelve months of his residence established a church at San José. Returning to the East, he became pastor at North Adams, Mass., where he remained until 1885, when he resigned to accept a call to the United Church, New Haven, Conn. He has published: *On the Threshold* (1880); *The Freedom of Faith* (1883); *The Appeal to Life* (1887); and *Horace Bushnell, Preacher and Theologian* (1899).

MUNGHIR, mŭn-gẽr′. A town of India. See Monghyr.

MUNGO. See Shoddy.

MUN′GO, Saint (518?-603). The popular name of Saint Kentigern, one of the three great missionaries of the Christian faith in Scotland. Saint Ninian (q.v.) converted the tribes of the south; Saint Columba (q.v.) was the apostle of the west and the north; Saint Kentigern was the apostle of the Strathclyde Britons, who held the country between the Clyde on the north and the furthest boundaries of Cumberland on the south. (See Brets and Scots.) He is said to have been the son of a British prince and princess, and is believed to have been born at Culross on the Forth, near Perth, in 518. He planted a monastery on the site of Glasgow, and became the Bishop of the Kingdom of Cumbria (q.v.). The nation would seem to have been only partially converted, and persecution drove Saint Kentigern from the realm. He found refuge among the kindred people of Wales, and there, upon the banks of another Clyde, he founded another monastery and bishopric, which still bears the name of his disciple, Saint Asaph. Recalled to Glasgow in 573 by King Roderick the Bountiful, Kentigern renewed his episcopal and missionary labors, in which he was cheered by a visit from Saint Columba. He died January 13, 603, and was buried where the Cathedral of Glasgow, called Saint Mungo's, now stands. There is a fragment of a *Life* of Saint Kentigern written in the twelfth century, and a longer *Life* by Jocelyn of Furness, written about 1180. Consult Forbes, in *The Historians of Scotland,* vol. v. (Edinburgh, 1874).

MUNGOOS, or **MONGOOSE** (Telugu *mangisu*). The mungoos (*Herpestes griseus*) is a species of ichneumon (q.v.), a native of India, but introduced into other countries, notably Jamaica, for the purpose of destroying rats and other vermin, upon which it feeds. In India it is often kept about the houses to reduce the number of lizards, mice, rats, and snakes. It kills and eats the most poisonous snakes, such as the cobra, the bite of which is either avoided by the animal's agility or else is not fatal to it.

The mungoos was introduced into Jamaica in 1872. when nine specimens were imported to destroy the rats on a sugar plantation. At first they were highly beneficial, reducing the stated annual loss from rats from $500,000 to one-half that, but in less than twenty years the island was almost overrun with them. Not only did they kill rats and mice, however, but snakes, lizards, ground-birds, and even poultry. At one time snakes had become so rare that they were regarded as practically exterminated, but since 1896 they are apparently on the increase. The ground-doves and other terrestrial birds, partly at least by change of habit, are also adapting themselves to this new enemy and their extermination is no longer to be feared. At the present time the mungoos is common and very tame in most parts of the island and in many other islands, and is generally looked on with favor.

The mungoos is from 15 to 18 inches long, and has a tail 14 to 15 inches in length, very thick at the base and tapering to a point. The fur is rather long and grizzly reddish-gray. A very full account of its habits is given in the *Royal Natural History*. For the details of its history in the West Indies, consult: Morris, *The Mungoose on Sugar Estates in the West Indies* (London, 1882); *The Field* (London) for July 13, 1895.

MUNICH, mū'nĭk (Ger. *München*). The capital of Bavaria, and the third largest city in Germany, situated at an elevation of 1700 feet, mostly on the left bank of the Isar, on the southern border of a partly swampy and partly fertile forested plateau, 296 miles by rail south of Leipzig (Map: Germany, D 4); latitude 48° 9′ N., longitude 11° 35′ E. The city is only about 25 miles north of the Bavarian Alps, and is subject to a somewhat raw climate characterized by abrupt changes of temperature, which are at times trying. Mean annual temperature, 46° F.

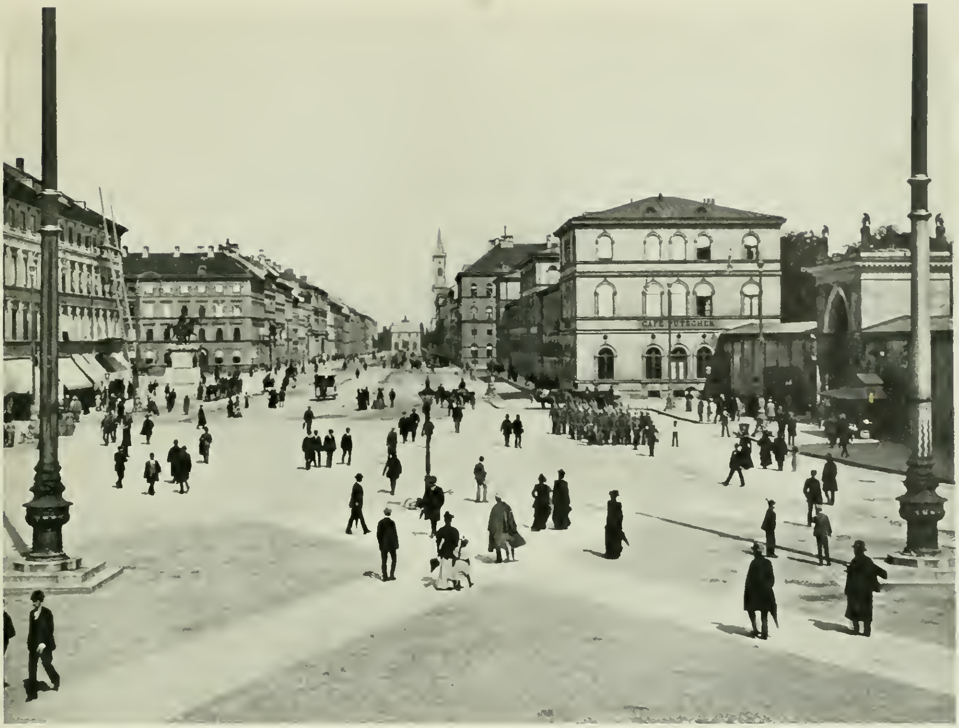
Munich is comparatively modern. It is progressive and handsomely equipped with the latest municipal improvements, having, in fact, been mostly rebuilt since about 1830. It owes its artistic and regal appearance to the art-loving Louis I. and his successors. The very wide avenues and the many buildings constructed in all the leading styles of architecture lend great dignity to the metropolis. The streets are generally regular, and the city is lavishly adorned by numerous squares and pleasure parks and gardens. The largest park is the beautiful English Garden. It contains over 500 acres, watered by branches of the Isar and adorned with small temples, towers, etc. Magnificent thoroughfares are the Maximilianstrasse, lined by public buildings, and the Prinzregentenstrasse, both leading across the river to the Maximilian pleasure grounds on the opposite side. The Ludwigstrasse, stretching northward from the royal palace, is also a splendid street, flanked with impressive Renaissance edifices.

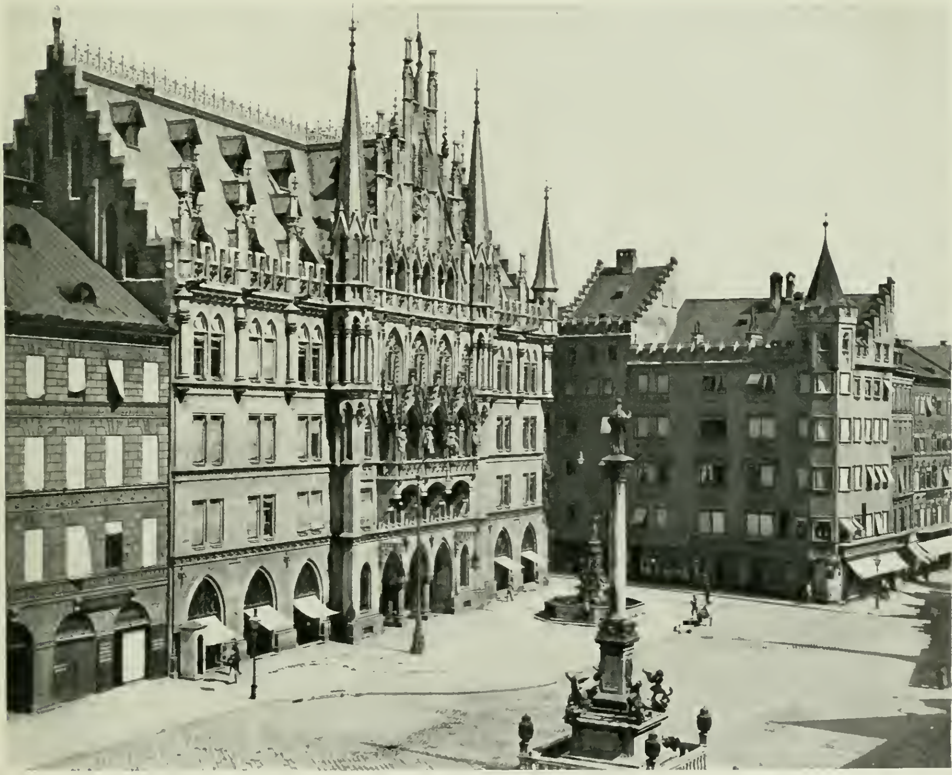
The Max-Joseph-Platz, together with the Marienplatz, represents the centre of life in Munich. The former connects the old and new sections, and is embellished by Rauch's huge bronze statue of King Max Joseph. The Alte Residenz—one of the three parts of the royal palace—extends here along the north side of the square and has in the rear the Court gardens, with their open arcades and frescoes. This structure dates from 1596 and contains four courts, but is of little architectural worth. Its apartments, however, are a source of great interest to sightseers, being luxuriously furnished in the seventeenth century style and rich in historical associations. The throne room was at one time occupied by Napoleon. The royal chapel and the treasury possess numerous objects of intrinsic and historic value.

The other two parts of the palace are the fine Festsaalbau and the Königsbau. The latter, finished in 1833, and fashioned after the Pitti Palace, is notable for its splendid Nibelungen frescoes by Schnorr (1861). The former is a handsome edifice, completed in 1842 in the late Italian Renaissance. It is enriched with Ionic pillars and with allegorical figures of the Bavarian provinces. Several apartments contain Hiltensperger's frescoes from the Odyssey. Beautiful salons are also the throne room, with striking bronze statues by Schwanthaler; the Hapsburg room, with paintings; the Barbarossa Hall, with reliefs by Schwanthaler; and the Hall of Charlemagne, containing ambitious decorations descriptive of scenes from the Emperor's life. But the best known of these apartments are those containing Stieler's thirty-six portraits of beautiful women, painted from various types of Bavaria's fairest womanhood.

Connected with these royal edifices are the great Hof und National Theater dating from 1823, with an attractive portico borne by Corinthian columns, and containing seats for 2200 persons, and the artistic and impressive Court chapel—a structure dating from 1837, in the Byzantine-Romanesque, and having sumptuous decorations. Still another feature in connection with this royal residence are the coach houses and harness rooms, with a collection of historic carriages, sleighs, and sledges. Adjacent also are a valuable ethnographical museum, an Art Union, with works of living artists, and an instructive museum of plaster casts. Other palaces in the city are the palace of Prince Charles, the palace of Prince Regent Luitpold, the palace of Duke Max, with good decorations, and the royal Wittelsbach palace, an artistic red structure begun in 1843.

Munich has no churches of great fame. The Ludwigskirche is a rather attractive example of Italian Renaissance, and contains a noteworthy Last Judgment by Cornelius. The Saint Boniface basilica, dating from 1850, with some three score of gray marble columns, is also worthy of mention, as are the cathedral—the Frauenkirche—the Gothic Mariahilfkirche, and the Gothic Giesinger Church. The synagogue is one of the largest and finest in Germany. All these churches, except the cathedral, belong to the nineteenth century. Among the impressive secular buildings are the War Office, the Post Office, and the





MUNICH

LUDWIGSTRASSE (UPPER)

RATHAUS AND MARIENPLATZ (LOWER)

new Gothic Rathaus, an attractive building completed in 1874.

The picture and sculpture collections of Munich are famous. The building of the Old Pinakothek, situated in the northern section of the city, not far from the royal palace, was constructed in 1826-36, in the Renaissance style. It is about 174 yards long, and is embellished on the exterior by statues by Schwanthaler. It contains about 1400 canvases. Almost all the great masters of paintings since Raphael's time are represented here by works of the highest excellence. The greatest gems perhaps are Dürer's Saints Peter, John, Paul, and Mark; several portraits and other pictures by Rubens, including the "Battle of the Amazons," the "Massacre of the Innocents," and the "Lion Hunt;" Perugino's "Virgin and Saint Bernard;" Raphael's "Madonna Tempi;" and Murillo's "Two Beggar Boys Eating Fruit." The Old Pinakothek contains in addition valuable cabinets of vases; also engravings and drawings. Its Loggie are decorated by Cornelius. Adjacent on the north is the New Pinakothek, with a good collection of modern artists, mostly Bavarian. There are about 700 works. Here is found also an antiquarium with fine bronzes and terra-cottas principally from Rome and Greece. In the vicinity is also the Glyptothek—containing mainly a collection of ancient statuary. The edifice is of a classic and imposing Ionic pattern, graced with columns and artistically embellished. It has Assyrian and Egyptian departments, as well as departments devoted to excellent Greek and Roman examples and to incunabula. The highly prized collection of marbles from the island of Ægina is also in the Glyptothek. Its most valuable sculpture perhaps is the Greek Barberini Faun (B.C. 300).

In connection with the realm of art in Munich may be mentioned the Kunstgewerbehaus; also the Academy of Art, an ambitious edifice in Italian Renaissance, completed in 1885. The artists of Munich maintain in the so-called Exhibition Building (finished in 1845) a permanent exhibition of their paintings exposed for sale. The Bavarian National Museum, founded in 1855, and housed in a fine edifice, is of great value. Among its numerous collections covering many departments of human endeavor, the most valuable perhaps are the art works of the mediæval Renaissance and modern periods. The Schwanthaler Museum contains models of the master's works. A noteworthy picture collection also is the Schack Gallery, possessing choice originals, and interesting copies of the great masters by many of Germany's foremost modern painters. Other museums are the collection of pictures and drawings left by the painter Kaulbach, and the Lotzbeck museum of pictures and marbles. Munich is celebrated also as a musical centre, especially for German operas. The National Theater is one of the most important of modern operatic institutions, being intimately identified with the Wagner influence and tradition.

Among the many monuments not already mentioned are those of Louis I., Schiller, Gluck, Schelling, Fraunhofer, Gärtner; the large and striking monument to Maximilian II., dating from 1875; the fine statue of Elector Maximilian I., after plans by Thorwaldsen; an obelisk made of the metal of captured cannon, and erected to the memory of the Bavarian soldiers who died in the war with Russia; the fine monument to Liebig, the chemist; the new and splendid Wittelsbach fountain; also the bronze Fischbrunnen, associated with the Butchers' Festivals. The Church of Saint Michael contains a fine monument by Thorwaldsen to Eugène Beauharnais. The Siegesthor—Gate of Victory—constructed in 1843 in honor of the Bavarian Army, is a splendid arch patterned after that of Constantine at Rome. It is surmounted by a huge figure of Bavaria. On the magnificent Königsplatz, near the Glyptothek, rises the Propylæa, an attractive portal completed with Doric and Ionic features in 1862—a tribute to the cause of Greek independence. Notable also is the ancient Isarthor, with elaborate frescoes. Still other objects worthy of visit in Munich are the Bronze Foundry, and the Royal Arsenal, with an interesting military museum, containing relics of the Napoleonic wars.

At the head of the educational institutions is the celebrated university. (See MUNICH, UNIVERSITY OF). The city's educational system is scarcely surpassed either for comprehensiveness or excellence. The Maximilianeum on the right bank is an institution founded by Maximilian II. for advanced civil service instruction. It is surrounded by attractive Gasteig pleasure grounds extending along the river shore. The important Polytechnic School is in a fine modern edifice. Near by is an art industrial school. There are also in the city a military academy and a military school, an academy of science with noteworthy collections, and numerous organizations for the development of all the chief branches of knowledge and its application. Of the many valuable libraries, the Royal Library is by far the most important. Its spacious Florentine building was constructed after 1832, and possesses a magnificent staircase. The library is one of the largest in the world. It contains some 1,350,000 volumes, and over 30,000 manuscripts. It is especially rich in German documents and scholastic literature, possessing some of the rarest of literary editions and other specimens, including a translation of Boccaccio, a codex aureus (in gold letters and dating before 900), and Four Books of Gospels. In this library, also, are the archives of Bavaria—a collection of 500,000 documents. The city has a botanic garden, and a crystal palace, where expositions are held.

Industrially, Munich is important and prosperous. Its iron, bronze, and bell foundries, its lithograph and engraving establishments, its optical and mechanical instrument factories are celebrated, as are its enormous breweries (some 45 in number), which have made the city famous for excellent beer. The large, palatial Hofbräuhäuser are a feature of the city's social life. The other manufactures comprise cotton, wool, and damask goods, wax-cloth, leather, paper-hangings, carriages, pianos, gold and silver articles, machinery, steel wares, etc. In its manufacturing and commercial interests the city has made great strides in very recent times. Beer is the chief export. Also grain, hops, coal, wool, furniture, carpets, and art goods figure in the shipments. Munich has a network of canals for traffic—over 100 miles in length. Numerous important industrial and commercial unions and associations are established here.

Munich is the seat of all the important Government institutions of Bavaria. It is administered by two burgomasters, about forty magistrates, and some seventy councilmen. The annual budget balances at approximately $4,500,000. The municipal debt is about $25,000,000, offset by nearly twice that amount invested in public property—mostly in buildings and grounds. Over a third of the taxes go to the service and reduction of the debt. The charitable institutions are excellent.

The popular festivals and 'Dults' (fairs) are a feature of Munich. They are all elaborate and interesting—for instance, the annual carnival, the Magdalen Festival in July, and the October Festival. The last is a kind of agricultural fair which attracts the picturesque country population. The environs are of no little interest. Their most unique attraction is the famous Bavaria, an immense bronze statue rising on a low elevation west of the city. It is a hollow female figure 62 feet high, and cast from the bronze of foreign cannon, according to designs by Schwanthaler. It was uncovered in 1850. From its head there is a good view of the city. The adjacent Hall of Fame is a Greek colonnade, dating from 1858. It holds about 100 busts of famous Bavarians, including Jean Paul and Schelling. The Nymphenburg is a royal château near the city. Its grounds are very attractive. The cemeteries of Munich are said to contain the most artistic tombs in the Empire. The population of the city has more than doubled in the last few decades. In 1871 it numbered 169,693; in 1900, 499,959, nearly all Catholics. The death rate fell from 30.4 to 24.1 in a thousand from 1871 to 1898.

History. The history of Munich may be said to date from the time of Henry the Lion, in the twelfth century. It grew rapidly under the House of Wittelsbach. The city was fortified in 1254, Otho the Illustrious having established his residence here. In the first half of the fourteenth century the library was founded. About the middle of the sixteenth century the art collections were begun. Munich became a royal residence in 1806. From the reign of Louis I. dates the city's present magnificence.

Consult: Kahn, *Münchens Grossindustrie und Grosshandel* (ib., 1891); Aufleger and Trautmann, *Alt-München in Bild und Wort* (ib., 1895); and the *Jahrbuch zur Münchener Geschichte* (ib., 1887 et seq.).

MUNICH, University of. One of the leading German universities, founded by Duke Ludwig of Bavaria with the approval of Pope Pius II. as a Studium Generale of Ingolstadt. The members of the faculties took an oath of loyalty to the See of Rome. Though the bull authorizing the opening of the institution was issued in 1459, it was not opened until 1472. True to its pledge, Ingolstadt University remained faithful to the Church of Rome during the trying period of the Reformation. In 1556 the Jesuits gained control of the university and the attendance sank greatly, but under the guidance of I. A. Ickstatt their influence was gradually destroyed. At the instance of Ludwig Maximilian, whose name the institution now bears, it was moved in 1800 to Landshut, where it remained until 1826, when it was transferred to Munich and reorganized. In addition to the collections and institutes brought thither from Landshut, the Government transferred to the university the botanical garden, anatomical theatre, observatory, and antiquarium, and a valuable collection of coins. In 1902 the university consisted of the faculties of theology, law, political science, medicine, and philosophy, with an attendance of 175, 1324, 159, 1095, and 1450 respectively. The university also includes a number of seminars, clinics, museums, a botanical garden, and an observatory. The University Library contains over 400,000 volumes and about 2000 manuscripts. The Collegium Georgianum, founded in 1494 for the education of Catholic priests, and the Maximilianum, founded in 1852 and opened in 1876, for the education of talented Bavarian youth, are affiliated with the university. The income of the university is about $250,000 a year, the greater share being contributed by the Government. The number of professors in 1902 was 117, besides 83 privat-docenten, including such illustrious men as Hermann Paul, the eminent philologist Von Zittel, and Röntgen.

MUNICIPAL ARCHITECTURE (Lat. *municipalis*, from *municeps*, citizens, from *munus*, duty + *capere*, to take). An important branch of civil architecture, that, namely, which has to do with buildings erected out of public funds for the use and amusement of the inhabitants of a city, or purely for the adornment of the city itself. The term is sometimes extended to include public and semi-public buildings for business or amusement erected by private capital, such as exchanges, railway stations, and theatres. It is doubtful if municipal buildings, properly speaking, existed in the prehistoric and the ancient Oriental worlds; the temple and royal palace filled all needs in these civilizations. The great city gates of ancient Babylonia and Assyria were the only structures in the Orient that could be included under the title of municipal buildings.

Greece. With the development of Greek city life after the seventh century B.C. several classes of such buildings were erected. Among these may be named the *Theatre* (q.v.), which was always erected with public funds, and which first began early in the fifth century B.C. to be built of stone and in the form and style recognized in the ruins of those at Epidaurus, Athens, Sicyon, etc. Of Greek buildings devoted to public games and sports, the most important were the *Stadium* (q.v.) and the *Hippodrome* (q.v.) for the different kinds of races, neither of which gave opportunity for much distinctive architecture. The *Gymnasium* and *Palestra* were devoted to contests requiring less space and to training and practice, and embodied most of the features developed later by the Romans in the Imperial thermæ. Those at Ephesus and Alexandria-Troas are especially well preserved. The commercial centre of the city was the market-place, or agora, corresponding to the Roman Forum (q.v.), an open rectangular space bordered by colonnades and halls, and decorated with monumental entrances, statuary, and fountains. The various halls for the transaction of municipal business, such as the *Prytaneum* and the *Bouleuterion*, were often connected with the market-place, and there were frequently two *agoræ* in each city—the political and the commercial. Those at Priene, Assos, and other cities of Asia Minor are particularly important, as no well-preserved examples have been found in Greece itself. One can judge of the great possibilities of the Greek columnar style even better from these many public porticoes than from the temples. Finally, the so-called *leschoi* were public halls for banquets and other reunions and celebrations. To the list of Greek municipal buildings should be added such decorative and memorial structures as the choragic monument of Lysicrates and the Tower of the Winds at Athens, public fountains, and the like.

ROME. The Romans developed municipal architecture even further in magnificence and variety after the second century B.C. Their theatres were richer in decoration; their amphitheatres were a new form altogether; their circus was architecturally more significant than the stadium and hippodrome. The Roman Forum, which was at first an irregular square without architectural beauty, was later bordered by basilicas (q.v.), great halls for commercial and judicial purposes, while memorial and triumphal arches were placed at its entrances and along its main road. Rome was embellished with new fora by successive emperors, these gifts culminating in the stupendous Forum of Trajan, with its basilica, temple, arch, and triumphal column. In the early days of the Empire a new type of city was developed, in which the various main groups of public buildings were united and harmonized by vast stretches of porticoes. Such porticoes in Rome itself were the Porticus Maximæ, extending to the Tiber, and the mile-long Porticus Triumphi in the Field of Mars. They masked the poorer streets. In the cities of Syria and the rest of Western Asia a great era of rebuilding set in, the old blank-walled main streets being replaced by colonnaded boulevards, decorated with statues and intersecting at right angles. This type, which originated at Antioch, can now best be studied at Palmyra, Gerasa, and other cities near the coast-line.

The many new Roman colonies and municipalities in North Africa and Syria gave even more occasion than the old cities for the carrying out of a regular plan of municipal architecture. The cities of Theveste and Thamugadi are important examples. Pompeii gives an older type. The Pompeian Forum, with its well-preserved basilica; its *curiæ* or municipal meeting-halls, with their colonnades; its Temple of Jupiter, flanked by memorial arches; its 'Pantheon,' with the money-changers' shops; its market-hall, Temple of Venus, lounging-gallery, and other well-grouped structures, shows how the government of a provincial town of moderate size grouped the public buildings around its main square.

Of the theatres, those at Aspendos in Asia Minor, and Orange in France, are the best preserved; of the amphitheatres, those of Rome (the Colosseum), Verona, Capua, Arles, Nîmes, and Thysdrus; of the basilicas, those of Maxentius in Rome, of Pompeii, and of Trèves.

With the decline of Roman power and the transfer of the capital to Byzantium, the focus of activity in municipal architecture was shifted and Constantinople, or New Rome, became the scene of an extraordinary work of reconstruction under Constantine, Theodosius, and (later) Justinian. Fora, palaces, triumphal arches, colonnades, basilicas, baths, and churches gave splendor to the new city, though less perfect in detail than the best Roman works. Meanwhile, until the final overthrow of the older capital, public buildings, porticoes, and basilicas were still being erected in Rome, and the majestic ruins of the Basilica of Maxentius and Constantine attest the importance of these expiring efforts of Roman art. After the fifth century there was nothing but lethargy in municipal architecture until the later Middle Ages.

MIDDLE AGES. The growth of municipal architecture in the Middle Ages was very gradual and depended largely upon the character of city government. In the monastic and feudal cities there were no works of municipal architecture of any importance. Conditions were more favorable to the erection of municipal buildings in the free communes and episcopal cities, which possessed complete or partial autonomy.

The most important municipal buildings were the hôtel-de-ville in France, the Rathaus in Germany, and the *palazzo pubblico* or *communale* in Italy. The cities of Northern and Central Italy, of Northern France and the Netherlands, of Northern Germany (especially the Hanseatic League), were most conspicuous for such buildings during the Romanesque and Gothic periods. The plan of the communal palaces varied according to whether the local constitution provided for meetings of a large body of citizens or only of a select few inside the building. The Doge's Palace in Venice had halls for the Gran Consiglio and others for the Council of Ten and the smaller council. At the more democratic Padua, the immense hall, with its wagon roof—the largest in Europe—provided for larger meetings. At Udine and Piacenza are the best examples of a whole lower story open in vaulted arcades for the popular meetings, with halls on the second floor for the smaller committees. These palaces in Lombardy were usually termed *broletti* (Como, Bergamo, Cremona, Monza, etc.). The main meeting room on the second floor was nearly always provided with a balcony or *ringhiera*, from which announcements were made to the people.

The cities of Tuscany and Umbria, later in achieving independence (except Pisa), erected, however, even more magnificent public palaces than their northern neighbors. The Palazzo Vecchio and Bargello in Florence, the Palazzi Pubblici at Siena and Perugia, built during the Gothic period (1250-1350), are the largest in Italy and especially remarkable for magnificent towers. Hardly a city in Italy, even one enjoying but a modicum of administrative autonomy, but had a public palace of some sort, and in some cities there were two palaces, the episcopal and the civil.

Such communal palaces were much rarer in feudal France: they are almost wholly wanting in the southern and central provinces. But the powerful cities of the Netherlands, Lille, Louvain, Mechlin, Brussels, Ghent, Bruges, Ypres, Arras, and Liège, built as magnificent public palaces as their Tuscan compeers. That of Brussels, with its great central towers, is a fine example in the developed Gothic style. Germany is particularly rich in such buildings, not on as large a scale, certainly, but interesting from their very number. Municipal belfries (q.v.) or *campanili* were prominent in many cities of both Northern Europe and Italy.

The communal organization in the cities was usually based upon the association of the labor and trade guilds. It was the officers of these guilds who, coming together for mutual benefit, originated in most cases the city administration and constitution. Many of these guilds had separate buildings for their meetings and they usually repeated on a smaller scale the architectural features of the communal palaces. The Loggia dei Mercanti at Bologna, those at Ancona and Perugia, the Or San Michele at Florence, are a few among many. The lawyers' guild sometimes built sumptuously, as in the Palazzo dei Giureconsulti at Cremona. In the case of some of the very powerful Flemish guilds, such as the cloth guild, their buildings equaled or surpassed the average town-hall; this was the case at Ypres. In some cases the governing body had a separate palace from that where the popular meetings were held. Thus at Pistoia there was a Palazzo del Comune and also a Palazzo del Podestà. Other associations besides the guilds erected common halls: the religious fraternities, such as that which built the Bigallo in Florence, or the various beautiful buildings in Venice. Hospitals, like the Ospedale degli Innocenti in Florence, the Hospital at Milan, and the Misericordia at Arezzo, are distinctly public monuments.

The most important of the minor works of municipal architecture were the bridges (q.v.), fountains (q.v.), and gates. The first two classes have been treated under their separate heads, so that it will be necessary to describe only the city gates. During the Middle Ages the fortification of cities by heavy walls was a universal custom and the gates were fully as important as the triumphal arches and gateways of Roman cities. The great gate at Lübeck and several gates at Florence show the German and Italian styles. They were usually dedicated to a saint and contained a shrine and frescoes or carved images in the central opening; guardrooms on the sides and above contributed to making the gate a monumental structure. The round or pointed single archway was often flanked by two towers, as in the Porta della Vacca at Genoa.

In so far as the general arrangement of the larger mediæval cities is concerned, the Cathedral Square was the main centre of the city, the market-place and a place of resort; but wherever there was also a strong municipal civic organization there was also a second square dominated by one or more city buildings and kept free for public assemblies. Seldom do we find a single square used for both classes of buildings.

Mohammedan. There was far more of municipal architecture in the mediæval Mohammedan cities of the Orient than Europeans realize. The *bazaars* with their long covered galleries rivaled the gallery arcades of modern cities; the *khans* and *caravanserais* with their immense courts were often on a colossal scale. Numberless *sebils* or fountains were dotted through the streets. The city gates were monumental. The *alcazars* were an interesting combination of governmental palace and fortress. There were numerous hospitals and colleges with attached mosques and mausoleums, as at Ispahan. Few European cities showed so ample a display as Bagdad, Cairo, Damascus, Adrianople, Constantinople, or even the mediæval cities of second rank, like Fez, Kairwan, Emesa, and a hundred more. The Mohammedan engineers in Western Asia were famous for their bridges, fortifications, and castles. The great wealth and advanced culture of the Arabs, Moors, and Persians, and of the Moslem Hindus—far superior to that of the West in the Middle Ages—made it easy to build up beautiful cities, now all reduced to squalor and ruin.

Renaissance. While the Renaissance was more fruitful in works of private and religious architecture than in municipal architecture, a great number of notable buildings were erected for public purposes in the cities of Italy and of Western Europe. The general downfall of civic liberties checked the progress of some phases of municipal architecture, but the change of style ushered in by the Renaissance led to the erection of many new edifices in the more modern style. Thus in Italy the elegant town hall at Verona (Palazzo del Consiglio), by Fra Giocondo (1470); the town hall at Padua, the Loggia del Papa at Siena, the Procurazie Vecchie at Venice, belong to the fifteenth century; to the sixteenth, the Library of Saint Mark, and the Loggetta of the Campanile (demolished by the fall of the tower, 1902), at Venice, the magnificent arcade surrounding the ancient 'Basilica' at Vicenza, by Palladio, and many loggias and administrative palaces in other cities. The Hôtel-de-Ville at Paris (1546), the town halls of Rheims, Rouen, and other French cities, and even of small towns like Beaugency, erected in the sixteenth century; the great town halls of Antwerp and of several Dutch cities, and the picturesque *Rathäuser* or council halls of Bremen, Nuremberg, Altenburg, Cologne, and other German cities, prove that there was still opportunity for effective and beautiful municipal buildings. Fountains were also multiplied, often of great elaboration and sculptural splendor. (See Fountain.) In the seventeenth and early eighteenth centuries there developed a remarkable movement for the embellishment of cities by the decorative treatment of open squares and spaces. Of this movement the piazza in front of Saint Peter's, with its colonnades, obelisk and fountain, and the Piazza del Popolo, both at Rome, and the Place de la Concorde and Place Vendôme at Paris, are the finest examples. It was in the eighteenth century that a new era of municipal architecture commenced in Germany with the transformation of Berlin under Frederick the Great, followed by that of Munich in the first half of the nineteenth century, and then by that of Vienna, and that of Paris by Baron Haussmann under Napoleon III. New classes of buildings were developed and erected: museums, picture and sculpture galleries, halls of fame, theatres, and public educational buildings. Every style of architecture was employed, but mainly the neo-classic and neo-Renaissance. The triumphal arch again came into vogue. Great boulevards became the fashion. The old-fashioned narrow streets were discredited, even in Italy. The sun was let in everywhere.

Recent Development. Europe. Of the more recent development of municipal architecture, Paris, Vienna, and Budapest stand out as the most conspicuous examples; but Berlin, Munich, and other German cities, Rome and Naples, and in less degree many other cities in Europe have undergone a process of architectural remodeling. The great operations undertaken by Napoleon III. in Paris under Haussmann's direction included not only the reform of the city's street-plan, but also the erection of many public buildings. This work, interrupted by the fall of the Empire, was resumed under the Republic, and has been steadily prosecuted ever since, at the joint expense of the city and State. The new Opera House, the reconstructed Palais de Justice, the Tribunal de Commerce, the completed and remodeled Louvre, the Saint-Michel Fountain, and since the war of 1870-71 the new Hôtel-de-Ville, Sorbonne (university), and Ecole de Médecine, the demolition of the ruined Tuileries and creation of new gardens on its site, the two new art palaces, and the Alexander III. and other bridges, are the monuments of this remarkable activity. So the new Reichstagsgebäude (Parliament-house), the Museum, the various columns of victory and other monuments, including the recently built Sieges-Allee, at Berlin; the squares and modern public buildings of Munich, the new town hall at Hamburg, indicate the tendencies of German taste in municipal buildings and embellishments; while in Austria-Hungary the marvelous rebuilding of the central portion of Vienna and the more recent architectural enterprises in Budapest are equaled only by the transformation of Paris under Napoleon III. While the architectural treatment of the Viennese public buildings (the Gothic Town Hall, the classic Parliament-house, the Renaissance University, museums, art institute, the Hoftheater, etc.) leaves something to be desired, the general effect is highly impressive by its stateliness and grandeur of disposition along a single splendid street, the Ringstrasse. In Great Britain nearly every important city has in recent years either rebuilt portions of its more overcrowded districts on improved plans, or erected new town halls, exchanges, public baths, schools, and museums; and the English architects have developed in these public works an architectural style of considerable interest and character, quite different from the modified French Renaissance style which has more generally prevailed elsewhere. Italy, though backward in many respects in this field of architecture, has not only remodeled some of the worst-crowded districts of Naples and Rome, but has embellished many of her cities with public buildings in modern style, established new parks and public gardens, and in some cases completed the unfinished façades of ancient buildings—notably that of the Cathedral of Florence (1883-89). The embanking of the Tiber (1879-1900) in Rome, the construction of new bridges, the building of 'arcades' or glass-roofed streets of monumental design, flanked by attractive shops (as at Milan, Naples, etc.), and the erection of railway termini sometimes of considerable architectural splendor, are further evidences of municipal activity.

United States. In the United States municipal architecture has until recent years had little to show worthy of serious consideration. While the first fifty years of independent national existence witnessed the erection of many noteworthy Federal and municipal buildings, especially custom houses and State Capitols, these were, for the most part, indifferently placed, with no adequate approach or surroundings. The public buildings of American cities—town halls, railway stations, schools, courthouses, and administrative offices—were cheap and commonplace, or pretentious and ugly. Only rarely, as at Washington, Savannah, and Charleston, has there been until recent years even the semblance of any recognition of the art of municipal planning, or of the importance of artistic treatment alike in the design and setting of public buildings. The rectangular street-plan was universally accepted as the ideal arrangement. Of late, with the general awakening of the art instinct in the United States, stimulated by the object lessons afforded by several great 'expositions' (Chicago, Omaha, Buffalo), there has begun a widespread reform in municipal architecture, of which the new plan for the improvement of Washington, the proposed adoption of the 'group system' for the public buildings of Cleveland, Ohio, the new park system of Boston, and the proposed remodeling of the Chicago lake front, are a few out of many evidences. Recent town halls, exchanges, university buildings (Columbia, New York University, University of Pennsylvania, Washington University, Leland Stanford, Jr., and California universities and others), public libraries, court-houses, and railway stations in the United States are excellent structures architecturally, and give promise that the ugliness of American cities is to be greatly mitigated if not done away with in the near future.

MUNICIPAL ART SOCIETIES. Societies in the United States which take their name from the purpose of their organization, which is the promotion of municipal art, i.e. art as applied to cities. They seek in a general way to beautify cities. Among the means advocated to this end are the planning of cities with regard to artistic beauty, as well as to the needs of traffic; the planting of streets with trees, and the restriction of the billboard nuisance; the increase in the number and size of parks, especially in the congested districts; worthy sites and beautiful architecture for public buildings, and their decoration with statuary and mural painting; the embellishment of the city with statues, monuments, and other works of art—things which have long been esteemed essential in European cities. These ideas are promoted by local societies, like the Municipal Art Societies of New York, Chicago, Baltimore, Cincinnati, etc., the Fairmount Park Association of Philadelphia, and by the American Park and Outdoor Association. Among the achievements of the movement have been the official appointment of Municipal Art Commissions, composed principally of artists, by New York and Chicago, with general supervision over public buildings, monuments, and other artistic undertakings; the enactment of legislation, both State and local, against the billboard nuisance in Chicago; the appointment of commissions of experts to devise comprehensive plans for the growth of Washington (1901) and similar proposals for New York (1903). Two volumes of *Municipal Affairs* are devoted to the movement, vols. ii. and iii. (New York, 1898-99). Consult also C. M. Robinson, *The Improvement of Towns and Cities* (ib., 1900); *Modern Civic Art* (ib., 1902).

MUNICIPAL DEBTS. In a strict sense of the word, debts incurred by municipalities. When, however, the total municipal indebtedness of a country is being discussed, particularly in comparison with State or national debts, the indebtedness of all minor civil divisions is generally included. Municipal debts are divided into bonded or funded, and floating, and the latter may be divided still further into temporary loans in anticipation of revenue and obligations due for material furnished or services rendered. Bonded indebtedness, as a rule, so far exceeds floating indebtedness that the latter is frequently ignored in ordinary discussions.

History, Objects, and Methods. The development of municipal debt is for the most part coincident with the expansion of municipal functions, an expansion which began with the nineteenth century and was particularly active during the decades between 1850 and 1870. A factor which contributed largely to the growth of American municipal debts was the aid given to railway enterprises. Many municipalities so burdened themselves with debt for the sake of assisting in the construction of railways through their limits, that for many years they were obliged to forego the most essential public improvements. Such railway aid was granted by rural as well as by urban communities.

Railway assistance aside, the chief objects for which urban communities issue bonds are the opening and paving of streets, the construction of water-works, sewers, bridges, schoolhouses and other public buildings, and lighting. Counties, in some sections, issue bonds for bridges and for highway improvements. Finally, school districts, chiefly those located in rural sections, issue bonds to raise money to construct schoolhouses. Obviously, loans in anticipation of taxes, and floating debts, may have their origin in almost any of the various needs of the municipality. Loans in anticipation of revenues are usually raised on notes or tax certificates. Obligations for material and for labor or other personal services, or for amounts due on contracts, are frequently acknowledged by warrants on the general treasury, or on some special fund; and such warrants become negotiable paper. When the cost of specifically local improvements, like paving or sewers, is met by special assessments on the property directly benefited, and the collections are delayed or distributed over a series of years, the obligations are met in a variety of ways, ranging from warrants to short-term bonds. In negotiating municipal loans, bonds are commonly sold, after public advertisement, to the highest bidder. Temporary loans on notes are commonly effected at banks.

The financial principles involved in a consideration of municipal debts are in most respects similar to those already set forth under Debt, Public; and Finance. Municipal bonds are issued for definite periods and the best and common practice is to provide in advance for their payment at maturity. Formerly such provision was made through sinking funds, but for a number of years past there has been a growing tendency to pay off municipal bonds in installments. This plan obviates the necessity of administering a number of special and rapidly accumulating funds, which sometimes present financial difficulties, and are always subject to diversion on the part of unscrupulous or ill-advised municipal officials.

In fixing the term for which municipal bonds are to run, it should be borne in mind that since municipal bonds are issued to distribute the expense of certain improvements over a number of years, the term of the bonds issued should bear some relation to the probable life of the improvement involved. Street pavements, for instance, require renewal in from ten to twenty years; it would therefore be a gross mistake to make bonds issued to cover their cost run forty or fifty years. Land purchases, on the other hand, involve a class of property that appreciates rather than depreciates as time goes on; it might accordingly be permissible to pay for them by an issue of long-term bonds. Another important factor in fixing the life of bonds is the character of the undertaking to which the proceeds are to be devoted. Water-works, for instance, produce a revenue, and not only may, but should be self-supporting. The means are therefore at hand to pay off the debt, and the sooner this is accomplished the quicker can water rates be reduced or the service improved. Schoolhouses produce no revenue; and this fact affords a reason, but not necessarily a sufficient one, for making the life of the bonds co-terminous with the probable useful life of the structure.

The interest rates on municipal bonds have fallen from 6 and 7 per cent. a few decades ago to 3½ and 4 per cent. as a normal figure for the bonds of municipalities of good standing. The premiums generally received virtually lower the interest rate, often to a considerable extent.

Debt Limitations. The interests of borrower and lender combine to make necessary some limit to the amount of indebtedness which a municipality may incur, and the purposes for which money may be borrowed. Considering the latter first, it is obvious that permanent loans should never be made to meet current expenses, although occasionally it may be necessary or wise to fund a floating debt that, through bad financiering, has grown beyond ordinary revenues. Public loans to aid private enterprises are generally held to be against public policy, and are unconstitutional in some States. As to the amount of indebtedness which a municipality may incur, prudence demands that this be kept so low as not to overburden the taxpayer with interest and other capital charges, or, in the case of productive undertakings, the patrons thereof. Even where there are no constitutional, statutory, or charter limits on indebtedness and taxation, there is a practical limit to the burden of taxation which the citizen will bear. But most municipalities are subjected to definite limitations as to debt and taxation. Such limits vary widely in different countries and States, and even among the cities of a single State. It is generally some percentage of the assessed valuation, but as the relation of this to the actual value of the property assessed varies widely, comparative debt limits are likely to be very misleading, unless supplemented by explanatory statements. In general, it may be said for the United States that the legal debt limit ranges from 3 to 10 per cent. of the total assessed valuation, although some cities are subject to no legal limitations in this respect. Where the limit is by statute instead of constitution, appeals for its extension or for exemptions on account of certain classes are frequently made to the Legislature. Water-works bonds are quite often exempted from computations of the debt limit, and recently there have been efforts in several States to exclude from the debt limit all bonds issued for revenue-producing works. In Great Britain some classes of loans are subject to the sanction of Parliament, and the control of other classes has been deputed by Parliament to the Local Government Board. This body has a well-organized staff of experts; it gives formal local hearings on applications for specific loans and grants or withholds its consent to the applications. On the Continent of Europe there is some central control of debts in at least Prussia and France. The nearest approach to central control of loans in the United States is found in Massachusetts, but its exercise is due primarily to sanitary rather than financial safeguards. Legislative permission to make water-supply and sewerage improvements is seldom if ever granted in Massachusetts unless the plans for the proposed work are approved by the State Board of Health.

STATISTICS. Reliable comparative figures of municipal indebtedness are even more difficult to obtain than a comparative summary of debt limitations. The debts of individual cities, especially when reduced to a per capita basis, can be interpreted intelligently only when accompanied by statements regarding tax rates, the extent to which the cost of municipal improvements is met by special assessments, and especially by data as to the character and extent of the services rendered to the citizens by the municipality. Low per capita bonded indebtedness is not necessarily advantageous to citizens and taxpayers, since it may mean that the city in question is either without improvements, or that its water-works, lighting service, bridges, and even sewers, are owned by private companies.

The municipal debts of some of the large European cities in 1888-89 are given by Fairlie* as follows (condensed and rearranged):

CITY	Amount	Per capita
Brussels	$56,000,000	$280
Paris	443,000,000	160
Manchester	79,000,000	150
Liverpool	43,000,000	90
Amsterdam	40,000,000	80
Birmingham	60,000,000	86
Glasgow	43,000,000	59
Munich	25,000,000	55
London	243,206,515	54
Leipzig	17,500,000	40
Berlin	66,219,175	37
Lyons	14,000,000	32
Cologne	10,000,000	29
Bordeaux	6,000,000	24

* Credited by Fairlie to Cadeaux, *Les Finances de Paris. Statistisches Jahrbuch der Deutschen Städte*, VIII. Paul Dubois, *Essai sur les Finances Comraunales.*

According to the English Local Government Board reports, the local debts of England and Wales increased from £92,820,100 in 1874-75 to £252,135,574 in 1896-97, whereas in the same period the debt of the United Kingdom decreased from £768,945,757 to £640,773,697. In other words, the local debt increased in twenty-two years from 12.07 to 39.35 per cent. of the national debt. Fairlie (see bibliography) states that in England the municipal debt trebled from 1875 to 1898, and that in France it increased by two-thirds between 1868 and 1899.

For the United States local debt statistics by cities, States, and for the whole country were given in the Tenth and Eleventh Censuses (1880 and 1890). Beginning with 1899, the United States Department of Labor has devoted a large part of its September Bulletin, each year, to "Statistics of Cities," among which it includes bonded, floating, total, net, and per capita net debts, sinking funds, and legal borrowing limits for cities of 30,000 population and upward. The bulletin for 1902 contained figures for the fiscal year preceding (1900-01, 1901, and 1901-02, according to local conditions) for 137 cities. The per capita net debts (figured on estimated populations) range from $1.48 for San Francisco to $115.57 for Newton, Mass. The average is not given. In connection with the low debt of San Francisco, it should be noted that the water-works and lighting plants are owned by a private company, and that in many respects the city is backward in public improvements. Newton, on the other hand, is a very progressive city. Selecting the largest city in each group of ten, the table following has been compiled from the 1902 bulletin.

Of the 137 cities in the original list, 23 report no sinking fund, and an equal number report no debt limit. Providence, R. I., is allowed to contract debts up to 30 per cent. of its assessed valuation and sinking fund combined, and Norfolk, Va., may go as high as 20 per cent. of the assessed valuation. The lowest limit is 2½ per cent. of the assessed valuation.

BIBLIOGRAPHY. Adams, *Public Debts* (New York, 1890); Fairlie, *Municipal Administration* (New York, 1901); the works noted under DEBT, PUBLIC, and FINANCE; United States Census Reports for 1880 and 1890; September Bulletins, United States Department of Labor (beginning 1899); British Local Government Board Reports (annual); and the semi-annual "States and City Supplement" to the *Commercial and Financial Chronicle* (New York). The latter contains abstracts of constitutional and legislative provisions regarding municipal debt limits.

DEBTS AND LEGAL BORROWING LIMITS OF FOURTEEN AMERICAN CITIES

(Compiled from *Statistics of Cities*, United States Department of Labor, 1902)

	Estimated population, 1902	Debt				Legal borrowing limit, per cent.
		Bonded	Bonded and floating	Net (total less sinking fund)	Net per capita	
New York, N. Y.	3,583,930	$426,174,823	$432,481,295	$311,140,375	$86.82	10 *
Pittsburg, Pa.	333,500	23,278,702	24,422,156	18,596,793	55.76	7 †
Indianapolis, Ind.	182,500	3,855,735 ‡	4,051,735 ‡	4,051,735 ‡	22.20 ‡	2 †
New Haven, Conn.	112,000	3,429,500	3,884,500	3,823,594	34.14	§
Cambridge, Mass.	94,084	8,374,500	8,374,500	6,374,916	67.76	2½ ¶
Wilmington, Del.	78,500	2,161,399	2,232,393	2,232,393	28.44	§
Somerville, Mass.	63,500	1,461,000	1,761,000	1,761,000	27.73	2½ ¶
San Antonio, Texas	55,500	2,271,000	2,542,827	2,451,052	44.16	8 †
Waterbury, Conn.	48,139	1,570,000	1,570,000	1,495,123	31.06	none
Lincoln, Neb.	42,500	1,566,988	1,861,833	1,812,426	42.65	none
Springfield, Ohio	40,000	893,846	938,846	938,846	23.47	none
Johnstown, Pa.	40,000	534,500	534,500	439,174	10.98	2 ‖
Topeka, Kan.	34,500	1,110,390	1,110,390	1,101,120	31.92	none
Canton, Ohio	33,000	969,189	1,017,169	1,003,289	30.40	none

* Of assessed valuation: excluding water debt. † Of assessed valuation. ‡ Including $856,209 assessment bonds. § Controlled by State legislature. ¶ Of average assessed valuation for three years. ‖ Of assessed valuation; may be 7 per cent. by vote of people, for general city purposes, also an equal amount for school purposes.

MUNICIPAL GOVERNMENT. The administration of the affairs of a city, town, borough, village, or other minor civil division of a State, but generally restricted to the government of pure municipal corporations as opposed to *quasi* municipal corporations, such as counties, townships, and school districts. Municipal government seldom reaches its fullest development outside of the larger cities, but numerous municipal activities are often undertaken in progressive urban communities of only a few thousand inhabitants. Since the municipality is the creature of the State, it follows that its form of government, its various activities, and its powers are not only derived from the State, but are also subject to alteration or repeal at its will. The municipality has a direct and far more intimate relation with those subject to its government than does the State, supplying many wants common to its inhabitants, and performing or supervising the performance of many services which outside of the municipality are left to private enterprise.

In some of these respects, as in the exercise of the police power, the care of the public health, the administration of charity, and the administration of local justice, the municipality is actually the agent of the State, and discharges duties of interest to the State at large; in others, as in the furnishing of water or light, the State permits the community as a whole to act as a local organization for the satisfaction of purely local needs of interest to the community only. The almost phenomenal growth of the urban population during the last half century has greatly increased the importance of municipal government, and at the same time multiplied its difficulties. About three-fourths of the population of England and Scotland now live under conditions of urban life, while in the older parts of the United States the town dwellers outnumber the country dwellers. For the origin and nature of the legal powers of municipalities, see Municipality; see also the general article Government. For the history, growth in population, and certain economic, social, and political phases, see Cities.

Municipal government may be considered under four main heads: (1) Functions; (2) organization; (3) finance; (4) public policy.

Municipal Functions. The functions of a municipality include all the public activities of the city, whether direct, such as laying out and maintaining streets, or indirect, such as regulating traffic and maintaining order on the public thoroughfares. These activities are many and complex, and frequently overlap, but they may be grouped as follows: (1) The so-called public utilities, which include ways and means of communication and transportation, together with the supply of light and water to the inhabitants; (2) disposal of wastes; (3) protection of life, health, and property; (4) charities and correction; (5) education; (6) recreation; (7) municipal housing. The provision of *ways and means of communication and transportation* is one of the first and most obvious functions of municipal government. Its basis is the public streets, upon the surface of which all land traffic moves, beneath which are placed pipes to bring in municipal supplies and to carry out wastes, and either above or below which are wires for transmitting messages. As an aid to the movement of street traffic, it falls within the duties of the municipal government either to provide street railways or to see that they are provided and properly operated by private enterprise. In many of the English and Scotch cities the street railways have been constructed and are owned by the municipality itself, although it is a common practice to lease them to a private company for operation. In the United States this is usually a function of private enterprise, subject to the supervision of the city. Where waterways are involved, bridges and perhaps ferries must be provided, and frequently docks, wharves, and harbors as well. Bridges are now almost always built at public expense, and are as free to all as the streets, but sometimes bridges are owned by private companies, and sometimes, but rarely in large municipalities, toll is charged for the use of the bridges. The construction and control of harbors is not a municipal function in the United States, and in other countries their care is generally a function of the national government. Municipal docks are far more common than municipal harbors. Where docks are required, they often are or may be an important source of revenue; but the first consideration should be to afford every facility for the speedy and cheap handling of goods and passengers. The relation of municipal government to the telephone and telegraph service is chiefly regulative, especially in the United States, and thus far extends but little beyond the police control of the electric wires involved.

One of the most important municipal services is the supply of water for household and industrial purposes, for fire protection, and for sewer and street flushing. The lighting service, like the water supply, is both for public and private use. The light furnished may be either in the form of gas or electricity. Almost everywhere at present the water and lighting supplies are municipal functions, although they may be intrusted to private companies. Municipal markets for the sale of meat and other food supplies are frequently maintained for the sake of both convenience and sanitation. The sanitary aspects of cattle markets, abattoirs, and slaughter houses are of great importance. Consequently, where markets are not provided, the municipal health authorities exercise, or should exercise, a rigid supervision over private markets, and also over the various foods prepared or exposed for sale therein. The supply of such articles as milk and ice to the inhabitants is left to private enterprise, but on sanitary grounds is usually subject to regulation by the municipal government.

Wastes. By far the greater part of the large quantity of water supplied to the modern municipality must be removed again in a more or less befouled condition. All American, many British, and the largest Continental cities have found water to be the best vehicle for removing excreta, and as a result we have the modern sewerage system, which carries away this dangerous waste together with the water otherwise befouled by domestic use. The surface drainage from roofs, yards, and streets may be removed with the sewage, or else in separate conduits. The food wastes of the kitchen and table, consisting of decomposable organic matter, and commonly known as garbage, require separate disposal; and the same is true of ashes, waste paper, and other rubbish. Street dirt must be collected and removed, and the streets must be sprinkled to keep down the dust which is inevitable even with the best sweeping. All these are municipal functions which cannot be left to private enterprise. Finally, the human dead must be considered under the general head of wastes, and cemeteries must be provided for burying or crematories for burning the bodies. Cemeteries are frequently, but crematories rarely, owned by municipalities. The other services included under the heading, in so far as they are performed with regularity and system, are almost invariably rendered by the municipality, either directly or by contractors at its expense and under its supervision.

Protection of Life, Health, and Property. The protective functions of a municipal character include the work of the police, the courts, the fire department, and the board of health, together with the building inspection service, and the provision of public baths, wash houses, and water closets. *The charities and correction service* includes poor relief and the maintenance of asylums and reformatories. *The educational service* embraces not only the work of the common schools preparatory to the college, but manual training, and sometimes technical education, night schools, vacation schools, libraries, and museums. The municipality in undertaking the work of elementary education and poor relief is acting as the agent of the State, and is subject to more or less central control so far as these activities are concerned. *The recreation service* includes the establishment and maintenance of parks, playgrounds, gymnasiums, together with the provision for public concerts and lectures. The three first named institutions might also be included under both education and health service, while concerts and lectures may be included under education as well as recreation. *Municipal housing* is practically unknown in America, but is a marked feature of municipal activity in Great Britain. It has arisen partly through the demolition of whole blocks of unsanitary houses, which seemed to make necessary a provision for rehousing the ejected tenants, and partly from a desire to afford municipal aid in the efforts being made by philanthropists to improve the home condition of the working classes. The houses built at municipal expense are generally designed to provide living places thoroughly sanitary in their construction and appointments for the poorest class of self-supporting wage-earners.

Organization. The successful administration of the many and varied activities just outlined demands a degree and character of organization resembling in some respects that of a large private corporation. In the government of States it is common to divide the functions of government as well as the officials who discharge them into three groups—the legislative, the executive, and the judicial. The same general plan might be followed in considering municipal government, but separation into these three branches is by no means so easy, on account of the greater overlapping of municipal functions. The judicial power, except as it is exercised by municipal mayors, is more a State than a municipal function, and will not be further considered, except to note the existence of municipal police courts for the prompt trial of persons arrested for misdemeanors or crimes. The legislative functions of municipal governments are exercised primarily by the council, and the executive, by various officers and boards, with the mayor as the chief executive officer. Some of the executive boards possess *quasi*-legislative powers, while others, such as boards of health, exercise both legislative and judicial functions. The mayor's duties are legislative, judicial, and executive. He often presides over the meetings of the council, casts the deciding vote in case of a tie, usually has the power to veto ordinances, appoints officials, supervises the affairs of the city, hears and passes upon charges involving possible dismissal of officials, and sometimes acts as a judge of municipal courts. In the United States the mayor is elected by popular vote, though formerly he was quite generally elected by the council; elsewhere he is commonly appointed either by the city council or by the central government. (See Mayor.) In extent of power the mayors of the United States rank first, and there is a strong tendency to increase their powers and responsibilities. In point of training the mayors of Germany take the lead; in that country the mayoralty is a profession, and a successful officer is promoted from one city to another and larger as his ability and reputation increase. In all countries the mayor is the chief representative of the city, but in Great Britain alone the office is mainly one of dignity and honor. In that country the mayor is a member of the council and presides over its meetings, but he does not possess the veto power. The importance of the mayor's office in the United States is largely due to the control which he exercises over legislation through his power of veto, and to his power of appointing and removing executive officers. The latter power is generally subject to approval by the council, but it is in freedom from this restriction that the growing importance of the office chiefly consists. The extension of the power of appointment is significant because it diminishes the number of officials elected by popular vote, as well as the number chosen by the council, and combined with the power of removal, which is coming to be generally granted, enables the mayor to shape municipal policy and to direct the manner in which that policy is carried out. The later municipal charters quite generally grant the mayor the power to appoint the various heads of departments, except the chief financial officer, who is usually elected by popular vote. Aside from the exercise of judicial power involved in the removal of officials for cause, mayors do not usually act as judges except in the United States and Great Britain, and in these countries their judicial functions are chiefly in the capacity of justices of the peace. In the larger cities of the United States this function is seldom exercised by the mayor, and in some sections it is entirely lacking; but it may still be found in force in Delaware, in the Southern States, Indiana, Iowa, and elsewhere. See Mayor.

The Council. The powers and duties of the city council vary greatly in the different countries of the world, and quite as much so in the several commonwealths of the United States, or even in the cities of a single State. Germany leads in the comprehensive control of its councils over municipal affairs, and Great Britain ranks next in this particular. The German councils control schools and charities, which in Great Britain are under two sets of quite independent authorities, but while the German councils are in some respects subject to the board of magistrates, including the head magistrate, the burgomaster or mayor, and while the latter has other important functions, the English council has full local control within its sphere. The French municipal councils, unlike those of Germany and Great Britain, have few or no administrative powers, their control being limited chiefly to the appropriation of money and questions of policy. In the United States the councils formerly closely resembled those of Great Britain, and frequently had control of charities and of other municipal activities, but one by one many of their powers have been taken from them and bestowed on the mayor or else on independent boards. Among these boards may be mentioned water, sewerage, street, park, fire, police, and health boards, or combinations of two or more of these into a single board. Again, single-headed departments, more or less independent of the council, have been created by municipal charters or by special legislation. The financial control of some of these new bodies has been left with the city council, at least to the extent of making or withholding appropriations, and borrowing money by means of bond issues. In Great Britain and the United States the councils are restricted to the exercise of those powers specifically or impliedly authorized by the State, and implied powers are seldom so construed as to warrant permanent loans, purchase of land, erection of buildings, or other public works. On the Continent of Europe grants of municipal authority are far more general and limitations specific, but the central government exercises a general control and supervision over the municipalities unknown in the United States, and rarely if ever practiced in Great Britain. In the latter country, however, the Local Government Board, in sanitary matters, and the Board of Trade, in the case of municipal enterprises which produce revenues, pass upon loans, and by their power of granting or refusing authority for these they exercise no little control over municipal councils. The council in the United States, particularly in small cities, is generally a single-chambered body, elected by districts, but there are numerous instances of a select council, or Upper House, the members of which are frequently elected by a larger constituency than those of the Lower House, or by the city as a whole, and sometimes serving for a longer term. In England the council sits as one body, but it is composed of councilors elected by the people and of aldermen chosen by the council, usually from its own membership. (See GREAT BRITAIN.) In Continental Europe there usually is but one chamber of councilors, and frequently the members are elected on a general ticket. As a rule, the councils in European countries are far larger than those in the United States, containing from 50 to 150 members, and in one case, Budapest, 400 members. In the United States, even where two chambers exist, there are rarely over 50 to 60 members, but Philadelphia is a notable exception, with nearly 200 members in both branches. The tenure of municipal councilors is from one to four years in the United States; three years for councilors and six years for aldermen in Great Britain; four years in France and Spain; five years in Italy; six years in Austria, Prussia, Hungary, Holland, Belgium; and nine years in Bavaria. In most of the European countries provision is made for periodic renewal of the council. The usual rule is renewal by thirds or halves, annually, biennially, or triennially, according to the length of the term. The most universal legal qualification for councilmen, aside from age, is residence. In America councilmen must not only reside in the city which they represent, but, by written or unwritten law, within the district which elects them. In France any taxpayer is eligible, even though not a voter, provided the number of non-resident councilmen does not exceed one-fourth the whole. In England taxpayers residing within fifteen miles of the municipality may be elected for any district thereof. Property qualifications for a portion of the members of the council are required in European countries, but in a few cities, including Dresden and Leipzig, half of the membership must be from non-property-holders. In the United States property qualifications for membership in the council were formerly quite common, but are no longer required. In all countries the work of councils is largely done by committees, and this is particularly true of those countries where the council has large powers and duties, which doubtless accounts for the large bodies in Great Britain and elsewhere in Europe. In Chicago and in most small cities the presiding officer of the council is the mayor. In other large American cities there is usually a president of the council elected by the city at large. In Europe the council usually elects its own presiding officer. Generally speaking, members of municipal councils receive no salary and frequently service is compulsory. In a number of the large cities of the United States, however, members receive pay ranging from a small per diem allowance to $2000 a year, which is the amount paid to members of the New York Council.

EXECUTIVE BOARDS AND OFFICERS. These range from the mayor and council committees to the more or less independent boards and commissions so common in the United States, and on down to minor officials acting under these officers. The number and variety of services which these boards and officials perform has been partly indicated in the enumeration of the city's functions. In cities where the council is supreme, the committees of that body exercise large executive powers. Great reliance, however, is placed on trained executive officers selected by such committees or by the council as a whole for the various departments of municipal activity. Outside of the United States such officials are seldom chosen by popular vote, but in this country it is not uncommon to choose many of these officers by popular election. Minor positions are, of course, filled by the board concerned or by the chief executive officer responsible for the work undertaken by the appointee, rather than by popular election or by the council. The town clerk is the most important official in an English municipal corporation. Besides his duties as recording officer of the council and general secretary of the municipality, he acts as legal adviser of the council and as custodian of records. His tenure of office is frequently for life, he receives a high salary, and he is a trained official much as is the mayor of a German city. The city clerk in the United States is never an officer of such training and importance. Generally he is simply a recording officer to the council, or perhaps a kind of mayor's assistant. Legal advice to the municipal authorities in the United States is given by an officer styled the corporation counsel, and suits are prosecuted and defended by a city attorney, although the two classes of service may be rendered by one man, and the names vary in different localities. The city engineer is everywhere a trained man, and municipal engineering has become a distinct branch of the engineering profession. In the large cities the legal and engineering work is so extensive and important as to require large staffs of experts. This is also the case in the financial department, using the latter term to embrace all the executive officers employed in assessing, collecting, and disbursing money, and in maintaining a check on collections and disbursements.

FINANCE. Under this head *Ordinary Revenues* include the proceeds of taxes, special assessments for benefits, like the frontage tax for street paving, and various licenses and fees. *Extraordinary Revenue* includes money from loans, bond issues, and trust funds or bequests. Some cities of Continental Europe receive no little revenue from landed property, and the cities of Great Britain and Germany, and a few in the United States, derive considerable revenue from municipal franchises. Where municipal ownership prevails in British cities effort is often made to turn into the common treasury a revenue for the reduction of the general tax rate. In the United States a portion of the revenue from water-works, and less frequently from municipal industries, is sometimes applied in a similar manner. The taxing power is generally limited to the council, the chief exceptions being the education and poor authorities in Great Britain, which have an independent power of taxation. In the United States the councils often have to raise large sums by taxation for independent boards, and also for the county and for the State. It is common for the independent boards to incur bonded indebtedness without consulting the council, but only as the authority, in general or specific terms, is granted by the State Legislature. The sub-departments under the general head of finance are tax assessors, who place a valuation on taxable property; a board of review or appeals from the rulings of the last-named officers; tax collectors; the treasurer, who receives money from the collectors; the disbursing officer or controller, who issues or approves warrants for the payment of bills and claims; and the auditing department. In some cities, particularly the smaller ones, the treasurer is also the disbursing officer, and the council instead of a controller may approve claims. The *municipal budget*, or the estimate of receipts and expenditures upon which the tax rate and appropriations are based, is prepared according to various methods. In general, the several departments make up their respective estimates, and these are amended by the mayor, or by a special board created for that purpose, and sent to the council for further amendment and final ratification.

CITY CHARTERS. The municipality being a mere creature of the State, its area, powers, and form of government are laid down by the Legislature in the form of (1) a specific act or charter; (2) a given act for cities of a given class; or (3) a series of either general acts relating to groups of cities or to all municipal corporations; or (4) special legislation on any subject and at any time that suits the wishes of the Legislature. Strictly speaking, the first only is a city charter, but the other grants of power have the same general effect, except that 3 and 4 are successively more confusing and less satisfactory than 1 and 2. In the United States city charters may or may not be, as the Legislature sees fit, submitted to popular vote for approval. Frequently both charters and charter amendments are so submitted, and where general municipal corporation acts prevail the transition from one class to another is generally by popular vote, but it may follow from an increase in population. As a rule, voters of a municipality have some voice or influence in framing new or amending old charters, except perhaps where general legislation prevails. This participation goes so far in some cases as to permit the framing of the designed changes by an authorized charter commission or to the adoption of changes requested by the municipal officials. In Missouri, California, and Washington, charter-making is virtually under the control of the municipality, subject to more or less specific legislative restrictions. Far more commonly, the respective legislatures pass enabling acts, which may or may not be in the nature of charter amendments, and leave their adoption to the popular vote.

OTHER MUNICIPAL PROBLEMS. A comprehensive term used in discussions of municipal affairs is *Municipal Reform*. This is nothing more or less than an effort to secure honest and efficient municipal government. The problem varies with each locality, and even changes in a given locality from year to year. The bane of municipal government is partisan politics. The remedy for bad municipal government, from whatever cause, invariably lies with the citizens and taxpayers, who are often too indifferent to their own interests, or at least to the public interest, to insist on good government. A decided reform in municipal affairs was effected in Scotland in 1833, and in England and Wales in 1835, as a result of agitation directed against incompetent and corrupt borough government. The reform acts of the year named were supplemented from time to time, and in 1882 a consolidated municipal corporations act was passed. In 1888 another act was passed, providing that cities and towns of more than 50,000 inhabitants should be administrative counties, and also creating a more unified government for Greater London, known as the London County Council. In 1900 this unification was carried still further, but only to the extent of reducing by consolidation into some fifteen borough governments a large number of minor authorities. In the United States the progress of municipal reform, as reflected by changed methods of administration, is difficult to trace. This is largely due to the many independent State legislatures controlling municipal affairs, to the great variations of practice within each State, and to the spasmodic efforts for reform. One of the notable steps in many States has been the adoption of constitutional amendments, from 1850 to 1880, prohibiting special acts of the Legislature which apply to a single municipality. Other great agencies of municipal reform in the United States have been the various local reform organizations, notable among which have been the good government clubs, and their federation into the National Municipal League.

(See subhead *Charters,* above.) Other organizations whose annual proceedings are noted below (see *Bibliography*) have played an important part in municipal reform.

The need for *Municipal Specialists* becomes more and more imperative as the muncipal activities increase in number and complexity. Mayors in Germany, city clerks in England, and city engineers in all countries are already a distinct professional class, stimulated by the prospect of advancement to more important cities as their abilities increase. Sanitary or health officers, professional accountants, superintendents of water supply and other public works are also rapidly gaining in professional ability, and public recognition of such ability is likewise increasing.

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MUNICIPALITY, or MUNICIPAL CORPORATION. A town or city possessed of certain privileges of local self-government; also the governing body in such a town. Municipal institutions date back to the Roman Empire. The provincial towns of Italy, though subjected to the rule of a Roman official, were allowed to enjoy the right of regulating their internal affairs. A class of the inhabitants called the *curia,* or *decuriones,* elected two officers called *duumviri,* whose functions were supposed to be analogous to those of the consuls of the Imperial city, and who exercised a limited jurisdiction, civil and criminal. There was an important functionary in every municipality called the *defensor civitatis,* or advocate for the city, the protector of the citizens against arbitrary acts on the part of the Roman governor. The municipal system declined with the decline of the Empire, yet it retained a fair degree of vitality, and rose to renewed life in union with feudalism, and with the Anglo-Saxon institutions of Great Britain. Indeed, some cities of Italy, France, and Germany have derived their present magistracy by direct succession from the days of Imperial Rome, as is notably the case with Cologne. The bishop, as the shield between the conquerors and the conquered, in many cases discharged the duties or obtained the functions of the *defensor civitatis.* To the north of the Alps, under the feudal system, he became officially the civil governor of the city, as the count was of the rural district. In Southern Europe, where feudalism was less vigorous, the municipalities retained a large share of freedom and self-government. Of the cities of the Middle Ages, some were entirely free. Venice, Genoa, Florence, Hamburg, and Lübeck all stood in this position. Next in dignity were the free Imperial cities in Germany, which, not being comprehended in the dominions of any of the princes, were in immediate dependence on the Empire. Most of these cities rose to importance in the thirteenth century, and their liberties and privileges were fostered by the Holy Roman emperors to afford some counterpoise to the growing powers of the immediate nobility. The chief organs of government in the German cities were the councils, usually one for deliberation and a smaller one for administration, both being chosen from the various trade and artisan guilds. There were also from two to four burgomasters in each city who presided over the council meetings. The Italian cities were governed by executive officers known as consuls, usually twelve in number. By the side of these were a council and a general assembly of the citizens. During the contest between the Italian cities and the Emperor an officer, called the *podestà,* was put in control of the cities which the Emperor succeeded in subjecting to his authority. Other cities, seeing the advantage of a single executive, voluntarily introduced this officer in place of the consuls. In Southern France the Italian consular system existed, but occasionally the *podestà* appears as the chief municipal officer. In the northern part of France the *maire* and *échevins* were most frequently the governing authorities of the towns.

Before the Norman Conquest the English

burghs were subject to the rule of an elective officer called the 'portreve,' who exercised in the burghs functions similar to those of the shire-reve in the shire. The Normans recognized the already existing privileges of the towns by granting them charters. One of the most important of these privileges was the *firma burgi,* or lease of the town to the inhabitants in consideration of the payment of a fixed sum in lieu of all feudal dues. This involved the right of the inhabitants to elect their own magistrates, the independent exercise of jurisdiction in their payment of the local taxes, and the performance of the quota of taxes assigned by Parliament. A sheriff or viscount was placed by the King over each shire, and a bailiff instead of the former elective officer over each burgh. In the larger towns the bailiff was allowed to assume the Norman appellation of mayor. The municipal franchise seems to have been vested in all the resident and trading inhabitants, who shared in the paymentof the local taxes and the performance of local duties. Titles to freedom of the town were also recognized on the grounds of birth, apprenticeship, marriage, and sometimes free gift. In all the larger towns the trading population came to be divided into guilds or trading companies, through membership of which admission was obtained to the municipal franchise. Eventually the whole community was enrolled in one or other of the guilds, each of which had its property, its by-laws, and its common hall, and the community elected the chief officers. It was on the wealthier and more influential inhabitants that municipal offices were generally conferred; and it gradually became the practice for these functionaries to perpetuate their authority by coöptation. Contentions and disputes arose regarding the right of election, and eventually the Crown threw the weight of its influence into the scale of self-elective ruling bodies. This was the period of incorporation, when charters were granted incorporating not the inhabitants of the town, but the governing body. No new governmental powers were conferred, but the corporations were given the right to hold property and to sue and be sued. The desire of the Crown to control the representatives which the towns were now allowed to send to Parliament led to a reckless policy of granting municipal charters, so that presently the urban communities were overrepresented in Parliament. During the period of the early Stuarts the writ of *Quo Warranto* was used frequently to deprive the towns of their liberal charters, with a view to replacing them with charters of a less liberal type, in order that the Crown might the more easily control the Parliamentary representation of the towns. The burghs of Scotland had a history much like that of the burghs of England; their earlier charters were mere recognitions of already existing rights, and were granted to the inhabitants at large. In the course of the fourteenth and fifteenth centuries the municipal suffrage fell more and more into the hands of restricted bodies of men until an act of 1469 gave to the councils the right of appointing their successors, the old and new council together electing the office-bearers of the corporation. This state of things continued till 1833, not without much complaint. In the Scottish burghs the several trades possessed a much more exclusive monopoly than in England. Along with the outcry for Parliamentary reform arose an outcry for municipal reform; and a separate municipal reform act putting an end to the close system was passed for each part of the kingdom.

In the United States the English system of municipal administration became the type for the government of the early towns and cities. In nearly every instance a special organization was provided for the cities and was outlined in a charter granted by the colonial legislature or by the Crown. Generally the governing body of the municipality consisted of the mayor, recorder, aldermen, and councilmen. At first the corporation seldom acted as the agent of the State, but was an organ for the satisfaction of purely local needs, such as the management of local property and finance. It had no power of government except the right to issue local police ordinances. Gradually, however, the municipal corporation came to be an organ for the administration of matters of State concern, as well as of purely local matters. Thus the regulation of matters relating to public education, the public health, poor relief, elections, local justice, etc., is quite generally intrusted to the municipalities. As now understood, therefore, a municipal corporation in the United States is a body politic and corporate created by the State for the purpose of State administration as well as of local administration, and vested with certain privileges, such as the right to hold property, to sue and be sued, etc. The transformation of the municipality from an organ of local government to an organ for the administration of central matters created the necessity for legislative control, which has had the result of depriving the cities to a very large extent of the management of their local affairs. The corporation is not the body of the people, nor is it the officers collectively considered, but rather that artificial body or legal entity created by the act of incorporation and limited thereby. A distinction must be made between a municipal corporation proper and what are known as *quasi* corporations not created upon petition of the people of the district, but rather as territorial or political divisions of the State, such as counties, townships, and school districts created for the convenience of State administration. The laws regulating the incorporation of English towns and cities have little application to municipal corporations in this country. Here none are founded on common law or royal charter, and but few are based upon prescription. It may be said that they exist only by legislative enactment, and possess no powers not created by statute. A few municipal corporations are created by charter singly, but general laws of incorporation have been passed in many States, and at the present time the constitutions of more than twenty States forbid the Legislature to incorporate cities and, as a rule, villages by special act. In twelve of these the prohibition extends also to amendments or changes of charters. When the incorporation is single or special the charter sets out that the inhabitants are constituted a body politic with such a name and style; that by that name they may have perpetual succession, and may use a common seal, sue and be sued, etc. The territorial boundaries are defined and provision made as to the form of government—usually by a council made up of aldermen and councilmen, or by trustees—as to division into wards, qualifications of voters, powers of city council to collect debts and impose taxes, etc. General laws of municipal incorporation usually start by abolishing all special charters existing and establishing general regulations for the incorporation, government, and regulation of municipal corporations throughout the State. Frequently such laws classify the towns to be incorporated as regards their importance into cities of first or second grade, towns, and villages. To become operative, the charter granted by the Legislature must be accepted by the body of citizens to be incorporated.

When established the municipal corporation is, in the absence of constitutional provisions to the contrary, completely subject to the power of the Legislature; thus it has been held that the latter may repeal charter provisions, allowing the licensing of liquor dealers, and even such as relate to police regulations. In other words, a municipal charter is not a contract, and may always be altered or revoked, with the important exception that the rights of existing creditors must not be disregarded. The Legislature has general control over public property; thus it may authorize a railroad to occupy streets of a city without its consent and without payment therefor. But the courts are beginning to hold that the municipalities may also own private property which is not directly devoted to governmental purposes, and which is no more subject to control of the Legislature than the property of private individuals. Such are wharves, cemeteries, ferries, libraries, parks, hospitals, etc. The Legislature cannot deprive the municipality of property of this kind, or direct that it shall be applied to other purposes, as, for example, that land used for a city reservoir shall be converted into a public park. The power of the municipality to alienate its public property without legislative authorization has generally been denied by the courts, although the right to dispose of private property as it sees fit has been readily conceded. It is also a general rule that the public property of a municipal corporation is not subject to execution in satisfaction of a judgment. No exact form of words is necessary to give force to the charter, and the corporation may even be created by implication, as where powers and privileges are conferred upon the inhabitants of a locality which cannot be enjoyed or exercised without acting in a corporate capacity.

The powers which may be exercised by a municipality are such as are expressly granted in the charter, such as may be fairly implied therefrom, and such as are essential to the declared objects and purposes of the corporation—not simply convenient, but indispensable. Any fair or reasonable doubt concerning the existence of a power claimed is resolved by the courts against the corporation. That is to say, the rule of strict construction applies. In some of the recent decisions, however, there is evidence of a tendency to depart somewhat from this rule in the direction of conceding to municipal corporations wider powers, especially as regards the management of public utilities. Thus it has been held that a municipality which has the right to establish an electric light plant for lighting the streets may without an express grant from the Legislature distribute lights to private families. Where the city is given discretionary power upon any subject it is not for the courts to say whether such discretion has been wisely used or not, unless fraud is shown or the discretion is being manifestly abused to the oppression of the citizen. Thus, if it have power to open new streets or grade old ones when necessary for the welfare of the city, the question of necessity is one for the determination of its own authorities. But when a municipal corporation is empowered to take certain action for others, and it is beneficial for them to have it done, the law requires that it should be done, although the language is merely permissive in form. Among the principal powers usually conferred upon municipal corporations may be mentioned the right to acquire and hold such property as may be necessary to the proper exercise of other powers granted, the right of taxation and of eminent domain, the appointment or election of officers, the maintenance of local courts, the enactment of ordinances, and the maintenance of actions in the courts. Many special powers are given, such as relate to the incurring of loans, special assessments, licenses, police regulations, wharves, ferries, entertainment of guests, etc. It is a general rule of construction that the legislative power conferred upon municipal corporations cannot be delegated to other authorities, nor can they divest themselves of it in any manner whatever. The power to act for the general welfare of the city is usually granted, in addition to other powers expressly enumerated. Under this grant it is generally held that municipal corporations may pass such ordinances not inconsistent with other provisions of the charter or the laws of the State as may be expedient in maintaining the peace, good order, safety, and welfare of the community. Thus they may enact ordinances to provide for a proper observance of the Sabbath, for the closing of saloons at night, for restraining domestic animals from running at large on the streets, for the suppression of vagrancy, for the prevention of cruelty to animals, etc. But the 'general welfare' grant does not authorize the municipality to levy taxes of any kind. As a result of their contractual powers, however, municipalities may incur debts, provided they are to be paid out of the ordinary income of the city for the current year. The better opinion seems to be that in the absence of a specific grant municipalities may borrow money where it is necessary to the successful existence of the corporation, or where its non-exercise would render inoperative and incomplete privileges granted. Where the Legislature imposes a duty on municipal corporations which necessarily involves large expenditures the power to borrow may be deduced. It has been held that where the city had express power to establish meat markets, a fire department, or a liquor dispensary, the power to borrow could be implied as a necessary means for carrying out these undertakings. It may be laid down as a rule, however, that municipal corporations have no general borrowing power or power to issue negotiable paper in evidence of debts without legislative authorization. The constitutions of many States contain provisions limiting the amount of indebtedness which municipal corporations may incur. The prohibition is usually construed to apply to indebtedness of all forms. It is, however, held by some courts that contracts for meeting the ordinary expenses of the municipality and in anticipation of receipts do not create an indebtedness within the meaning of the limitation. A municipality cannot escape liability for its obligation arising *ex delicto* by pleading that its indebtedness has reached the constitutional limit. Those who contract with a municipality whereby its indebtedness is increased do so at their own risk. If, therefore, an individual lends money to a city which has no legal power to borrow he cannot recover it by pleading ignorance of the powers of the city. But where municipal bonds contain recitals that the city is acting within its constitutional power, and has complied with all the requirements of the law, it will be estopped from disputing the truth of such representations as against a bona fide purchaser of the bonds.

The legislature has no power to enact legislation which will have the effect of impairing the obligation of a contract between the city and a private party. Thus it cannot so limit the taxing power of a municipality as to render it impossible for the city to meet its ordinary expenses and pay interest on its outstanding bonds. On the other hand, the legislature has no power to authorize a municipality to levy taxes for other than public purposes. Thus it cannot authorize the granting of aid by a municipality (if it involves taxation) to a private enterprise to enable it to begin business, since that would amount to taking private property without compensation. Among the public purposes for which a municipality may levy taxes may be mentioned the construction of sewers, the laying out of parks, the establishment of water-works, etc. Moreover, the legislature cannot levy a special tax upon the inhabitants of a municipality for other than strictly municipal purposes. Thus it cannot require them to defray the expenses of improving a navigable stream or to take stock in a railway company, although they may be required to build a local canal or levee. The city may be compelled by mandamus to fulfill its obligations to private parties, as where it refuses to levy a tax for the purpose of paying interest on its outstanding bonds or for the satisfaction of judgments against it. The city may be enjoined from doing an injurious act to an individual or from committing trespass upon his premises. Furthermore, it may be enjoined at the instance of a taxpayer from violating the law or doing other acts prejudicial to the general welfare, as where the city proposes to enter into a contract which will create an indebtedness in excess of the constitutional limits. Municipal officers may also be proceeded against under a writ of *quo warranto* for usurping powers not legally conferred upon them. In the United States the practice of frequent interference in the affairs of the cities by the legislature has led to so many abuses that in most of the recent constitutions provisions have been inserted prohibiting the legislatures from passing special acts which apply to a particular city when a general law can be made applicable. These provisions, however, have frequently been evaded by arranging the cities into classes in such manner that a particular city will constitute a class by itself and by making the act applicable to a single class. The practical difficulties of dispensing entirely with special legislation has led the courts in some instances to sustain the constitutionality of methods of classification which seem unreasonable if not ludicrous. Where a part of a municipality is detached from the main body of the city the old corporation retains all the liabilities and private property of the city if no provision to the contrary is made by legislation. Property of a public character falling within the limits of the new corporation passes into its control, the theory being that there has been no transfer of title, but simply a change of trustee. A new municipal corporation, embracing substantially the same boundaries as the old, is regarded in law, as the successor of the old, entitled to all its property rights and subject to its liabilities. Upon the repeal of the charter of a municipal corporation a court of equity will lay hold of its private property and administer it for the benefit of the creditors of the corporation. It is a general rule of construction that if the existence of a municipal corporation is not questioned by the State it cannot be put in issue by a private individual in a collateral proceeding.

In discussing the liability of municipal corporations for torts it is necessary to distinguish between the two classes of powers which they exercise, viz. public governmental functions on the one hand and private corporate functions on the other. When acting in the former capacity municipal corporations are acting as the agent of the State and are governed by the rules of public law, one of which is the irresponsibility of the government for the tortious acts of its agents. When acting in a private local capacity, primarily for the advantage and benefit of the locality, the municipal corporation is subject to the rules of the private law, according to which it is held liable for the torts of its officers. The rule of liability for torts does not apply to *quasi* corporations, such as counties, townships, school districts, etc., because they are agencies of the State created for the purpose of State administration, and usually without solicitation or concurrence of action of the inhabitants. The principal torts which are imputable to municipal corporations when acting in the latter capacity are negligence, non-compliance with the statutes, nuisance, and trespass. The courts have generally held that municipal corporations are not liable for failure to exercise discretionary legislative power which may be conferred by the legislature or for the manner in which they may exercise it if done in good faith. Thus, it is not liable for its neglect to abate a nuisance, as where an individual was injured by an explosion of fireworks which the municipality was authorized to prohibit. But where the duty is ministerial and absolute the corporation becomes liable for the injury arising because of failure to perform it, and where it positively licenses something which constitutes a nuisance it will be held liable for any injuries that may result therefrom. In the exercise of a discretionary power, as in the construction of a sewer, the city will not be held liable for injuries resulting from defective service unless it results in the positive invasion of an individual's property and unless it can be shown affirmatively that the municipality has been guilty of negligence. It is a general rule that a municipal corporation is not liable for injuries arising from neglect or failure to enforce strictly its ordinances for the good government of the city, but an act of the Legislature making the city liable for property destroyed by mobs has been held to be constitutional. In the exercise of its police powers the city is not generally liable for the acts of omission of its agents, as where a policeman shoots a bystander while attempting to kill a dog running at large. The same is true of negligence on the part of the fire department and of the health department. In all these cases the municipality is acting in its public governmental capacity as an agency of the State. In the management, however, of institutions not directly connected with the function of government, such as wharves, gas and water works, markets, and wash-houses, municipal corporations are held liable for injuries that may result therefrom, the theory being that in this capacity the corporation is engaged in private business, from which often a revenue is derived. It is also a general rule that municipal corporations are responsible for the management of streets. The rule, however, does not apply to *quasi* corporations in the management of public highways. This is due to the fact that, unlike pure municipal corporations, they are engaged chiefly in the performance of public governmental duties from which they do not generally derive any revenue or particular private advantage. The peculiar rule exists in New England that the property of any citizen of a municipality against which a judgment has been recovered may be seized in execution thereof. Elsewhere the remedy is execution upon the private property of the municipality. Consult: Dillon, *The Law of Municipal Corporations* (Boston, 1890); Jones, *The Negligence of Municipal Corporations* (New York, 1892); Goodnow, *Comparative Administrative Law* (New York, 1893); id., *Municipal Home Rule* (New York, 1897).

MUNICIPAL LAW. To the Romans, municipal law meant the special law of the cities, other than Rome, which were included in the Roman Empire. A *lex municipalis* was a city charter, granting limited self-government in matters of local interest. On the Continent, toward the close of the Middle Ages, the phrase was sometimes used to describe any local law, whether of a city or a province, as contrasted with the general law of Christendom, i.e. the Roman law, civil and canon. Later, with the development of international law, municipal law came to describe local law in contrast with international law. The term is no longer used in this way on the Continent: municipal law now means city law as contrasted with national law; but among English-speaking peoples national law is called municipal in contrast with international law. English municipal law has thus become the very inappropriate description of all the law, written or unwritten, by which England is governed in matters purely English.

The expression 'municipal law' is sometimes, however, employed in the United States in the Continental sense above indicated, to describe the organization of municipal corporations and the local laws enacted and enforced by municipal authorities. It is under this head (municipal corporations), therefore, that information concerning the organization of city, county, township, and village governments, the organization and jurisdiction of local courts, and police laws for the regulation and restraint of vice, may be found. See MUNICIPALITY. Consult the authorities referred to under LAW and JURISPRUDENCE.

MUNICIPAL LEAGUE, NATIONAL. An organization composed of associations seeking to accomplish municipal reform in the various cities of the United States. It was established in New York in 1894, as the outcome of a national conference held in Philadelphia in July of that year to promote the interests of good government. It has no political interests whatever, but confines its operations to the securing of good municipal laws, the appointment of men of integrity and ability to office, and the correction of abuses in municipal methods of government in American cities. The reforms recommended by the League are being tried with considerable success by various municipalities throughout the United States, Cuba, Hawaii, and Porto Rico. The League is also directing attention to the question of instruction in municipal government, in American educational institutions, and to the subject of uniform municipal accounting and statistics. A meeting is held annually to confer and report on the subject of municipal reform.

MUNICIPAL OWNERSHIP. Possession by a municipality or any minor civil division of the State. The term is, however, more commonly limited to public as opposed to private ownership of water-works, lighting plants, street railways, telephone systems, and other revenue-producing industries designed to meet the wants of urban populations. The term generally implies municipal operation as well as ownership, but exceptions are frequent and sometimes notable. The term 'municipal socialism' has sometimes been used in much the same sense as municipal ownership; but it is more inclusive, embracing various efforts to meet the collective wants of a municipality, whether founded on municipal ownership or not. In its broadest sense, municipal socialism would provide for all wants common to the citizens of a municipality, in so far as they were not met by the State. A narrower usage would apply the term more particularly to unusual municipal enterprises, such as the management of coal-yards or bakeries. The term 'municipal trading' has been applied in England to municipal ownership, but it has not gained currency outside of Great Britain.

The services which a municipality may be expected to render its citizens are more comprehensive than those included under municipal ownership, municipal socialism, or municipal trading, as may be seen by referring to the article MUNICIPAL GOVERNMENT. The object of the present article is to consider those undertakings requiring the use of the streets or other public places, and which might be carried on by either municipal or private enterprise, but are actually carried on by the former. Since by their nature such undertakings exclude competition, they are called natural or municipal monopolies. Under either kind of ownership they can be carried on only by authority from the State, in the form of general or special legislation, besides which a private corporation must generally secure the grant of a municipal franchise permitting it to use the public streets. Within the limitations stated the most common objects of municipal ownership are sewerage systems and waterworks, and gas and electric-lighting plants. More rarely street railways, ferries, and telephones are owned by the municipality.

Aqueducts for the supply of the cities of antiquity were the nearest approach to municipal ownership as the term is understood to-day, although from remote times cities have owned lands, improved harbors, built docks, and derived revenues therefrom. But these services were confined to a relatively small number of important cities until the nineteenth century, when water-works, gas-works, electric-light and power plants sprang up with increasing rapidity. At the opening of the twentieth century these services were to be found in practically all the larger and in the majority of the smaller municipalities of the civilized world, particularly in the United States, Great Britain, and to a less extent on the Continent of Europe and in Australia.

The proper scope of municipal ownership is still a subject of debate. Perhaps the nearest approach to a general agreement is (1) that it may rightly embrace all those services which are primarily or largely of a sanitary character, like water supply and sewerage, and (2) that it should be restricted to quasi-public industries, in which private competition is impossible or at best uncertain. Under (2) some draw the line so as to include only imperative and universal needs, the supplying of which is at the same time a natural monopoly. The difficulty with such a limitation is that it varies with local conditions, time, and individual opinions. Thus the demand for public lighting in the larger cities of the present day is far more imperative than was that for a public water supply a hundred years ago, or in some localities to-day. There is a growing conviction that the relative cheapness and efficiency of service are the chief facts to be considered in deciding between public and private ownership, and that local conditions determine whether public or private ownership is the better in these respects. A third point upon which there is more or less agreement is that municipal ownership should not be carried so far as to increase municipal debts beyond prudent limits. So far as revenue-producing municipal works of a monopolistic character are concerned, it is generally possible so to adjust income and expense that the revenue from such undertakings will meet capital charges as well as other expenses. But there is also the possibility that the popular demand for low charges will result in a deficit that must be met from the general tax rate, and with a large number of municipal undertakings to be provided for it is conceivable that this might prove financially embarrassing if not disastrous.

Water-Works. With the exception of sewerage systems, which rarely yield a revenue, water-works are the most common form of municipal enterprise.

The relative decrease in public ownership from 1870 to 1890 was due to the remarkable activity of private water-company promoters at a time when the municipalities were just awakening to the need for such improvements, but lacked the funds for public ownership, or had not become infused with its spirit. In the larger cities municipal ownership is the rule, all but eight of the 38 cities of over 100,000 population (census of 1900) owning their own works at the beginning of 1903. New York, which was first supplied by a private company in 1776, put municipal works in operation in 1842. Chicago was supplied by a company in 1840, and by its own works in 1854. Philadelphia built its works in 1801. At Boston a private company established water-works in 1652—the first public water supply in the United States. A second small company built works in 1796, and continued to operate on a small scale until 1893, when its pipes were bought by the city, which had built works in 1848. The Baltimore works were built by a company in 1807, and bought by the city in 1854. Cleveland built its works in 1854-56. At Buffalo a company established works in 1852 and was bought out by the city in 1868. In San Francisco the water-works are still under private ownership. At Cincinnati a company built works in 1820 and sold them to the city in 1839. Up to the close of 1896 changes from private to public ownership had occurred in 205 cities and towns, against only 20 changes from public to private ownership. There have been many changes to municipal ownership since 1896. In the North Central and Northwestern States municipal ownership is decidedly in the majority, and in the Pacific States the reverse is true. New England is about evenly divided, with Massachusetts strongly in favor of municipal ownership, and Maine even more strongly in favor of private.

In the *United States* in 1801 there were but sixteen works, of which only the plant at Winchester, Va., was owned by the city it served. The development of municipal ownership during the century is shown by the accompanying table:

Number of Public and Private Works in the United States at the End of Each Decade, Beginning With 1800 *

YEAR	Public	Private	Total	Per cent. of total, public
1800	1	15	16	6.3
1810	5	21	26	19.2
1820	5	25	30	16.6
1830	9	35	44	20.5
1840	23	41	64	35.9
1850	33	50	83	39.7
1860	57	79	136	41.9
1870	116	127	243	47.7
1880	293	305	598	49.0
1890	806	1,072	1,878	42.9
1896	1,690	1,489	3,196	53.2

* Compiled from the Manual of American Water-Works for 1897. Figures for 1898, but excluding all places of less than 1000 population by the Census of 1890, published in the Report of the United States Commission of Labor for 1899, show 1787 municipal (53.73 per cent.) to 1539 private works.

In *Canada*, in 1896 municipal ownership prevailed in 75 per cent. of the municipalities having works, or 109 of 145 cities and towns. At Montreal water-works were built by a company in 1801 and bought by the city in 1845. At Toronto private works were built in 1841 and bought by the city in 1873.

In *Great Britain and Ireland*, in 1901, of 64 county boroughs in England and Wales, including the great towns, 45 owned their water supplies, and of the 141 other boroughs 139 had municipal works. All the large towns of Scotland own their works. In Ireland, Dublin and Cork have municipal service. About half the so-called urban districts in England, other than boroughs, have municipal works. Water-works appear to have been introduced by the municipality of London in 1283; by Plymouth in 1585; and Oxford in 1610. Manchester and Liverpool each bought out a private company in 1847, Glasgow in 1855, Birmingham in 1876, and Sheffield in 1888. Edinburgh transferred municipal works to a company in 1819, but they were restored to municipal ownership in 1869. Greater London has been served for years by eight companies, beginning with the New River Company, whose works were completed in 1613 with the aid of James I. The other seven companies date from 1721 to 1822. After years of agitation for municipal ownership, a Parliamentary act was passed in 1902 providing for the purchase of the London companies and the control of the water supply by a joint board representing the several boroughs and the other public bodies comprised within what is known as Greater London. The transfer is to be made in June, 1904.

Most of the large cities of the *European Continent* have extensive water-works. In *Germany* practically all places of 50,000 population and upward have municipal works. Berlin secured control of her water-works in 1873, buying them from a company which began to build them in 1853. Hamburg and Frankfort-on-the-Main, Vienna, Moscow, Paris, Rome, and other large cities own their water-works. The municipal water-works of Rome may be said to date from 312 B.C. (See AQUEDUCTS.) At Paris an old Roman aqueduct was restored in the seventeenth century, and a small municipal supply seems to have been continued from that date until more adequate works were installed by the city about the middle of the nineteenth century. As a rule, private ownership prevails in Latin-speaking countries. In Australia there are a number of important municipal works.

GAS-WORKS. In North and South America these are rarely under municipal ownership, but in Europe they are frequently owned by the municipality.

Of 981 towns in the *United States*, each having a population of 3000 and more by the census of 1900, returns for the close of 1901 showed 21 municipal works; but of these the Philadelphia plant was leased to a private company in 1897, after over fifty years of municipal ownership and operation. Two of the 21 municipal plants supply natural gas. The municipal works at Richmond, Va., were established in 1852.

Of 693 gas-works in *Great Britain and Ireland* reported late in 1901, 240 were owned by the municipalities served, and they supplied barely half the population involved. In 1883 there were only 143 municipal works. With the exception of London, Liverpool, and Dublin, nearly all the large towns have municipal works.

At least 41 of 54 cities of *Germany* having a population of 50,000 and upward have municipal works, and as far back as 1885 figures for the whole country showed 338 municipal to 329 private gas-works. Among the larger cities with private works are Munich, Frankfort-on-the-Main, and Altona.

Municipal works are found in most of the cities of Holland, Norway, Sweden, and Switzerland, and in a few cities of France, Italy, and Australia.

SEWERAGE. Municipal ownership is almost universal, but many countries are practically without sewerage systems for household wastes. It is doubtful if any country is better provided with sewerage facilities than the United States, where 1096 of the 1524 places with a population of 3000 in 1900 reported sewerage systems late in 1901. Of the 1096 places with sewers, private ownership was reported in 47 instances. Most of these sewer companies were in small places; but Atlantic City, N. J., Wilmington, N. C., and Austin, Texas, each with more than 20,000 inhabitants in 1900, were served by sewers owned by private companies.

STREET RAILWAYS. This class of service has been developed since 1850, and up to 1870 was confined chiefly to the United States. Municipal ownership outside of Great Britain is rare, and even there it has sprung up recently. In fact, until 1893 Huddersfield, England, and the railway on the Brooklyn Bridge were the only examples of municipal ownership and operation, the first dating from 1882 and the second from 1883. A few British cities constructed railway tracks and leased them to companies between 1870 and 1893. At the close of 1901 there were 40 municipalities in Great Britain that owned and operated horse or electric street railways, and 27 (including a few in the other list) that owned railways, but leased them to operating companies. Among the 40, such large cities as London, Manchester, and Sheffield are included, but there are also private lines in some of these 40 places. The operation of the railway on the Brooklyn Bridge, New York City, was assumed by a private company in 1898, in connection with the Brooklyn railway service. In 1901 the small city of Grand Junction, Colo., assumed the ownership and operation of a short horse railway line. In 1902 an electric railway at Saint Thomas, Ont., was taken over in like manner. The street railway system of Toronto, Ont., was bought by the city at the expiration of the franchise of a company in 1891. After being operated for a few months by the city it was sold to a company, under a contract providing for conversion, by the purchaser, from horse to electric traction, together with a payment to the city of a percentage of gross receipts increasing with the latter. In other countries than those already named there are a few street railways owned by the city and leased to operating companies. A subway to accommodate street railway traffic in congested districts of Boston has been built by the city and leased to a company, and the same general plan is being carried out on a much more comprehensive scale in New York.

ELECTRIC LIGHTS. This service was started on a practical scale in or about 1880.

Probably the first municipal plant in the *United States* was put in operation in 1882, at Fairfield, Iowa. At the close of 1898 there were in places of 1000 or over by the United States census of 1890, 460 municipal and 2572 private electric-lighting plants. At the close of 1901, in places of 3000 population and over, by the census of 1900, there were 193 cities and towns with municipal and 1190 with private plants, besides 85 cities having both. The largest municipal plants are at Chicago and Detroit; but these, like many other American municipal electric-lighting plants, are for lighting streets and public buildings only.

The first electric-lighting plant in the *United Kingdom* was established by a private company in 1882. The oldest municipal plant was started by Bradford, in 1889. At the close of 1901 there were only 248 works in operation in the United Kingdom, of which 168 were municipal. In addition, 84 municipalities and 31 companies were then installing works. Among the larger municipalities Glasgow bought out a company in 1892, Liverpool in 1897, Leeds in 1898, Sheffield in 1899, and Birmingham in 1900; Dublin built works in 1892, and in 1893 Edinburgh and Manchester did likewise. London is divided between municipal and private ownership, with the latter far in the lead. From the outset municipal ownership of electric-lighting plants has been encouraged by the general Government; and that to such an extent, especially in the earlier years of the industry, as to check the growth of private plants.

On the *Continent of Europe* private ownership of electric-lighting plants seems to be the rule, with some exceptions in the northern part. The works at Berlin were opened by a company in 1886, but the city controls their operation in important particulars, and shares largely in the gross receipts. At Hamburg, Germany, municipal works were put in operation in 1889.

TELEPHONES. This service, like the telegraph, is national rather than municipal in scope, and is generally controlled by large companies, as in the United States, or by the general governments, as in many countries of Europe, in Japan, and in Australia. Tunbridge Wells, England, and Glasgow, Scotland, inaugurated the first municipal telephones in Great Britain in 1901, and early in 1902 some 40 other plants or projects were under way. The English trunk lines are owned by the national postal authorities; municipal telephones are reported at Amsterdam.

FERRIES. In the United States there are about 10 cities with municipal ferries to 70 with private ones, Boston being the most notable example of municipal ownership. In Great Britain a large municipal ferry between Liverpool and Birkenhead is owned and operated by the latter municipality. Public bodies at Glasgow and at Belfast also control ferries. There are a few other municipal ferries in Great Britain.

OTHER INDUSTRIES. The chief additional services that might properly be discussed under municipal ownership, as here considered, are docks and wharves and public markets. The former, particularly on a large scale, are more frequently found in Europe than in America; but New York City has expended many millions on dock construction, and receives a considerable yearly revenue from dock leases. Municipal markets are common in Europe, Australia, and Canada, where they are frequently exclusive in character. In the United States they exist, but they are in competition with private markets. Of cities and towns of over 30,000 inhabitants 129 were reported in 1901 to have municipal markets, but doubtless the list was incomplete, and at the same time it included some outdoor markets or market places. New York, Boston, Baltimore, and New Orleans have large markets, which yield considerable revenue. Subways for electrical wires have been constructed in a number of American cities for lease to the various owners of wires. A few cities have built subways for general use and receive a rental therefrom.

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MUNICIPAL REFORM ACTS, ENGLISH. The various acts passed by Parliament in the nineteenth century aiming to reform the government of the English municipalities. The Parliamentary reform of 1832 having left untouched the notorious abuses in the English system of municipal government, a Parliamentary commission was appointed the following year to investigate exhaustively the general condition of municipal corporations throughout the Kingdom. A monumental report was made by the commission showing that the municipal governments were in the hands of self-elected cliques; that the corporate funds were wasted; that public improvements were almost wholly neglected; that the municipal courts were corrupted and prostituted for party purposes; and that the whole system of municipal institutions as then constituted was a source of weakness rather than of strength to the country at large. The report of the commission was followed by the Municipal Corporations Act of 1835, which has been well called "the great charter of English municipal freedom." By this act 178 boroughs were reformed, 125 others given corporate privileges, and provision was made for the remedying of many defects, and the correction of the most notorious abuses of the municipal system. It admitted to the franchise all property-owners and occupiers of property rated at £10 per annum, and established a uniform system of municipal organization. This scheme provided first for an elected council, varying in size according to the population of the borough; the council was to be a bicameral body, the Upper House consisting of a certain number of aldermen elected by the council. The act further provided for a mayor to be chosen by the body of councilors and aldermen from among their own members. The mayor, aldermen, and councilors were to constitute the full municipal governing body. The chief features of this act have remained as the framework of the English municipal constitution (see GREAT BRITAIN); although the various acts of Parliament, passed from time to time, modifying in unessential particulars the municipal structure made a consolidation and revision of the statutes necessary. This was accomplished by the consolidated municipal code of 1882. By the Local Government Act of 1888 the municipal constitution was modified to the extent that cities and towns with a population of 50,000 inhabitants were made distinct counties for administrative purposes, the municipal councils assuming all duties which would otherwise devolve upon county councils. Consult: Chalmers, *Local Governments* (London, 1883); Goodnow, *Comparative Administrative Law*, vol. i. (New York, 1897); Shaw, *Municipal Government in Great Britain* (ib., 1895). See MUNICIPAL GOVERNMENT; MUNICIPALITY.

MUNK, muŋk, HANS (1589-1628). A Danish navigator, born at Elsinore. In 1619, by order of King Christian IV., he set out with two ships to discover the northwest passage to the Indies. He penetrated Davis Strait as far north as 69°, and then turned southward and spent the winter on Chesterfield Inlet. Cold, famine, and scurvy destroyed so many of his men that when he regained the coast of Norway in September, 1620, only two persons besides himself survived. He sailed on a second voyage in 1621, and upon his return in 1623 reported that he had reached 75° north latitude, and had seen an open sea beyond. An account of his first voyage was published at Copenhagen in 1623, under title of *Efterretuing af navigatinonen og reisen til den Nye Danmark af Styrmand Hans Munk.*

MUNK, HERMANN (1839—). A German neurologist. He was born at Posen, studied at Berlin and Göttingen, and in 1862 became docent in the former university. Seven years afterwards he was promoted to assistant professor of physiology, and in 1876 he was placed at the head of the physiological laboratory in the veterinary college. In 1897 he became full professor in the university. Besides studies on the productive methods of threadworms, Munk wrote on the physiology of the nerves and especially on the brain: *Untersuchungen über das Wesen der Nervenerregung* (1868), and *Ueber die Funktionen der Grosshirnrinde* (2d ed. 1890).

MUNK, SALOMON (1805-67). A French Orientalist. He was born in Glogau, Silesia, of Jewish parents, studied at Berlin, Bonn, and Paris, and in 1840 was made custodian of Oriental manuscripts in the Paris National Library. He accompanied Montefiore and Crémieux to Egypt, bringing back many valuable manuscripts. Although he had become blind, he was in 1865 appointed professor of Hebrew, Chaldee, and Syriac in the Collège de France. He was a member of the Académie des Inscriptions et Belles-Lettres, and published an edition (with French translation) of Moses ben Maimon's *Guide of the Perplexed* (1856-66). His further works include *Palestine* (1845) and *Philosophy Among the Jews* (1848).

MUNKÁCS, mụn'käch. A town of Hungary, situated on the River Latorcza, about 70 miles east-southeast of Kaschau (Map: Hungary, H 2). It has manufactures of coarse cloth. In the vicinity are mined alum, iron, and crystals. The fortress of Munkács, situated on a rock near the town and used as a prison, is noted for its many sieges, especially for its defense against the Austrians, to whom it surrendered in 1688 after a siege of three years, the garrison having been commanded by Helen Zrinyi, the wife of the patriot leader Tökölyi. Population, 1900, 14,416.

MUNKÁCSY, mụn'kä-chē, MICHAEL (1844-1900). An Hungarian historical and genre painter, whose real name was Michael Lieb. He was born at Munkács, February 20, 1844, the son of a petty official, became an orphan at an early age, and in 1855 was apprenticed to a joiner. After several years of hard work and privation, chance threw him in the way of the portrait-painter Szamossy at Gyula, who aided and befriended him, as did also the landscape painter Ligeti, at Budapest, whither Munkácsy had gone in 1863. A small grant from the art society there enabled him to study for a year (1865) at the Academy in Vienna, after which he proceeded to Munich, where he studied under Alexander Wagner, and found a special protector in Franz Adam, the battle painter. In 1868 he went to Düsseldorf to work under Knaus. Two years later his first important picture, "The Last Day of a Condemned Man" (in the collection of Mrs. W. P. Wilstach, Philadelphia), took Paris by storm, bringing him the gold medal. His future was forthwith assured, and in 1872 he took up his residence in Paris, where for several years he continued to depict episodes from the popular life of his native country with impressive truthfulness and a sombre, blackish coloring. In 1876 he entered upon a new field, painting a series of charming Paris interiors, in which he adopted a richer coloring, but his most important production of this period was "Milton Dictating Paradise Lost" (1877, Lenox Library, New York). It was not, however, until 1881 that he reached his own ideal with the completion of the now world-famous "Christ Before Pilate" (John Wanamaker, Philadelphia), which has become one of the most widely discussed pictures of recent times. It was exhibited all over Europe and in the United States in 1886, on which occasion Munkácsy visited New York. In 1884 he painted his second biblical subject, "Christ on Calvary," like its predecessor replete with dramatic life, treated in the light of history with ethnographic reality and supreme coloristic vigor. It also was brought to America in 1887, and the artist's next important work, "The Last Moments of Mozart" (1886), a touching representation of the dying composer rehearsing his famous *Requiem*, found its way into the collection of Gen. Russell A. Alger, Detroit, Mich. His subsequent creations were of a decorative character, and comprise the "Apotheosis of the Fine Arts," for the Art-Historical Museum in Vienna, and "Arpád Taking Possession of Hungary" (1896), for the new House of Parliament in Budapest. The strain and disappointments connected with this work brought on a mental disease, and the artist passed the last three years of his life in the sanitarium at Endenich, near Bonn, where he died, May 1, 1900. Many of the prominent public and private collections of the United States contain examples of his paintings. Consult: Tahi, in *Die Kunst für Alle*, xv. (Munich, 1900).

MUNN, ORSON DESAIX (1824—). An American journalist and lawyer, born in Hampden County, Mass. He was educated at the Monson Academy. In 1846, in conjunction with Alfred E. Beach (q.v.), he bought the *Scientific American*, which had been founded six months before. In 1876 he began to issue the *Scientific American Supplement*, and in 1885 he established a monthly *Architects' and Builders' Edition.*

MÜNNICH, mụ'nĭk, BURKHARD CHRISTOPH, Count (1683-1767). A Russian general and statesman, born at Neuenhuntorf in Oldenburg, Germany. In the War of the Spanish Succession, he served as captain of Hessian troops. He became a colonel in the Polish army in 1716, entered the Russian service in 1721, and six years afterwards became general. He was created commander-in-chief of the Russian army by Peter II. in 1727, and in 1732 was made field marshal and president of the War Council. He played a distinguished part in the war with Turkey, overran the Crimea in 1736, and advancing beyond the Dniester, made himself master of Moldavia. After the death of the Empress Anna Ivanovna in 1740, he opposed the party of Biron, the Regent, whom he overthrew. The regency was conferred on Anna Karlovna (q.v.), mother of Ivan, the young heir to the throne, and Münnich became Chief Minister and the most powerful man in Russia. After the coup d'état which placed Elizabeth Petrovna on the throne (1741), Münnich was arrested, and the sentence of death passed upon him was changed only at the foot of the scaffold to exile in Siberia, where he remained for twenty years. Peter III. restored to him his estates in 1762, and he was made director-general of the Baltic ports by the Empress Catharine. Consult: Halem, *Geschichte des Feldmarschalls Grafen Münnich* (Oldenburg, new ed., 1838).

MUÑOZ, mōō'nyōth, Juan Bautista (1745-99). A Spanish historian, born at Museros, Valencia, and educated at the University of Valencia. His leading work was *Historia del nuevo mundo* (1793), which Charles III. had commissioned him to write. It follows the course of American discovery down to 1500. The council of the Indies, to which he had been appointed cosmographer (1770), forbade its publication; but Charles IV. sanctioned it, despite the author's revelations concerning the atrocious treatment of the aborigines by Spaniards in the New World. Some writings of Muñoz are to be found in vol. lxii. of the *Biblioteca de autores españoles* and elsewhere in the collections of the Academy of History, Madrid, but many of his manuscripts were burned in the library of Valencia when that city was stormed by the French (1812).

MUNRO', Hugh Andrew Johnstone (1819-85). An eminent English classical scholar. He was born in Elgin, Scotland, was educated at Trinity College, Cambridge, and was from 1869 to 1872 the first university professor of Latin at Cambridge. His edition of Lucretius (4th ed. 1885), with commentary and prose translation, remains one of the standard English contributions to Latin scholarship. His edition of Horace (1868), containing a valuable introduction, and his *Criticisms and Elucidations of Catullus* (1878) are also highly esteemed. He contributed to the *Journal of Philology* and other learned periodicals, and wrote much Greek and Latin verse.

MUNRO, Neil (1864—). An English novelist, born at Inveraray, in Argyllshire, Scotland, June 3, 1864. He was educated at the parish school, and subsequently entered the office of the Glasgow *Evening News*. He is the author of admirable tales and romances dealing with life in the Scottish Highlands. They include: *The Lost Pibroch* (1896); *John Splendid*, which gained him his reputation (1898); *Gilian, the Dreamer* (1899); and *Doom Castle* (1901).

MUNRO, Sir Thomas (1761-1827). A Scottish major-general, Governor of Madras, born and educated in Glasgow. He was noted as a civil ruler, beginning with his appointment to the newly acquired district of Baramahal. Afterwards he was made Governor of Canara, and then of Ballari, Cuddapah, Karnul, and the Palnad, where his wise rule was most effective in quelling disorder. He established the ryotwar system of land tenure now in vogue throughout a large part of British India, whereby peasants may hold property by paying a land tax to the State. In 1819-26 he was Governor of Madras.

MUNROE, mŭn-rō', Charles Edward (1849—). An American chemist and educator. He was born at Cambridge, Mass.; graduated from the Lawrence Scientific School in 1871, and in the same year became assistant in chemistry. From 1874 to 1886 he was professor of chemistry at the United States Naval Academy, and then devoted himself to the study of explosives. In 1886 he was appointed chemist to the torpedo corps at Newport, R. I., and in 1892 received a chair in chemistry and the post of senior dean in Columbian University. Munroe invented a smokeless powder, and attained an international reputation as an authority on explosives. His publications include *An Index to the Literature of Explosives* (1886).

MUNROE, Kirk (1856—). An American writer of books for boys, born near Prairie du Chien, Wis. He studied civil engineering at Harvard, and while professionally engaged on the routes of the Northern and the Southern Pacific railways gained material for many of his tales. Afterwards he worked for various newspapers in New York City, and was the first editor of *Harper's Young People* (1879-82), but on his marriage with a daughter of Amelia Barr, the novelist, went to reside in southern Florida, a district that colored his writings, which include: *The Flamingo Feather* (1887); *Dory Mates* (1889); *The Fur Seal's Tooth* (1893); *At War With Pontiac* (1895); *With Crockett and Bowie* (1897); *Under the Great Bear* (1900); and *The Belt of Seven Totems* (1901).

MUN'SEE. A subtribe of the Delaware (q.v.), originally constituting one of the three great divisions of that tribe and dwelling along the upper streams of the Delaware River, and the adjacent country in New York, New Jersey, and Pennsylvania. They were considered the most warlike portion of the tribe and assumed the leadership in war councils. From their principal totem they were frequently called the Wolf tribe of the Delaware. They were prominent in the early history of New York and New Jersey, being among the first tribes of that region to meet the whites. By a noted fraudulent treaty known as the Walking Purchase, the main body was forced to remove from the Delaware River about the year 1740. They settled on the Susquehanna, on lands assigned them by the Iroquois, but soon afterwards moved westward and joined the main Delaware tribe on the Ohio River, with whom the greater portion eventually became incorporated. A considerable body, who were converted by the Moravian missionaries, drew off from the rest and formed a separate organization, most of them removing to Canada during the Revolution. Others joined the Ojibwa and Stockbridge Indians. The majority were incorporated in the Delaware, with whom they participated in their subsequent wars and removals. Those who still keep the name of Munsee are in three bands, two of which are consolidated with other tribal fragments, so that no separate census is available. These tribes are the Munsees of the Thames, Ontario, Canada, 120; Munsee (or Christian), and Chippewa, northeastern Kansas, 90; and Stockbridge and Munsee, Green Bay Agency, Wis., 530. Those of the United States are officially reported as civilized and entirely competent to manage their own affairs. The mixed band in Kansas has dissolved tribal relations.

MUNSELL, mŭn'sĕl, Joel (1808-80). An American editor, publisher, and antiquary, born in Northfield, Mass. He settled in Albany, N. Y., in 1827, and entered journalism. He subsequently became the editor of various publications, among which were the *New York State Mechanic*, the *Lady's Magazine*, and the *New England Historical and Genealogical Register.* He rendered valuable services to the cause of American history by publishing the *Annals of Albany* (10 vols., 1849-59); *Collections on the History of Albany* (4 vols., 1855-57); and a series of books, some of considerable value, known as the "Munsell Historical Series."

MUNSEY, mŭn′sĭ, FRANK ANDREW (1854—). An American publisher, born at Mercer, Maine. In 1882 he established at New York City *The Golden Argosy*, a children's weekly, which he afterwards changed to *The Argosy*, a monthly for adults. In 1890 he founded *Munsey's Weekly*, which he changed to the monthly *Munsey's Magazine* the next year. He also founded *The Puritan* and the *Junior Munsey*, and afterwards obtained control of the Washington *Times*, the New York *Daily News*, and the Boston *Journal.*

MUNSON, mŭn′son, JAMES EUGENE (1835—). An American inventor, born at Paris, Oneida County, N. Y. He studied for a time at Amherst, then removed to New York City, where he became a court stenographer, a position which he held for more than thirty years. He formulated the Munson system of stenography, an automatic typesetting machine, and a mechanism of operating typewriting machines by telegraph, and published a number of books of phonography.

MÜNSTER, mụn′stẽr. The capital of the Prussian Province of Westphalia, situated in a level district at the confluence of the Aa with the Münster Canal, 65 miles northeast of Düsseldorf (Map: Prussia, B 2). The town is mediæval in appearance, with its ancient gabled buildings, old Renaissance houses, rococo dwellings of the eighteenth century, arcaded markets, and shaded allées. The site of the former fortifications, which divided the old and new towns, has been converted long since into promenades. Münster has many churches, of which two are prominent: Saint Lambert's and the cathedral. The former is a graceful, pleasing structure. It is Gothic, dates from the fourteenth century, has been restored in recent times, and possesses a majestic new tower. The church is associated with the history of the Anabaptists in the sixteenth century. The cathedral is of the thirteenth century, and has some noteworthy features, though none of great interest. The imposing Church of Our Lady also merits mention as well as the beautiful Romanesque tower of the Ludgerikirche.

The Rathaus is a handsome, gabled, Gothic structure. The Peace of Westphalia was signed in it in 1648, in a curious room called the Friedenssaal, which contains portraits claimed to have been painted by Terburg. Among the interesting old buildings are also the Renaissance Weigh House; the Renaissance Stadtkeller, the headquarters of the Kunstverein, with pictures of minor value; and the Schuhhaus, or the ancient guild-hall of shoemakers. The castle was the episcopal residence in former times, and is now occupied by the leading officials of the city. In its grounds is a botanical garden. The Government offices, the law courts, and the attractive Gothic post-office are modern. The splendid modern Ludgerus fountain is adorned with interesting religious statues. The Roman Catholic university, which ceased to exist as such in 1818, when the institution was reduced to a theological and a philosophical faculty (which figured as the Academy of Münster from 1843), was revived in 1902 by the establishment of a faculty of law. Noteworthy also among the many educational institutions are the royal pedagogical seminary, a seminary for priests, and two 'Konvikte.' Münster has a Museum of Christian Art, the Pauline Library, with about 115,000 volumes, and an extensive Roman Catholic gymnasium. There is a notable zoölogical garden, which is much frequented by the citizens, and contains an antiquarian collection. The industrial products of Münster include leather, linen and cotton fabrics, starch, thread, and sugar. There are also carriage works and distilleries. A large trade is carried on in the produce of the country. Carriages and sculptures of stone are exported. The population in 1871 was 24,815; in 1901, 63,776, mostly Catholics.

HISTORY. Münster had its origin in a celebrated monastery which appears as early as the time of Charles the Great. A considerable settlement sprang up around the monastery in the first part of the twelfth century. The town received municipal rights about 1180, and in the course of many years the inhabitants succeeded in vindicating their liberties against their feudal lords, the bishops of Münster. In the thirteenth century Münster entered the Hanseatic League. In the fifteenth century it became a centre of learning and religious life, and during the Reformation suffered greatly from the strife of parties. In 1533 Münster fell into the power of the Anabaptists, whose leader, the celebrated John of Leyden (q.v.), erected the city into a kingdom of Zion with himself as sovereign (1534). The city was taken by the Bishop in the following year, and John of Leyden was put to death. Against the ambitious and warlike Bernhard of Galen, Bishop of Münster, the city carried on a desperate struggle in defense of its rights, but it was finally compelled to submit with the loss of almost all its liberties (1661). The Bishopric of Münster, which held a prominent place among the ecclesiastical States of the old German Empire and embraced a territory of nearly 4000 square miles, was secularized in 1803.

MUN′STER. The largest of the four provinces of Ireland, occupying the southwest part of that country and bounded north by Connaught, east by Leinster, and west and south by the Atlantic (Map: Ireland, C 4). It contains the six counties of Clare, Cork, Kerry, Limerick, Tipperary, and Waterford. Area, 9481 square miles. The population of the province in 1841 was 2,404,460; in 1891, 1,173,643; and in 1901, 1,075,075.

MÜNSTER, mụn′stẽr, SEBASTIAN (1489-1552). A German theologian and geographer. He was born at Ingelheim, studied at Heidelberg and Tübingen, and in 1529 left the Catholic Church for the Reformed. He was professor of theology and Hebrew at Heidelberg until 1536, when he became professor of mathematics at Basel. He edited in 1534 the first Hebrew Bible to appear under the care of a German. But his chief work was his *Cosmographia* (1544), a geography which was translated into Italian, French, and Latin, and passed through twenty-four editions in a hundred years.

MÜNSTERBERG, mu̥n′stẽr-bĕrk, Hugo (1863—). A German-American psychologist, born in Danzig. He received the degree of Ph.D. at Leipzig in 1885 and that of M.D. at Heidelberg two years afterwards, and taught psychology at Freiburg for five years (1887-92). In 1892 he became professor of psychology at Harvard University. He devoted himself mainly to the physiological side of the science, and it was under his supervision that the psychological laboratory at Harvard was organized. His more important publications are: *Die Willenshandlung* (1888); *Gedankenübertragung* (1889); *Der Ursprung der Sittlichkeit* (1889); *Beiträge zur experimentellen Psychologie* (1891); *Psychology and Life* (1899); *Grundzüge der Psychologie* (1900); *American Traits* (1901).

MÜNSTER-LEDENBURG, mu̥n′stẽr lā′den-bo͞ork, Ernst Friedrich Herbert, Count (1766-1839). A Hanoverian statesman. He was born at Osnabrück; studied at Göttingen, and in 1788 entered the governmental service of Hanover. For three years (1801-04) he was Ambassador to Saint Petersburg, and as Cabinet Minister at London immediately afterwards did much to bring about the entente between Russia and England. His foreign policy was marked by deep opposition to Napoleon. In 1813-14 he was at the headquarters of the allied forces, and he was a member of the Vienna Congress (1814-15). In Germany his programme was progressive, but anti-Prussian; the constitution of the Kingdom of Hanover and its formation in the midst of Prussia may be considered typical of his policy. In 1831 Münster retired from office. Consult Hormayr, *E. F. H. Graf Münster* (Jena, 1875).

MÜNSTER-LEDENBURG, Georg Herbert, Graf zu, Freiherr von Grotthaus (1820-1902). A German politician and diplomat, born in London, England. He was educated at Bonn, Heidelberg, and Göttingen, was for a time a member of the first chamber of the Hanoverian Parliament, and from 1856 to 1864 was envoy extraordinary of the Government of Hanover at the Court of St. Petersburg. After the annexation of Hanover to Prussia in 1866 he declared himself pro-Prussian, and from 1867 was a member of the Upper House. He represented Goslar in the Diet of the North German Confederation from 1867 to 1870, and in the German Reichstag from 1871 to 1873. He became Ambassador at London in 1873, at Paris in 1885, and in 1900 retired from the diplomatic service. He wrote several works on contemporary German and Continental public affairs, including *Politische Skizzen über die Lage Europas vom Wiener Kongress bis zur Gegenwart* (1867), and *Der norddeutsche Bund und dessen Uebergang zu einem deutschen Reiche* (2d ed. 1868).

MUNTANER, mo͞on′tȧ-nâr′, En Ramon (1265-1336). A Spanish chronicler, born at Peralada, in Catalonia. On the burning of his native town by the French he became a wandering soldier and minstrel, and for thirty years led an adventurous life. Having returned to Catalonia, he began in 1325 to write in Catalan the history of the princes of Aragon from the time of James the Conqueror to the coronation of Alfonso IV. This chronicle of great events, of which he was an eye-witness, is valuable for the history of his time, and is remarkable for its accuracy, homeliness, epic beauty, and grace. It remained in manuscript until the middle of the sixteenth century. The most ancient editions of the original are those of Valencia (1558) and Barcelona (1562). The former is entitled *Chronica o descripcio dels fets e hazanayes del inclyt Rey Don Jaumes Primer . . . e de molts de sos descendents, etc.* It has been translated into German, Italian, and French. Lanz published an edition of the original at Stuttgart in 1844. Consult also the edition by A. de Bofarull (Barcelona, 1860).

MUNTHE, mu̥n′te, Ludvig (1841-96). A Norwegian landscape painter, born at Aaröen, near Bergen. He was first instructed by Schiertz, a German painter and architect at Bergen, and then became a pupil of Flamm at Düsseldorf, which he subsequently selected for his permanent residence. A thoroughly realistic treatment characterizes his paintings, of which autumn and winter scenes in stormy or gloomy weather, forest and coast views form the prevailing subjects, and which may be judged by such specimens as a "Pine Forest in Winter" (1870), Hamburg Gallery; "Wood Interior in Winter, with Stags" (1878), National Gallery, Christiania, which was awarded the gold medal in Paris; "Birch Wood in Autumn" (1886), and "Autumn in Holland" (1895), both in National Gallery, Berlin.

MUNT′JAC (Javanese name). Any of a genus (Cervulus) of small Oriental deer which dwell solitarily in the jungle, and whose young are spotted. The species best known is that of India, called 'barking deer' by Anglo-Indian sportsmen, or 'kakar' (*Cervulus muntjac*) by the Hindustani. It is a little larger than a roebuck. Its lyrate antlers are peculiar in that they rise from pedicels about five inches high, or as long as the antler itself, and have only one short basal spur. The female has no antlers; nor has she the great exposed upper canine tusks, which, like those of the musk, are the effective weapons of the bucks in their fights. Allied species, some with smaller horns, are found in China and the Malayan islands, and an interesting fossil genus (Amphitragulus), inhabiting Tertiary Europe, was totally hornless in both sexes. See Plate of Fallow Deer, Musk, etc.

THE INDIAN MUNTJAC.

MÜNTZ, mu̥nts, Charles Achille (1846—). A French agricultural chemist, brother of the art critic Eugène Müntz. He was born at Sulz, Alsace, studied under Boussingault in Paris, and, after acting as his assistant for ten years, succeeded him as director of the chemical laboratories in the Institut National Agronomique. Müntz made special research on the feeding of cattle and horses, and, following Boussingault's method, tested his theories by practice on great herds, on Parisian cab horses, and, in the case of his contributions to viniculture, in various vineyards. He founded a Bibliothèque de l'Enseignement Agricole, published the results of his experiments in the *Annales* of the Agricultural Institute, and other chemical and agricultural journals, and wrote: *Recherches sur l'alimentation des chevaux,* with Girard (1884); *Les engrais,* with the same (1888-91); and *Les vignes* (1895).

MÜNTZ, EUGÈNE (1845-1902). A French art critic, born at Sulz, Alsace. He took Taine's place as professor of the history of art at the Ecole Nationale des Beaux-Arts, where he lectured from 1885 to 1893. He made a specialty of Italian art, and the following works are of unique value: *Notes sur les mosaïques de l'Italie* (1874-92); *Les arts à la cour des papes pendant le XVème et le XVIème siècle* (1878-98); *Les précurseurs de la Renaissance* (1881); *Histoire de la tapisserie* (1882); *Etudes sur l'histoire de la peinture et de l'iconographie chrétiennes* (1882); and *Histoire de l'art pendant la Renaissance,* vol. i., *Italie: les primitifs* (1888); vol. ii., *Italie: l'âge d'or* (1892); vol. iii., *Italie: la fin de la Renaissance* (1895); *Léonard de Vinci, l'artiste, le penseur, le savant* (1899).

MÜNZER, mụn'tsẽr, THOMAS (c.1489-1525). A religious enthusiast of the German Reformation, born at Stolberg, in the Harz Mountains. He acquired a good knowledge of theology, taught at Aschersleben and Halle, became in 1519 chaplain of a nunnery at Beutwitz, and in the following year received a call as preacher to Zwickau. There he gained great popularity by his attacks on the monastic and mendicant Orders. In 1521 he was compelled to leave the town, and went to Bohemia, where his preaching, however, met with little sympathy. In 1523 he became pastor at Allstedt, in Thuringia, married a nun who had abjured her vows, and carried on his pastoral work in full sympathy with the advanced representatives of the Reformation. He was an ardent champion of German nationality, and was the first to substitute German for Latin in the liturgy. He stood in close touch with Carlstadt (q.v.) and shared the latter's iconoclastic ideas. In time he developed a fanatic mysticism whose chief tenet was the validity of inner revelation, and he attacked as 'new papists' those reformers who set up the Gospel above personal justification. His ideas partook also of a political and social nature; he preached the speedy coming of God's kingdom on earth, and sought to organize the peasants and the artisans of the towns into secret associations looking, it is asserted, to the destruction of all authority and the establishment of communal property. In August, 1524, he was expelled from Allstedt and betook himself to Mühlhausen, where he joined forces with Heinrich Pfeifer, a renegade monk, who had succeeded in gaining great influence over the lower classes. Together they were driven from the city in September, and Münzer wandered through Southern Germany and Switzerland, forming close relations with the Anabaptist leaders and hastening in no small degree the peasant uprising in those regions. He returned to Mühlhausen in December, and with Pfeifer, who had likewise reëntered the city, assumed leadership of the discontented masses. The old council was overthrown, and a new council was installed under the control of Münzer. Mühlhausen speedily became the centre of a violent agitation. The opposition of the nobles was ineffectual; but at Frankenhausen, on May 15, 1525, Münzer's peasant mob was almost annihilated by the force of Philip of Hesse, the Elector of Saxony, and the Duke of Brunswick. (See PEASANTS' WAR.) Münzer escaped from the battlefield, but was captured at Frankenhausen and taken to the Castle of Heldrungen, where he was put to the torture. On May 25th he was decapitated at Mühlhausen, together with Pfeifer and twenty-four other leaders of the peasants. Fanatic though he undoubtedly was, there is nothing to disprove Münzer's warm love for the common people, whose cause he upheld against Luther, accusing the latter of fawning on the German princes while seeking to appease the peasants with empty words about the responsibility of rulers to God. Consult: Strobel, *Leben, Schriften und Lehren Thomas Münzer's* (Nuremberg and Altdorf, 1795); Seidemann, *Thomas Münzer* (Dresden and Leipzig, 1842).

MUNZINGER, mụn'tsĭng-ẽr, WERNER (1832-75). A Swiss traveler and linguist. He was born at Olten, was educated at Bern, Munich, and Paris, and in 1853 joined a mercantile establishment at Alexandria, Egypt. He was attached to the expedition of Von Heuglin in 1861, but quitted it when it reached North Abyssinia, and in company with Kinzelbach explored an unknown territory. In 1862 he was placed at the head of the German exploring expedition, succeeding Heuglin, but was unable to penetrate farther than Kordofan. In 1864 he was appointed British consul at Massowa, and in the Anglo-Abyssinian War acted as a guide to the English forces, after whose withdrawal he remained at Massowa as consul in the French service. In 1870 he made a journey to Southeast Arabia, and was appointed by the Khedive Governor of Massowa. In 1872 he was made Pasha and Governor-General of the Eastern Sudan, and in 1875 was mortally wounded while leading an expedition against Abyssinia. He published: *Sitten und Recht der Bogos* (1859); *Ostafrikanische Studien* (1864); and a *Vocabulaire de la langue Tigré* (1865).

MUONGS, mo͞o'ŏngz. A people who, together with the Thos, also dwelling in Northeastern Tongking and Annam and the adjoining parts of China, constitute, in the opinion of some leading anthropologists, one of the four chief groups of the Thai stock, of which the Siamese are the best-known members. The Farther Indian Muongs inhabit the basin of the Black River, and the Thos that of the Claire, while the great mass of the primitive population of the Chinese provinces of Kwang-si, Southern Kwei-chow, Northwestern Kwang-tung, Eastern Yun-nan, and perhaps also the Le of the island of Hainan, belong in this group of primitive Thai peoples. The Pueun and Pu-thai of Annamese Laos closely resemble in physical characteristics and language the Muongs of Tongking. A number of the Thos-Muongs tribes have methods of writing of their own resembling those of the Laotians, and apparently not derived from Chinese, even in the case of the tribes of this group resident in China. Like some others of the primitive population of this part of the world, they impress one as being rather non-Mongolian in physical characters. Consult: Colquhoun, *Across Chryse* (London, 1883); Baber, *Travels in Inland and Western China* (ib., 1882-86); Bourne, *Journey in Southwestern China* (ib., 1888); Henry, *Ling-Nam* (ib., 1886); Hosie, *Three Years in Western China* (ib., 1890); Garcin, *Un an chez les Muongs au Tonkin* (Paris, 1891).

MURA, mōō′rȧ. A populous but inferior tribe of Tupian stock (q.v.), residing along the Amazon River, Brazil, from the confluence of the Madeira as far as the Purús. They were formerly very formidable and hostile to the Portuguese, but were completely crushed by the Mundurucú (q.v.) in 1788. Since that time some of them have come into the Portuguese settlements for protection and have acquired a rudimentary civilization; but those of the interior and upon the Purús are still in their original savage condition. Their houses, grouped in small villages, are mere roofs supported upon poles, without walls. They do not cultivate the ground, but live upon fish, game, and wild fruits, using bows six feet long, spears, and well-made canoes. They are much addicted to a sort of narcotic snuff prepared from the seeds of a species of mimosa. They were formerly naked, but those near the settlements now wear clothing. They carry on a trade with the Brazilians in sarsaparilla, turtle oil, and Brazil nuts, in exchange for cotton cloth, knives, spear and arrow heads. They are described as lazy, drunken, dishonest, and quarrelsome, and are among the lowest of all the Amazonian tribes.

MURAD, mōō′rȧd. The name of five Turkish sultans. See Amurath.

MURADABAD, mōō′rŭd-ȧ-bäd′, or **MORADABAD.** The capital of a district of the United Provinces, British India, on an elevation on the right bank of the Ram′ganga, and on the Oudh-Rohilkand Railway, 50 miles northwest of Bareilly (Map: India, C 3). It has two mosques, dating respectively from 1628 and 1636, an American Methodist mission church, built in 1874, and the Anglican Church of Saint Paul. The cantonment and civil administrative offices are on the northwest. Muradabad is noted for its engraved metal ware, and has cotton factories and several printing establishments. There is an extensive trade in the agricultural and other products of the district. The town is administered by a municipal council of twenty-three members, eighteen of whom are elected. Muradabad was founded by Rustam Khan in 1625. The ruins of his fort, with brick walls from four to six feet in thickness, overlook the river. Population, in 1891, 72,921; in 1901, 75,128.

MURÆNA, mū-rē′nȧ. A fish. See Moray.

MURAL CIRCLE. An astronomical instrument formerly used for measuring the declinations of stars. The principle of its construction was somewhat similar to that now used for the meridian circle, by which it has been replaced. See Meridian Circle.

MURAL CROWN. In heraldry (q.v.), a crown in the form of the top of a circular tower, masoned and embattled.

MURAL DECORATION (from Lat. *muralis*, relating to a wall, from *murus*, OLat. *mœrus*, wall). Art applied to the adornment of wall surfaces. Wall painting in fresco, in oils, in encaustic; figured sculpture in low relief, colored or plain, in stone, marble, terra-cotta, or stucco; mosaic compositions, marble incrustations, and sectile work, and wainscoting in carved and paneled woodwork, are the principal modes used for the purpose. The term is commonly made to include also, by extension, the decorative treatment of vaults and ceilings, as well as walls. For details, consult the special articles, such as Fresco, Mosaic, Byzantine Art, and others of this kind.

Egypt. In ancient Egypt flat undecorated walls were avoided; the internal surfaces of the temples and the external surfaces of pylons and walls were converted into large grouped pictures, deeply incised, and with flat tints, graded according to the light, being delicate in the well-illuminated parts, heavier in the darker apartments. See Egyptian Art.

Asia. Babylonia and Assyria had greater variety of method. The walls were often divided horizontally into zones—a lower dado of sculpture, an upper one of painting. The sculpture was either of fine stone partly colored (not entirely, as in Egypt), or of glazed tiles in relief, strongly colored. Though the tones were still flat, more relief was given than in Egypt by the accentuation of outlines and details by heavy dark lines. Gold and other metals and rich hangings increased the strength of the color scheme. The exterior walls were often faced with flat glazed tiles in massed colors, with the same result. See Babylonian and Assyrian Art.

Greece. The pre-Hellenic Greeks seem to have used gypsum and plaster reliefs and wall paintings in similar fashion to the Assyrians, and the Greeks of the historic period at first show signs of Oriental influence in the violent colors applied to gable, frieze, and metope sculptures, without the Oriental appreciation of color harmony. The polychromy of Greek architecture and sculpture gradually, however, gave way to the use of plain sculpture and to a reliance on the play of light and shade by means of projecting moldings and members in place of pure surface decoration. Simplicity of method, reticence of style, plasticity of composition, and delicacy of coloring were their characteristics. Color was subordinated to form, and the decorated surfaces were broken up usually into small units. The predominance of external over internal effects helped to minimize the importance of Greek mural decoration.

Rome. The Romans returned, with different methods and a different style, to the Oriental and Egyptian idea of colored instead of plastic mural adornment, which received great importance from their development of vast interiors. They adopted three principal media, with increasing heaviness as the Empire advanced—wall painting in fresco, mosaic painting, and marble incrustations. The molding of decorations in low relief in the stucco covering of walls and ceilings may be considered chiefly as an adjunct to the painted decoration. The most characteristic of these three treatments was the use of rich Oriental and African marbles. The interior walls of temples, Imperial thermæ and palaces, basilicas, and other buildings were covered to a considerable height in this way, while private houses were generally confined to fresco work. (See Plate of Pompeian Mural Decoration, under DECORATIVE ART.) Mural decoration on stucco was often microscopic in scale, small compartments, and small scenes being juxtaposed without much central interest, and by attempts at perspective effects and different planes the effort was made to counteract the confining effect of the walls of a room; to substitute pictures one could look *into* for flat decorated surfaces. See ROMAN ART.

EARLY CHRISTIAN. In early Christian and Byzantine mural decoration one school adopted as its main medium the new method of mosaic wall pictures (see MOSAIC), which gave a richer mural color scheme than had ever been known in any style. Casting aside the Roman picturesqueness, this school returned to the Oriental flat effects; but with the addition of glowing gold grounds and the depth given by the colored glass cubes an entire wall often became a single picture instead of an agglomeration of units. The advantage of Byzantine decoration was that the eye was received by and sank into its rich mosaic surfaces instead of being thrown back by shallow fresco coloring. The other school preferred plain or frescoed surfaces; this treatment was common in most of Syria, Asia Minor, North Africa, and Europe. Mural decoration in these regions for long after the decline of Rome was practically extinct where Byzantine influence did not exist. Even in Byzantine art fresco painting tended in many places to displace mosaic. See CHRISTIAN ART; BYZANTINE ART.

MOHAMMEDAN. The earliest special development of mediæval decoration was in the Mohammedan world, and it was one of great interest. It used color very generously, but also sculpture in low relief: its effects were mainly those of tapestry and other stuffs, even when design was in the form of colorless carvings on the outside surface of a dome. Geometric patterns were most prominent; floral forms, and very rarely human figures, characterize Persian art. Glazed tiles were specialties in Persia, geometric mosaics in Egypt, colored stuccoes in Spain. There was but little composition, grouping, or subdivision; the main plan was to cover the surfaces completely with more or less uniformity. There were practically no plain surfaces and no heavy projections. Such necessary projections as pendentives were broken up into minute stalactites. The effects were rich and restful, often even hypnotic. The Oriental races always retained the faculty of harmonious coloring, and used it to the full in mural decoration. Though related to the Byzantine type, this style was far more intricate and less well composed. See MOHAMMEDAN ART.

MEDIÆVAL. The mediæval decorative mural work in Europe did not begin to take shape until the close of the eleventh century; its usual media were extremely simple, merely fresco painting and sculpture in stone. The multiplicity of styles makes any unity of characterization such as was possible in other previous styles, quite impossible. In some parts of Europe there was practically no attempt at mural decoration till the Gothic period, as in parts of Germany and England. In Central and Southern France the entire exterior façades were often compositions in sculpture; in Tuscany and Northern Italy effects of color on the exterior were given by the use of marbles, terra-cotta, and brickwork in patterns or courses. In certain regions, such as Sicily, Rome, and Venice, the Byzantine and Oriental rich color scheme, especially in the form of mosaic work, prevailed. (See ROMANESQUE ART.) When, however, European art became thoroughly nationalized and indigenous in the Gothic period, Italy took a decided lead in the development of painted mural decoration in fresco which superseded all other methods. The reason for this was that the more logical Gothic art of the North, under French leadership, practically suppressed wall surfaces, and consequently mural decoration, in favor of detached ornamentation in stone, stained glass, and the like, due to the framework system of Gothic architecture. Italy, almost alone, did not abolish wall surfaces; consequently her painters, like Cimabue and Giotto and their contemporaries and successors, could develop the primitive fresco-work of the Romanesque type into a really artistic scheme of mural decoration such as we see at Assisi, Florence, and Siena. Grand figured compositions, harmoniously grouped, were the characteristic of this Italian school. Rich borders sometimes followed, sometimes contrasted with the architectural lines. Above all the coloring was light and clear and the effects flat and symbolic, the figures being rather like silhouettes on a flat ground. (See GOTHIC ART.) Sometimes there were also grand exterior effects both of color and form, as at Orvieto.

RENAISSANCE. The Renaissance saw Italy still easily leading in mural decoration from Masaccio to Raphael; the media were even simpler than before, for mosaics were entirely discarded and effects of sculpture and architectural memberment less frequent. The climax in the Sistine Chapel and Raphael's Stanze was reached by a perfectly consistent series of steps, some advantageous, such as the abandonment of the heavy architectural frameworks of the Giottesque period for simpler borders; some were disadvantageous, such as the attempts to do away with flat effects by the introduction of perspective and a variety of planes in both environment and figures. The juggling with perspective and anatomical difficulties indulged in during the fifteenth century by Paolo Uccello, Melozzo, and Mantegna led, in later days, to the extravagances of Correggio, Paolo Veronese, and Tiepolo. It became the main object of painters of the sixteenth century to change the subdivisions of flat mural decoration into a series of realistic framed vistas, and this mistaken realism was emphasized by the use of oil instead of fresco colors, giving effects of atmospheric perspective besides the previously acquired linear perspective. See RENAISSANCE ART.

MODERN. During the first half of the nineteenth century mural decoration declined to very low estate. In France, however, the influence of the national school of fine arts and the Government patronage of the arts preserved it from extinction, and the domination of classicalism and tradition began toward 1840 to yield to a new and fresher spirit, exemplified in the works of Hippolyte Flandrin. The decorative sense is more highly developed in France than elsewhere, and there has risen in France a remarkable school of mural painting, whose influence has been felt throughout the modern world. Modern French decorative painting rejects the flatness and conventional composition of the Italian fourteenth-century artists, inclining rather to the pictorial realism of the developed Renaissance schools; but it recognizes the difference between an easel picture applied to a wall or ceiling, and a decorative painting composed specially for an architectural setting. Paul Baudry (Grand Opera) and the late Puvis de Chavannes (Panthéon) are the most noted exponents of this school; but J. P. Laurens, O. Merson, Galland, and others stand high in this art; and all French public buildings are rich in the works of such men.

While Germany did much early in the century to study and revive mural painting, classical tradition tended to stifle originality, and no really great masters of the art have appeared. Cornelius (1783-1867) and Kaulbach (1805-74) made efforts to revive monumental mural painting, especially at Munich and Berlin, but their works lack the real decorative spirit. In England there is almost nothing to show in the way of mural painting, the preference there being usually for decoration by architectonic means and conventional ornament. In Spain the eccentric but powerful genius of Goya (1746-1828) asserted itself in the first third of the last century in ceiling paintings of great merit in Madrid, but he had no successors, and Spain and Italy are equally in arrears in this branch of art. Until lately the same was true of the United States, but recent progress in American art has in nothing been more noteworthy than in the rapid advance of skill in mural painting. This has been stimulated by the influence of the Chicago Columbian Exhibition and others. Many great public buildings recently erected have been adorned with mural paintings by first-rate artists (e.g. Boston Public Library, Congressional Library of Washington, Appellate Court and Mendelssohn Concert Hall at New York, etc.); and American artists, though generally trained in France, have shown independence and originality. Among the leaders in this revival may be named W. M. Hunt, Maynard, Kenyon Cox, Blashfield, Blum, Abbey, and Sargent.

Modern mural decoration has generally abandoned fresco painting in favor of oil painting on canvas, attached to the wall with white lead. Fresco, tempera, encaustic, and water-glass painting are rarely attempted. Other forms of decoration have been revived and are largely used, wainscoting, marble incrustration, mosaic, and inlay and stucco relief, and wall-hangings in paper, tapestry, stamped leather, and other materials, besides other more purely architectonic methods of adornment, being widely used and with conspicuous success.

Bibliography. No special works have been written upon the general subject, except practical manuals for the use of painters, such as Thomas, *Mural Decorations* (London, 1869); Crowninshield, *Mural Painting* (Boston, 1887). Consult also the bibliographies of Fresco, Mosaic, and the other articles referred to.

MURANO, mōō-rä′nō̂. A town in the Province of Venice, Italy, on an island, one and a half miles north of Venice. It has the Cathedral of San Donato, completed in the tenth century, the Basilica of San Pietro Martire, and a museum with exhibits of glass products. The town has been, since the thirteenth century, the seat of the Venetian glass industry. Population (commune), in 1881, 3629; in 1901, 5150.

MURAT, mụ′rȧ′, Joachim (1767-1815). A celebrated French cavalry leader, King of Naples from 1808 to 1815. He was born March 25, 1767, being the son of a well-to-do innkeeper at La-Bastide-Fortunière, near Cahors, in France. He was intended for the priesthood and commenced the study of theology and canon law at Toulouse, but soon enlisted in a cavalry regiment. Being dismissed for insubordination after two years of service, he returned to his home, and later proceeded to Paris, where he obtained admission into the constitutional guard of Louis XVI. through the good offices of a friendly Deputy, M. Cavignac. On the outbreak of the Revolution he was made a sublieutenant in a cavalry regiment, and a little later aide-de-camp to General Hué. His gallantry and his extreme Republicanism soon won him the rank of colonel. He attached himself closely to Bonaparte in 1795-96, and later served under him in Italy and in Egypt, signalizing himself in many battles. He finally rose to be general of division (1799), and having returned with Bonaparte from Egypt to France, he rendered most important assistance on the 18th of Brumaire, by dispersing the Council of Five Hundred at Saint Cloud. Bonaparte now intrusted him with the command of the Consular Guard, and gave him his youngest sister, Caroline, in marriage (January 20, 1800). The same year Murat commanded the cavalry at Marengo, and expelled the Neapolitans from the Papal States. In 1803 he was a member of the *Corps Législatif*, and in 1804 Governor of Paris. On the establishment of the Empire he was loaded with honors, being made a marshal of the Empire (1804), and a prince and Grand Admiral (1805). He continued to command the cavalry in the armies led by the Emperor, contributed to the triumph of the French at Austerlitz, and to other victories. In 1806 the newly erected Grand Duchy of Berg (q.v.) was bestowed upon him. After the battle of Jena, in 1806, he led in the pursuit of the Prussians, and in 1807 he participated in the battles of Eylau and Friedland. In 1808 Napoleon placed him in command of the army in Spain, where in May he suppressed the insurrection in Madrid. Joseph Bonaparte having exchanged the throne of Naples for that of Spain, Murat was made his successor, and on August 1, 1808, was proclaimed King of Naples under the title of Joachim I. Napoleon. He immediately took possession of the Kingdom of Naples, but the Bourbons, through the support of Great Britain, retained Sicily. Murat instituted a number of wise and beneficent reforms, but had to endure the yoke of Napoleon, who left him little but the outward show of royalty. In the Russian campaign of 1812 he commanded the cavalry, but after sharing in the disaster which befell the French army returned to Naples anxious and discontented. He joined the French army again in 1813, and distinguished himself at Dresden, but after the battle of Leipzig withdrew to his own dominions and concluded a treaty with Great Britain and Austria in January, 1814, by which he was guaranteed the possession of his throne on condition of joining the coalition against Napoleon and contributing 30,000 troops to the allied armies. After a pretense of attacking Eugène Beauharnais in Italy, Murat withdrew to Naples and entered into private communications with Napoleon at Elba. On the Emperor's return to France, Murat placed himself at the head of an army of 40,000 men and commenced a war against Austria. He was defeated by the Austrians at Tolentino. May 2d-3d. Naples was evacuated May 19th, and Murat fled to the island of Ischia. and finally found his way to France, while his wife and children took refuge with the British fleet. Napoleon declined to treat with his brother-in-law on any terms and forbade his presence in Paris. Murat then found a refuge near London, and after Waterloo he fled to Corsica. Declining Metternich's offer of an asylum in Austria, he proceeded in a foolhardy manner with a few followers to the coast of Naples and proclaimed himself King and liberator, but was presently taken prisoner, and after trial by a court-martial, was shot in a hall of the Castle of Pizzo, October 13, 1815.

Consult: Helfert. *Joachim Murat, seine letzten Kämpfe und sein Ende* (Vienna, 1878); Gallois, *Histoire de Joachim Murat* (Paris, 1838); Guardione, *Gioachimo Murat in Italia* (Palermo, 1899). See Napoleon I.

MURAT, Napoléon Achille (1801-47). Eldest son of Joachim Murat, King of Naples. He was born in Paris, and for a time bore the title of the Prince Royal of the Two Sicilies: but after the overthrow of his father, in 1815, he sought refuge with his mother in Lower Austria, where he received an excellent education. In 1821 he emigrated to the United States, and after a tour of the country settled near Tallahassee, Fla., where he bought a large estate and built an elegant mansion. When Lafayette revisited the United States in 1825, Murat traveled much with him, and was by him introduced to a grandniece of Washington, Miss Catharina Dudley, whom he married in 1826. Murat declined numerous offers of a political career, and devoted himself to farming, literary pursuits, and philanthropic undertakings. His literary works include: *Lettres d'un citoyen des Etats-Unis à un de ses amis d'Europe* (1830); *Esquisse morale et politique des Etats-Unis* (1832); *Exposition des principes du gouvernement républicain tel qu'il a été perfectionné en Amérique* (1833). These works attracted great attention in Europe. Consult MacConnell, "The Prince and Princess Achille Murat in Florida," in the *Century Magazine* (1893).

MURAT, Napoléon Lucien Charles (1803-78). The second son of Joachim Murat, King of Naples. He was born in Milan. and after the overthrow of his father in 1815 lived for several years with his mother in Lower Austria. He went to Boston in 1825. and soon after his arrival in the United States he joined his uncle Joseph, who was then living in Philadelphia under the title of the Count of Survilliers. In 1827 he married Miss Frazer, an heiress, of Bordentown, N. J. His wife later established there a fashionable school for young women. Unlike his brother, Napoléon Achille, he did not give up the idea of recovering his father's throne, and in 1839 and 1844 made trips to France with that purpose in view, but was permitted to remain in France only a short time. After the February Revolution of 1848 he returned to France and was elected a Deputy to the Constituent Assembly. He was Minister Plenipotentiary to Turin in 1849-50. After the coup d'état of December 2, 1851, he received a seat in the Senate, and was recognized by Napoleon III. as a prince of the Imperial family, which brought to him an annual pension of 150,000 francs and secured the payment of two millions of debts. In 1861 he advanced claims to the throne of Naples, but his pretensions were officially disavowed by the French Government and came to naught.

MURATORI, mo͞o′rȧ-tō′rė, Ludovico Antonio (1672-1750). A celebrated Italian antiquary and historian. He was born at Vignola, near Modena, October 21, 1672. He studied theology and history in the University of Modena, and early attracted the attention and won the friendship of Father Bacchini. the librarian at the ducal palace, who fostered in him a taste for historical and antiquarian research. In 1688 Muratori took minor orders, and in 1694 obtained the degree of doctor in canon and civil law. The same year he was appointed to the staff of the Ambrosian Library at Milan. While there he published his two collections of previously unedited Greek and Latin fragments entitled *Anecdota Græca* and *Anecdota Latina*. In 1700 he returned to Modena at the invitation of the Duke, in order to become keeper of the ducal archives and librarian of the Este Library, Father Bacchini having resigned this last post. For fifty years Muratori toiled unceasingly, collecting and editing mediæval chronicles and Italian historical records. His enemies, chiefly the Jesuits, accused him of publishing and teaching heretical doctrines; but, appealing to Pope Benedict XIV., the learned antiquary and historian received full protection against such attacks. He was one of the foremost scholars of his day and had a European reputation. He died on January 23, 1750. His works fill forty-six folio volumes, the most important ones being as follows: *Rerum Italiarum Scriptores* (25 vols., 1723-51), the standard collection of documents relating to Italian history; *Antiquitates Italicæ Medii Ævi* (6 vols., 1738-42); *Annale d'Italia* (12 vols., 1744-49); and *Antichità estense* (2 vols., 1717). Consult the biography by his nephew, G. F. Muratori, *Vita del celebre Ludovico Antonio Muratori* (Venice. 1756); Troya. *Studi intorno agli annali d'Italia del Muratori* (Naples, 1877; new ed. 1901 et seq.).

MU′RATO′RIAN FRAGMENT, or Canon of Muratori. A fragment of a treatise upon the Bible canon commenting upon the several books and so giving a very important list of the books accepted as canonical at the time of its composition, which probably was the latter half of the second century. In the list are the Gospel of Luke, which it calls the third (the fragment begins at this point, so doubtless Matthew and Mark had been mentioned in the part now lost); John, Acts. the Epistles of Paul to the Corinthians, Ephesians, Philippians. Colossians. Galatians, Thessalonians, Romans, Philemon, Titus, and Timothy; Revelation of John; Jude; two Epistles of John; Wisdom of Solomon; and, as doubtful, the Revelation of Peter, but omits the Epistles of James and of Peter and the Epistle to the Hebrews. The fragment was brought into notice by Muratori, a distinguished archæologist, at the close of the seventeenth century, hence the name, and is translated in the *Ante-Nicene Fathers,* vol. v.

MURAVIEFF, mo͞o′rȧ-vyĕf′. An ancient and distinguished Russian family, originally of Moscow, which in 1488 was presented by Czar Ivan Vasilievitch I. with large estates in the Province of Novgorod. The best known members of the family are: Mikhail Nikititch (1757-1807). Catharine II. made him the tutor of her grandchildren, Alexander and Konstantin, for whom he composed works in prose and poetry, which are still classics in Russian literature. He also occupied various important administrative posts. His works were published in three volumes (Moscow, 1810).—Nikolai Nikolaievitch (1768-1840). He studied at Strassburg, and thereafter served for some time in the army and navy. In 1797 he founded a private institution for officers of the general staff. During the war of 1812-14 against Napoleon he served as colonel. His school became a State institution in 1816, and he continued to superintend it until 1823, after which he devoted himself to agriculture.—Alexander Nikolaievitch (1792-1864). He was the eldest son of the preceding, and was prominent in the Decembrist uprising, which broke out in 1825 at the accession of Nicholas I. In consideration of his father's services his life was spared and he was exiled to Siberia. Later he was permitted to return, and during the Crimean War he entered the army and became a major-general. —Nikolai Nikolaievitch (c.1794-1866). The brother of the preceding. He entered the army in 1810 and took part in the campaigns of 1812-14 against the French. After the end of the war he remained in the army, and traveled extensively in Asia. He served during the Persian War and was made a major-general. In 1830 the Polish Rebellion broke out, and Muravieff was called in to aid in suppressing the revolt. In 1832 he was sent to Egypt to treat with Mehemet Ali for the conclusion of peace with Turkey. He then took charge of the Russian forces dispatched to the Bosporus to aid the Sultan against Mehemet Ali. In 1838 he fell into disgrace and retired from the army, remaining inactive until 1848. During the Crimean War he rendered valuable service to Russia in the Caucasus. The capture of Kars, in November, 1855, earned for Muravieff the title of prince and other great honors.—Mikhail Nikolaievitch (c.1796-1866). A brother of the preceding. He entered the army and participated in the campaigns against France of 1812-13. He occupied many important administrative positions, and opposed vehemently the emancipation of the serfs. During the Polish Rebellion of 1863 he was sent to Vilna, and acted with such relentless rigor that in a few months the entire insurrection was suppressed. His acts of cruelty made his name infamous throughout Europe.—Mikhail Nikolaievitch, Count (1845-1900). A grandson of the preceding. He was born April 19, 1845, studied in Heidelberg, and in 1864 entered the service of the Ministry of Foreign Affairs. He was attached to various Russian embassies in Europe, and on the death of Prince Lobanoff in 1897 he became Minister of Foreign Affairs. He advanced Russian interests in the Far East and put forth the Czar's note for The Hague Peace Conference in 1898. He died June 21, 1900.

About 1730 a member of the Muravieff family married a daughter of Apostol, the Ataman of the Cossacks, whose name was added to his own. Of this branch of the family the best known is Sergei Muravieff-Apostol (1796-1826). He participated in the Decembrist uprising of 1825; proclaimed Grand Duke Konstantin as Emperor, and seized the town of Vasilkov. Troops were sent against him and he was captured, taken to Saint Petersburg, and hanged July 25, 1826.

Nikolai Nikolaievitch, Count (c.1809-81), belonged to another branch of this family. He entered the army while young, and served in the Caucasus, where he attained the rank of major-general. In 1848 he was appointed Governor-General of Eastern Siberia, and gained for Russia the entire territory of the Amur, and concluded the Treaty of Aigun, May 28, 1858, by which this country was definitely ceded by China. His services were rewarded by the title of Count, and he was given the name Amurski. In the summer of 1859 he went with twelve ships to Yedo, and concluded a favorable treaty with Japan. He resigned his Governorship in 1861, and was made a member of the Imperial Council.

MURCHISON, mûr′chĭ-son, Charles (1830-79). A Scotch physician, born in the island of Jamaica. He was educated at the universities of Aberdeen, Edinburgh, Dublin, and Paris. In 1853 he entered the East India Company's military service, but soon after reaching India was appointed professor of chemistry at the Calcutta Medical College. In 1855 he published two valuable papers on *The Climate and Diseases of Burmah.* The same year he returned to Europe, and settled in London, where he was connected with a number of the leading hospitals. He published the important *Treatise on the Continued Fevers of Great Britain* (1862).

MURCHISON, Sir Roderick Impey (1792-1871). A British geologist, born in Tarradale, Ross. After studying at the military college of Marlow, he entered the army and served as an officer in the Peninsular War under Wellington. Through the advice of Sir Humphrey Davy he was induced to take up the study of science, and in 1825 became a fellow of the Geological Society of London, before which he read a paper entitled "Geological Sketch of the Northwestern Extremity of Sussex and the Adjoining Parts of Hants and Surrey." Returning from a geological tour through France, which he made in the company of Sir Charles Lyell, he undertook a systematic exploration and study of the lower fossiliferous strata of England and Wales. This work engaged his attention for many years and resulted in a reclassification of the Paleozoic rocks, with the introduction of a new system to which, in 1835, he gave the name Silurian. He was soon after employed by Emperor Nicholas in a geological survey of Russia, being associated with De Verneuil and Keyserling; during the years 1840-44 he explored a large part of Southern Russia and introduced a second new system—the Permian—into the geological time scale. From his knowledge of the geological structure of the Ural Mountains and the Australian systems, he was led to believe that gold occurred in the latter, and as early as 1844 predicted its discovery. Murchison was elected president of the British Association for the Advancement of Science in 1846, president of the Royal Geographical Society in 1844, 1845, and 1857, and in 1855, upon the death of Sir H. T. De la Beche, became director of the British Geological Survey. He was knighted in 1846, made Knight Commander of the Bath in 1853, and a baronet in 1863. From the Emperor of Russia he received the grand cross of Saint Anna and that of Saint Stanislaus. The greater portion of his contributions to science were published in the society journals. Among his principal works are: *Geology of Cheltenham* (1834); *The Silurian System* (1839); *On the Geological Structure of the Northern and Central Regions of Russia in Europe* (1841); and *Geology of Russia in Europe and the Ural Mountains* (1845). Consult Geikie, *Life of Sir Roderick I. Murchison* (London, 1875).

MUR'CHISO'NIA (Neo-Lat., named in honor of Sir R. I. Murchison). An extinct gastropod of the family Pleurotomariidæ, found in rocks of Ordovician to Triassic age, and especially common in the Devonian and Carboniferous formations. The shell has a more or less pointed spire consisting of numerous coils or whorls. The aperture has in its outer lip a slit like that of Pleurotomaria, and a corresponding slit-band that forms a more or less pronounced ridge on the outside of the whorls all the way from the aperture to the apex of the shell. The earlier species as a rule have smooth surfaced shells; the later species are more frequently ornamented by nodes and transverse ridges. A subgenus, Hormotoma, with rounded whorls, is represented by Murchisonia gracilis, a very common species in the Trenton limestone of the United States and Canada. Loxoplocus, another very peculiar genus, with the coils of the spire unrolled and somewhat carinate in section, lived in the cavities of the corals that made up the Guelph beds of Canada and western New York. See PLEUROTOMARIA.

MURCIA, mōōr'thē-ȧ. A former division and an old Moorish kingdom of Spain, situated in the southeastern part of the country, and bounded on the north by New Castile, on the east by the former Kingdom of Valencia, on the south by the Mediterranean Sea, and on the west by the former kingdoms of Granada and Jaén and by New Castile (Map: Spain, E 4). The division comprised the modern Province of Murcia, the greater part of Albacete, and small portions of Jaén and Alicante, with a total area of about 10,000 square miles.

The surface of Murcia partakes of the general character of the whole peninsula—the interior plateau, the rapid and mountainous slope toward the sea, and the low coastal region. The last is a sandy semi-arid belt from 10 to 20 miles wide, and broken by several coast lagoons, of which the Mar Menor is the largest. The mountainous belt occupies the greater part of the division, and consists of an irregular system of ranges whose nucleus and highest point is the Sierra de Espuña, with an altitude of 5193 feet. North of the mountains the interior plateau forms a part of La Mancha (q.v.), a deforested and almost arid plain. The principal water system is the Segura River with its tributaries, which are used only for irrigation, and are subject to great variations in volume, being at some seasons almost dry, and at other times subject to disastrous inundations. The climate is subtropical near the coast and temperate on the slopes and plateaus. The winters are mild, the sky nearly always clear, and the climate is pleasant and healthful; but the rainfall is insufficient for the needs of agriculture. The whole region has been almost entirely deforested, and agriculture can be carried on only in the valleys by means of irrigation. Many of the valleys, however, are well cultivated, especially the Huerta or 'Garden' of Murcia, which is one of the most beautiful places in Spain. The chief agricultural products are wheat, barley, and flax. Oranges, lemons, olives, grapes, and hemp are grown in the south. Mining is an important industry, producing iron, lead, zinc, copper, and sulphur. The production of zinc has increased fourfold within the last ten years, being 46,000 tons in 1900. The output of iron has decreased from 430,000 tons in 1890 to 370,000 tons in 1900. Other industries are silk manufactures and the plaiting of articles of esparto grass. The population in 1887 was 708,828, and in 1900, 815,864. The chief city is Murcia (q.v.).

Murcia was the centre of the Carthaginian colonies in Spain. It was conquered by the Saracens early in the eighth century and by them called Todmir. It formed a province of the Caliphate of Cordova, after whose dissolution, in the early part of the eleventh century, it became an independent Moorish kingdom. About the middle of the thirteenth century it was conquered by Castile.

MURCIA. The capital of the Province of Murcia, in Southeastern Spain. It lies on both banks of the Segura River, in the beautiful valley known as the Huerta or 'Garden' of Murcia (Map: Spain, E 4). This valley rivals in the luxuriance of its vegetation the famous Vega of Granada. It was carefully irrigated by the Moors, and is covered with vineyards and groves of mulberry, olive, and fig trees. The city itself has narrow streets, but a clean and generally neat appearance. Several promenades and pleasure grounds have been laid out along the embankments of the river, and the Paseo de Floridablanca is a wide avenue with fine rows of plane trees. Though the city still retains some of its old Moorish atmosphere, it has preserved but few objects of interest. The only building which attracts considerable notice is the cathedral, a Gothic-Romanesque structure begun in the fourteenth century. Its façade in the baroque style dates from the eighteenth century, and its tower, the most interesting feature, was begun in 1522 and completed in 1766. Other prominent buildings are the imposing bishop's palace, the city hall, with a monumental façade, the Colegio de San Fulgencio, two theatres, a bull ring, and the large and well-built silk factories. There are a provincial museum, two normal schools, and a secondary school. The industries are largely derived from the surrounding huerta, the chief being the silk industry, which, with grain and fruit, furnishes the principal articles of trade. There are also manufactures of woolen goods, gunpowder, soap, leather, hats, and musical instruments. The population in 1887 was 98,538, and in 1900, 111,693.

MURDER (AS. *morþor*, *morþur*, from *morþ*, OHG. *mord*, Ger. *Mord*, death; connected with Welsh *marw*, Lith. *smertis*, Lat. *mors*, death, Gk. βροτός, *brotos*, mortal, Skt. *mar*, to die). The unlawful killing of a human being with malice aforethought. The term appears to have been limited in early English law to a homicide committed in secret, or accompanied by concealment of the body. During the Norman period, this *morth* (or secret) slaying of Saxon times became the *murdrum*—the homicide of the very worst kind, and was distinguished by Glanville from a mere *homicidium*, or open killing. For a considerable time, *murdrum* signified the fine imposed by the Crown on any hundred in which a man was slain, as well as the killing itself. This fine—originally 46 marks, of which 40 went to the King and 6 to the kinsfolk of the deceased—could be avoided by the production of the slayer, or by proof that the slain man was an Englishman and not of Franco-Norman race. Furnishing such proof was known as Englishry. From the time that Englishry was abolished in 1348, murder bears the single meaning of unlawful homicide of the worst species, which subjects the slayer to capital punishment.

The next step in the history of murder as a term of English law, according to the best authorities, "consists in the adoption of the expression 'malice aforethought,' as the characteristic specific distinction of murder as distinguished from other kinds of homicide." This came about from the forms of the special findings of the jury in prosecutions for homicide. In order to entitle the slayer to a pardon under the Statute of Gloucester (6 Ed. I., c. 9, A.D. 1278), it was necessary for the jury to find that he acted "in self-defense and not by felony or of malice aforethought." During the next two centuries and a half, the modern distinction between willful murder and manslaughter (q.v.) was developed, as appears by a statute of 1531 (23 H. VIII., c. 1, § 3), which takes away the benefit of clergy (q.v.) in cases of "willful murder of malice prepense." The first element in the crime is unlawfulness, as distinguished from the killing which is justifiable or excusable homicide. (See HOMICIDE and JUSTIFIABLE HOMICIDE.) Not only must the killing be unlawful, but the person killed must be a "reasonable creature in being." Accordingly, the killing of an unborn child is not murder at common law, but is abortion (q.v.).

The other essential element in murder is the malice aforethought with which the killing is done. This requires, first of all, sanity and discretion on the part of the slayer. An idiot, a lunatic (q.v.), or an infant (q.v.) below the age of discretion cannot commit murder. While malice aforethought is essential to the crime of murder, the law does not require the lapse of any prescribed time between the formation of the intention to kill and the killing. It is sufficient that the murderous intention precedes and accompanies the act of homicide. If the will accompanies the act a moment antecedent to the act itself which causes death, this makes the offense murder as certainly as if a day intervened between the willing and the doing. The malice in case of murder must be actual, or, as it is sometimes said, express, in contradistinction to implied malice. This does not mean, however, that the slayer must actually have intended to kill his victim, nor that he bore toward him a settled and malignant ill-will. Hence if one shoots at A, and misses him, but kills B, this is murder, because of the previous felonious intent, which the law transfers from one to the other. So if one lays poison for A, and B, against whom the poisoner had no felonious intent, takes it, and is killed, this is murder. In short, the idea of malice aforethought is not spite or malevolence to the deceased in particular, but evil design in general; not premeditated personal hatred or revenge toward the person killed, so much as a deliberately unlawful purpose which, if persevered in, must produce mischief. At the common law the procuring of a person to commit suicide (q.v.) is murder if the suicide is accomplished. So it is said in the books that if two persons agree to commit suicide, and attempt to carry their design into execution, but only one dies, the survivor is guilty of murder if he were present at the commission of the suicide; otherwise he is an accessory before the fact.

The common law knew nothing of degrees of murder. If the homicide was committed unlawfully and with malice aforethought, the slayer was a murderer, and, upon conviction, liable to capital punishment. This penalty has been thought too severe for some kinds of murder, and a number of our States have divided the offense into two degrees, continuing capital punishment for the first degree, and punishing the second degree with imprisonment. While these statutes differ in detail, they agree in limiting the definition of murder in the first degree to those cases where the killing was done in a willful, deliberate, premeditated, or particularly cruel manner, or while engaged in the commission of some heinous felony, such as arson, and in some States rape and burglary. Consult: Bishop, *New Criminal Law* (Chicago, 1892); Stephen, *History of the Criminal Law of England* (London, 1883); Wharton, *Criminal Law* (Philadelphia, 1896); Clark and Marshall, *Law of Crimes* (Saint Paul, 1900); and authorities referred to under CRIMINAL LAW; and LAW, CRIMINAL.

MURDERS IN THE RUE MORGUE, THE. A tale by Edgar A. Poe, which appeared in *Graham's Magazine* in 1841, and became a model for later detective stories. The story opens with newspaper accounts of a horrible murder in Paris of an old lady and her daughter. The writer and a friend visit the house, and the friend ascertains from the appearance of the room that the murderer was an orang-outang escaped from its keeper.

MUR'DOCH, JAMES EDWARD (1811-93). An American actor, born in Philadelphia. His first appearance on the stage was in his native city in 1829. In 1833 he acted with Fanny Kemble during her tour in America, and in 1856 played with some success at the Haymarket Theatre in London. During the Civil War in America he devoted himself to caring for sick and wounded soldiers, and gave popular readings for the benefit of the United States Sanitary Commission. Subsequently he was professor of elocution in the Cincinnati College of Music. Joseph Jefferson characterizes his acting as "not only extremely versatile, but entirely original." His greatest successes were in comedy and lighter tragedy. With William Russell he published *Orthophony, or Culture of the Voice* (1845); and *The Stage* (1880).

MURDOCK, JAMES (1776-1856). An American scholar, born in Westbrook, Conn., and educated at Yale, class of 1797. He taught school in New Haven and at Oneida Academy, now Hamilton College, studied for the ministry, was licensed in 1801, preached for thirteen years in the Congregational Church of Princeton, Mass., and was professor of ancient languages in the University of Vermont from 1815 until 1819, when he went to Andover Theological Seminary. There he taught sacred rhetoric and Church history until 1829, and then he removed to New Haven, where he devoted his last years to private study. He wrote versions of Munscher's *Elements of Dogmatic History* (1830), of Mosheim's *Institutes of Ecclesiastical History* (1832), and of Mosheim's *Affairs of the Christians Before the Time of Constantine the Great* (1852), a *Literal Translation of the Whole New Testament from the Ancient Syriac Version* (1851), and *Sketches of Modern Philosophy* (1842).

MURDOCK, William (1754-1839). An English engineer, who was the first to employ coal gas as an illuminant. He was born at Bellow Mill, in Ayrshire. In 1784 he had begun to experiment on a high pressure locomotive. From these unsuccessful attempts, about 1792 he turned his attention to lighting by coal gas. (See Gas, Illuminating.) The actual perfection of the invention was probably two or three years afterwards, and in 1802 gas was used in the illumination of Soho, after the news of the Peace of Amiens. Murdock made several improvements on Watt's steam-engine and invented an independent or 'ball-crank' engine and various apparatus by which compressed air might be used.

MURE, Sir William (1594-1657). A Scottish poet, born probably in Ayrshire, where the Rowallan estate, which he inherited, was situated. In 1643 he was a member of Parliament in Edinburgh, and he was wounded the next year at Marston Moor. His principal effort is his clever but somewhat heavy *True Crucifixe for True Catholikes*, which appeared in 1629. His other writings are a poetical translation (1628) of *Hecatombe Christiana*, a Latin poem by Boyd of Trochrig, many miscellaneous poems, and a paraphrase of the Psalms (1639).

MURE, mūr, William (1799-1860). An English classical scholar, born at Caldwell, Ayrshire, Scotland. After studying at Westminster School and at Edinburgh, he spent several years at the University of Bonn. His chief work, *A Critical History of the Language and Literature of Ancient Greece* (5 vols., 1850-57), was left unfinished, but the several portions of it on the epic and lyric poets and the historians may be regarded as separate works. His attempt in the first two volumes to prove the essential unity of the *Iliad* and *Odyssey*, and the identity of their authorship, won him a wide reputation among European scholars. In addition to numerous contributions to the *Edinburgh Review*, his publications include: *Brief Remarks on the Chronology of the Egyptian Dynasties* (1829); *A Dissertation on the Calendar and Zodiac of Ancient Egypt* (1832); and his *Journal of a Tour in Greece and the Ionian Islands* (1842). He sat in Parliament for Renfrewshire in 1846-55, and was lord rector of the University of Glasgow in 1847-48.

MURET, mụ'rȧ', or **MURE'TUS,** Marc Antoine (1526-85). A French humanist. He was born at Muret, became a proficient scholar in Greek and Latin, and when but eighteen lectured in the College of Auch. At the invitation of Cardinal Ippolito d'Este, he took up his residence in Rome, where he won fame by his lectures. He took orders in 1576 and in 1584 retired from his professoriate. He wrote *Orationes* and *Epistolæ,* and his *Variarum Lectionum Libri XIX* are still valuable. His reputation rests chiefly, however, upon the classic Latinity of his style. The best edition of his collected works is that of Frotscher and Koch (Leipzig, 1834-41).

MUREX (Lat., purple-fish). A genus of tropical shells, large, heavy, and variously armed with stout spines, processes, or knobs. These are to protect and strengthen the shells, for the animals live on exposed coasts. One species (*Murex pomum*) is found along the American coast from Cape Hatteras to Texas. It is from two to three inches in length, but not so conspicuously spiny as some more tropical forms. Allied to Murex is the oyster-drill (*Urosalpinx cinerea*), which bores into oyster shells by means of its lingual ribbon. (See Drill.) *Murex fortispina* of New Caledonia is furnished with a powerful tooth at the lower part of its outer lip. Its favorite food is *Arca pilosa*, a species of bivalve allied to the 'Noah's ark' (see Ark Shell), which lives half buried in coral refuse. Many of the tropical species are gayly colored, and some yield, when the animal is crushed, a rich violet-purple liquid which will act as a permanent stain, and which furnished to the ancients their 'royal-purple' dyes. Other shells yield this or a similar color. See Purple Shell; also Colored Plate of Gastropods.

MUREX'ID (from Lat. *murex*, purple-fish), Purpurate of Ammonia, or Roman Purple, $C_8H_4N_5O_6.NH_4 + H_2O$. A beautiful coloring matter similar to the Tyrian purple of the ancients, which was made from a species of Murex—hence its name. Murexid may be prepared from uric acid, and as this exists in abundance in guano, that material has been found one of the best sources from which to obtain it. One process used to produce murexid is to dissolve uric acid in dilute nitric acid, and after evaporating for some time at a temperature a little short of boiling, while still hot, to add a slight excess of ammonia. Two compounds are formed by this process, alloxan and alloxantin, and their reaction on each other results in the formation of the beautiful minute green metallic-lustred crystals of murexid, which, in combination with some of the compounds of lead and mercury, yield most brilliant red and purple dyes. The use of murexid was becoming extensive until the discovery of the aniline colors, the greater brilliancy of which has checked its employment. The acid combined in murexid, viz. purpuric acid, $C_8H_4N_5O_6H$, is not known in the free state. Its ammonium salt, murexid, was first obtained in 1839 by Liebig and Wöhler. See Uric Acid.

MURFREE, mûr'frė, Mary Noailles (1850—). An American authoress, born in Murfreesboro, Tennessee, best known by the pseudonym of Charles Egbert Craddock. Unable because of lameness to enjoy the usual play of young people, she devoted herself, almost from childhood, to reading and the study of the native types of the Tennessee mountains, where she passed her summers. Her novels began to appear in 1884. The chief titles are: *In the Tennessee Mountains* (1884); *The Prophet of the Great Smoky Mountains* (1885); *In the Stranger People's Country* (1891); *The Phantoms of the Foot-Bridge* (1895); *The Mystery of White-Face*

Mountain, and Other Stories (1895); *The Young Mountaineers* (1887); *The Bushwhackers, and Other Stories* (1899); *A Spectre of Power* (1903).

MUR′FREESBORO. A city and the county-seat of Rutherford County, Tenn., 32 miles southeast of Nashville; on the Nashville, Chattanooga and Saint Louis Railroad (Map: Tennessee, E 5). It is the seat of Soule Female College (Methodist Episcopal, South), opened in 1852, and of the Mooney School, established in 1901. The city is the centre of an agricultural region largely interested in cotton and fruit growing, and has manufactures of flour, lumber, cedar ware, leather, carriages, cotton gins, machine shop products, etc. Near the city is the Stone River battlefield (see Stone River, Battle of), the site of a national cemetery with 6150 graves, 2333 of unknown dead. Murfreesboro was first settled in 1811, and was incorporated in 1817. From 1819 to 1825 it was the State capital. Population, in 1890, 3739; in 1900, 3999.

MURFREESBORO, Battle of. See Stone River, Battle of.

MURGER, mụr′zhȧ′, Henri (1822-61). A French novelist and poet, born in Paris, March 24, 1822, who made attractive to his readers the irresponsible life of artists and students in Paris. Among his works are: *Scènes de la vie de Bohême* (1848); *Scènes de la vie de jeunesse* (1851); *Les buveurs d'eau* (1854); *Madame Olympe* (1859); other prose tales; and the poems *Les nuits d'hiver* (1861). To Murger, if to any one writer, literature perhaps owes the word 'Bohemia,' signifying not a geographical spot, but a moral condition. Murger left some classic tales and songs of dissolute thriftlessness and literary impecuniosity that have deluded a generation into looking back with dreamy regret on the sordid follies of their student days. The first Romantic generation, that of Gautier, had real enthusiasm, the ardor and fervor of renascence, for which Murger's whimsical hysteria of merriment and his vicious sentimentality are but a poor substitute. Murger was trained for the law, became for a time secretary of Count Leo Tolstoy, but like that earlier Bohemian, Villon, he chose dissipation rather than decency. He died in a charity hospital in Paris, January 28, 1861. A monument was recently erected to his memory, not without protest. Several of Murger's songs are translated by Andrew Lang in *Ballads and Lyrics of Old France* (London, 1872). 'Estimates' of Murger by fellow-Bohemians may be found in *Les nuits d'hiver* (Paris, 1862).

MURGHAB, mo͞or-gäb′. A river of Central Asia, rising in the Paropamisus Mountains, on the northern boundary of Afghanistan (Map: Afghanistan, J 3). It flows northwest into Russian Turkestan, irrigates the Merv Oasis, and after a course of 366 miles is lost in the sands and marshes of the desert about 150 miles below Merv.

MURIATIC ACID. See Hydrochloric Acid.

MU′RIDÆ (Neo-Lat. nom. pl., from Lat. *mus*, Gk. *μῦς*, *mys*, mouse). The family of rats and mice, typified by the house-mouse (*Mus musculus*). It embraces in its seventy-six genera (Thomas) more than a third of all the rodents, is world-wide in its distribution, and includes many species of great importance to man, as pests or otherwise. The family has been most fully monographed by O. Thomas in the *Proceedings of the Zoölogical Society of London* (1881), p. 528. Consult also authorities cited under Rodentia; and see Mouse, Rat, Gerbil, Hamster, Water-Rat, Vole, Muskrat, and similar titles.

MURILLO, mo͞o-rēl′yȯ, Bartolomé Estéban (1617-82). A Spanish religious and genre painter of the school of Seville. He was, after Velazquez, the greatest figure in Spanish art, and unquestionably the most important religious painter of Spain. He was born in Seville, probably December 31, 1617. Very little is known of his early life. When quite young he was apprenticed to his uncle, Juán del Castillo, from whom he learned the rudiments of painting; but upon the departure of the latter to Cadiz in 1640, Murillo was left without means, and for the succeeding two years he supported himself by painting rough, brilliantly colored pictures for the *Feria*, a weekly market. His close contact with the beggars and print-sellers gave him unusual opportunity for studying their characteristics, and his reproductions of them upon canvas exhibit a sympathy and realism alike notable. These earlier works may be cited as representing the artist's first period, during which he attained results intensely individualized and at the same time expressive of the type.

The example of Moya, a fellow pupil in the studio of Castillo, made Murillo discontented with his position at Seville, and he resolved to visit Rome, but, not having the means for the longer journey, set out on foot for Madrid. Velazquez (q.v.) gave him shelter in his own house and access to the royal galleries, where, with untiring zeal, he copied Ribera, Titian, Rubens, Van Dyck, Velazquez, and other masters. This course of practice, extending from 1642 to 1645, gave him a much freer style and greater control of color—the chief characteristics of his second period. This era, generally known as his 'warm [calido] style,' was characterized by the execution of works exhibiting especially a masterly control of color contrasts. The series of pictures upon which the painter was employed from 1645 to 1648 for the small Franciscan convent near Casa del Ayuntamiento typify the early works of this second period, and through their success he received many commissions.

In 1648 Murillo married a wealthy and noble wife, and his house became the resort for the distinguished people of Seville. In 1650, upon the death of Pacheco, he became the acknowledged head of the Seville school and the president of the academy founded in 1660. During these years he was continually improving in style, becoming more idealistic in conception and individual in technique. The result of this transitional epoch was the third period or last phase, known as *el vaporoso*, from a certain vaporous or misty effect produced. A favorite subject of this era was the "Immaculate Conception," which he painted no fewer than twenty times, the most famous example being in the Louvre, Paris. It was taken from Spain by Marshal Soult, and bought by the French Government at the Soult sale, in 1852, for 586,000 francs.

Murillo is very popular with the general public, but less so with the artists, who, while acknowledging his facility and charm, find his work lacking in technique, force, and originality. His work is highly subjective; so much so that the attention of the beholder is attracted to the personality and technique of the artist rather than to the subject represented. Murillo's chief importance consists in the wonderful manner in which he employed the medium of Spanish realistic forms to express ideal religious conceptions.

Much of the work of the artist was taken from Spain during the Peninsular campaign, a fact that accounts for the number of fine examples to be found in the galleries of Europe; the various collections of London possess 105 of his paintings, and those of Paris 21. Among his principal works were eight large pictures painted for the Hospital of Saint George (1661-74), of which three—viz. "Moses Striking the Rock," the "Miracle of the Loaves and Fishes," and "San Juan de Dios Attending the Sick"—remain in their original places.

The Cathedral of Seville is rich in his works, among which are: 'Saints Leandor and Isidoro;" the "Vision of Saint Anthony" (1656); and "La Purissima" (1668). In the museum are seventeen of the twenty-six pictures painted for the Capuchin monastery at Seville, among which are four "Immaculate Conceptions." In the Prado Museum (Madrid) are the beautiful "Children of the Shell" (the infants Jesus and John), the "Adoration of the Shepherds," the "Education of the Virgin," and "Saint Elizabeth of Hungary Healing a Leper." Other famous works are: "The Birth of Mary" (1655) and "The Holy Family, with Saint Elizabeth" (1670), in the Louvre; "The Vision of Saint Anthony," in the Berlin Museum. The best examples of Murillo's Madonnas are in the galleries of Dresden, Madrid, Seville, Florence (Pitti Palace), and Rome (Corsini Palace). Of his admirable series of genre subjects representing children in the action of eating, throwing dice, and selling fruit and flowers, the best-known examples are in the national collections of Munich, Paris (Louvre), London, and Saint Petersburg. Murillo's last work was the altarpiece of Saint Catharine, painted at Cadiz for the Church of the Capuchins. The picture was never completed, owing to a fall, which compelled his return to Seville, where he died shortly afterwards, April 3, 1682. He was buried, by his own request, in the Cathedral of Seville, before Pedro de Campagna's picture of the "Deposition from the Cross." Consult the biographies of Murillo by Tubino (Seville, 1864); Stromer (Berlin, 1879); Lücke, in Dohme, *Kunst und Künstler*, vol. iii. (Leipzig, 1880); Minor, in *Great Artist Series* (London, 1882); Alfonso (Barcelona, 1886); Justi (Leipzig, 1892); Knackfuss (Bielefeld, 1896). See, also, Curtis, *Velasquez and Murillo* (London, 1883); Lefort, *Murillo et ses élèves* (Paris, 1892); Stirling-Maxwell, *Annals of the Artists of Spain* (London, 1848).

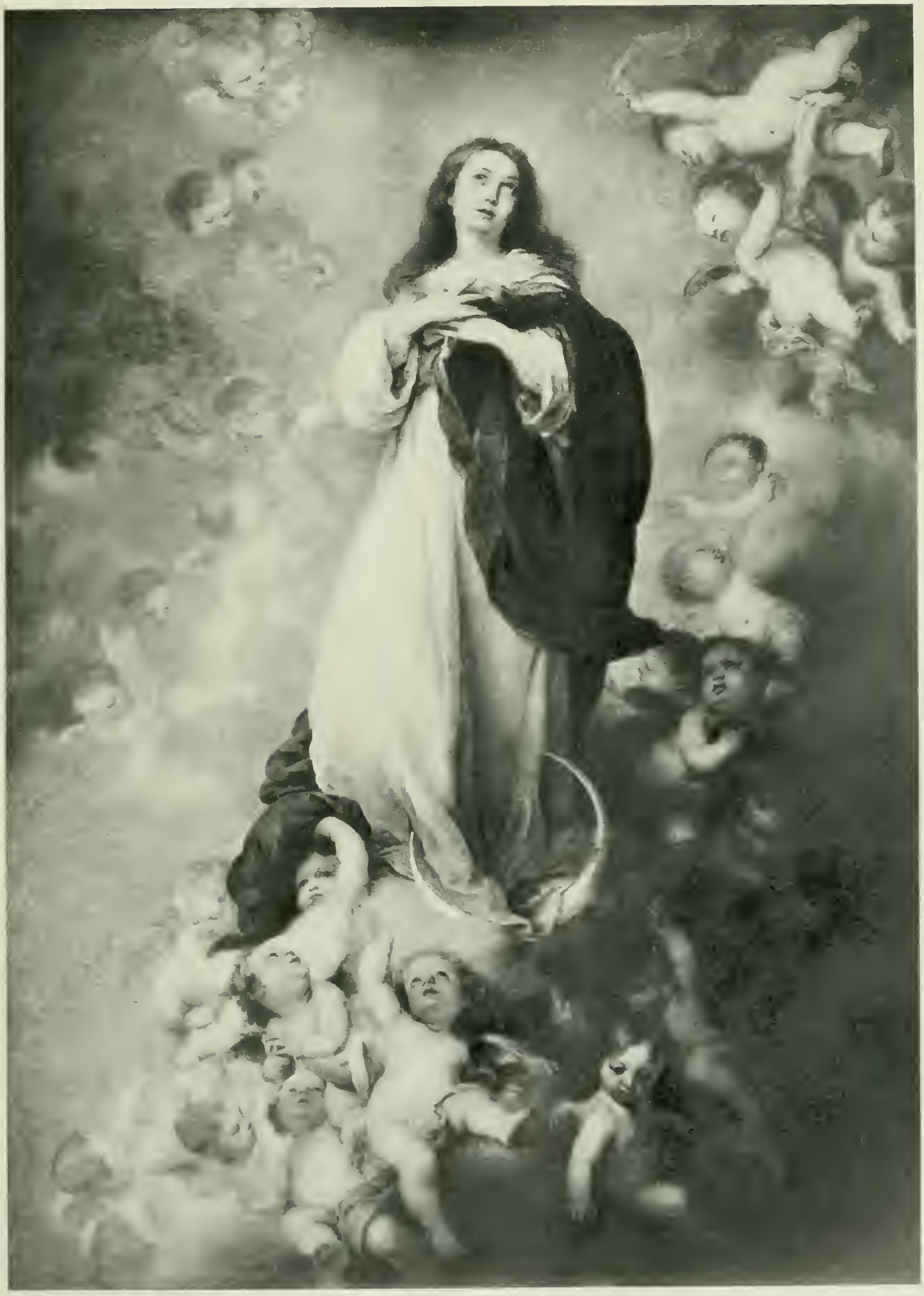
MUR′ISON, ALEXANDER FALCONER (1847—). An English jurist and historian, born in Aberdeenshire, and educated at the University of Aberdeen. In 1883 he was appointed professor of Roman law, and in 1901 of jurisprudence in University College, London. He was editor of *The Educational Times* (1902), and wrote: *The External History of Roman Law* (1885), and, in the Famous Scots Series, *Sir William Wallace* (1898) and *King Robert the Bruce* (1899).

MURMEL′LIUS, JOHANNES (c.1480-1517). A Dutch humanist, born in Roermond, Gelderland, and educated at Deventer, at Cologne, and at Münster. In the last city he taught for some time, and then at Deventer and Alkmaar. One of the foremost humanists of the day, he introduced the study of Greek almost single-handed, and published many excellent school books. His *Scoparius in Barbariei Propugnatores et Osores Humanitatis* (1514) and his defense of Reuchlin are important documents. Consult the biography by Reichling (Freiburg, 1880) and the selections from his poems, edited by Reichling (ib., 1881).

MURNER, mụr′nẽr, THOMAS (1475-1537). A German priest, famous mostly for attacking Luther and the Reformation. Murner taught and preached in Freiburg, Paris, Cracow, and Strassburg. After voyages to Italy and England he settled in Strassburg, whence in 1525 he was frightened away by the Reformation. Murner was highly enough prized for his religious poems to be made laureate by Maximilian I. in 1505. In 1506 he took his doctorate in theology; in 1513 he became prior of the Franciscan cloister at Strassburg. In 1519 he became a doctor of jurisprudence at Basel. After a stormy life Murner died at his birthplace, Oberenheim, near Strassburg, in 1537. In his *Gäuchmatt* and his *Narrenbeschwörung*, Murner shows some realistic humor. He translated the *Æneid* in 1515; whether he wrote the High German version of the *Eulenspiegel*, a kind of chapbook, originally in Low German, is not known. His selected works were published in Kürschner's *Deutsche Nationallitteratur* (Stuttgart, 1890 et seq.). Consult: Kaweraus, *Murner und die Kirche des Mittelalters* (Halle, 1890); *Murner und die deutsche Reformation* (Halle, 1891).

MUROM, mo͞o′rôm. One of the oldest towns of Russia, situated in the Government of Vladimir, on the left bank of the Oka, 84 miles southeast of Vladimir (Map: Russia, F 3). It has an old cathedral, a gymnasium, two monasteries, and a convent. The town is noted for the vegetables raised in the vicinity. It manufactures tallow and soap, and has trade in grain. Murom is believed to have existed before the time of Rurik, and had rulers of its own, who were subjugated by the princes of Moscow at the end of the fourteenth century. Population, in 1897, 12,589.

MUR′PHEY, ARCHIBALD DE BOW (1777-1832). An American jurist, born in Caswell County, N. C. He was educated at the University of North Carolina. He served as a tutor and then as professor of ancient languages until 1802, when he was admitted to the bar. From 1812 to 1818 he was a member of the State Senate. While in this body he was a member of the committee appointed in 1816 to consider the establishment of a system of public schools, and at the session of 1817 submitted an elaborate plan which, while not adopted, formed the groundwork for the later attempts. In 1818 he was elected judge of the Superior Courts and was designated to sit on the Supreme bench during three terms in 1819-20. He was interested in internal improvements, and persuaded the State to attempt an elaborate system of canals and harbor improvements. In 1822 he secured a share of the Tennessee land warrants for the University of North Carolina, and thus saved that institution from ruin.



MURILLO

"THE IMMACULATE CONCEPTION," FROM THE PAINTING IN THE LOUVRE, PARIS

MUR′PHY, Arthur (1727-1805). A British actor and playwright, born at Clomquin, Roscommon, Ireland, December 27, 1727. Having studied at the English college at Saint Omer in France (1738-47), he became a clerk to a merchant in Cork (1747-49), and worked in a London banking house (1749-51). Turning to literature, he started the *Gray's Inn Journal* (1752-54) in imitation of Addison's *Spectator.* In 1754 he appeared at Covent Garden as Othello. In this and other parts he was moderately successful. Beginning with *The Apprentice* (1756), he wrote many farces and clever satires, mostly adapted from the French, and tried his hand at several tragedies. Among his many miscellaneous works are an edition of Fielding with a memoir (1762), an essay on Dr. Johnson (1792), a translation of Tacitus (1793), and a *Life* of Garrick (1801). He died June 18, 1805, at Knightsbridge. His plays and early essays were collected (8 vols., London, 1786), and his life was written by J. Foot (ib., 1811).

MURPHY, Francis (1836—). An American temperance evangelist, born in Wexford, Ireland. He served in the Federal army during the Civil War. Beginning in 1870 at Portland, Me., he started temperance reform clubs throughout that State, and was their first president. His headquarters were in Pittsburg, Pa., and after his first addresses there in 1876, 45,000 people signed the pledge, a number that was soon increased to 10,000,000, as a result of his ministrations in different parts of the United States. He labored also in England, and he acted as chaplain in the Spanish-American War.

MURPHY, Henry Cruse (1810-82). An American politician and historian, born in Brooklyn, N. Y. He graduated at Columbia College in 1830, studied law, and was admitted to the bar in Brooklyn, where he became city attorney and, in 1842, Mayor. The next year he became a member of Congress. At the expiration of his term he was elected a delegate to the New York State Constitutional Convention of 1846. In 1847 he was again sent to Congress, and in 1852 was a prominent candidate for the Democratic nomination for President. In 1857 President Buchanan appointed him Minister to Holland, where he remained until 1861. He was for a time an editor of the *Brooklyn Eagle*, but he is perhaps best known for his researches in the early colonial history of New York, which led to the discovery and publication of many interesting and important documents. Probably the most valuable of these is De Vries's *Voyages from Holland to America, 1632 to 1644* (1853), which he translated from the Dutch. During his residence at The Hague as American Minister he printed for private distribution two monographs, *Henry Hudson in Holland: Origin and Objects of the Voyage Which Led to the Discovery of the Hudson River* (1859); and *Jacob Steendam, Noch Vasater. A Memoir of the First Poet in New Netherland, with His Poems, Descriptive of the Colony* (1861). The latter of these was reprinted in his *Anthology of New Netherland; or, Translations from the Early Dutch Poets of New York, with Memoirs of Their Lives*, issued by the Bradford Club in 1875.

MURPHY, James Gracey (1808—). An Irish Presbyterian clergyman, born at Ballyaltikilikan, County Down. He graduated at Trinity College, Dublin, in 1833, was appointed minister at Ballyshannon in 1836, became classical headmaster at the Royal Belfast Academical Institution in 1841, and professor of Hebrew at the Presbyterian College of Belfast in 1841. He published a number of volumes, among them a *Latin Grammar* (1847); a *Hebrew Grammar* (1857); *The Human Mind* (1873); and commentaries on (1864) Genesis, (1866) Exodus, (1872) Leviticus, (1875) The Psalms, and (1882) Revelation.

MURPHY, John Francis (1853—). An American landscape painter. He was born in Oswego, N. Y., studied art by himself, and first exhibited in 1876 at the National Academy, of which he was elected an associate and later an Academician. Murphy worked both in oils and water colors. Among his paintings are: "Sultry Season" (1884); "The Yellow Leaf" (1885); and "Sundown" (1886). His work is exceptional for the beauty of its coloring.

MUR′PHYSBORO. A city and the county-seat of Jackson County, Ill., 86 miles southeast of Saint Louis, Mo.; on the Big Muddy River and on the Illinois Central, the Mobile and Ohio, and the Saint Louis Valley railroads (Map: Illinois, C 6). It is the centre of a farming district that has considerable mineral wealth, particularly deposits of coal, and carries on a trade of some importance. There are manufactures of flour, lumber, beer, foundry and machine-shop products, brick, etc. Population, in 1890, 3880; in 1900, 6463.

MURRAIN, mŭr′rĭn (OF. *morine*, from Lat. *mori*, Skt. *mar*, to die). A general term loosely used to designate a variety of diseases of domestic animals, but more correctly restricted to the vesicular epizoötic, popularly known as foot-and-mouth disease. 'Bloody murrain' is sometimes used referring to anthrax (q.v.), and 'dry murrain' is similarly applied to Texas fever (q.v.).

MUR′RAY, Alexander (1755-1821). An American naval officer, born at Chestertown, Md. At the outbreak of the Revolution he received a commission in the navy, but while waiting for a ship served, during 1776-77, as lieutenant and captain in the First Maryland Regiment, and participated in the operations around New York. In the latter part of 1777 he commanded the *Revenge* with letters of marque to prey on British commerce. He was captured, but after exchange served on board the *Trumbull*, and was again captured. When exchanged again he commanded a privateer and afterwards served on the *Alliance*. When the navy was reorganized in 1798 he was one of the first six captains appointed, and commanded the *Montezuma* during the troubles with France. He was transferred to the *Constellation* and saw some service in the Mediterranean during the war with Tripoli.

MURRAY, Alexander (1775-1813). A linguist, son of a shepherd, born at Dunkitterick, Kirkcudbrightshire, October 22, 1775. Murray taught himself French, Latin, Greek, and Hebrew; made his way through Edinburgh University, became parish minister of Urr in his native shire (1808), and professor of Oriental languages in Edinburgh University (1812). He died April 15, 1813. Murray edited in a thorough manner Bruce's *Travels* (1805; new ed. 1813); wrote for his students *Outlines of Orien-*

tal Philology (1812); and contributed to the *Edinburgh Review*. After his death appeared his chief work, *History of the European Languages*, with a memoir and the fragment of an autobiography (2 vols., Edinburgh, 1823).

MURRAY, Alexander Stuart (1841—). A distinguished English archæologist, born near Arbroath. He was educated at the University of Edinburgh and in Berlin. In 1867 he was appointed assistant in the department of Greek and Roman antiquities of the British Museum, and in 1886 keeper of the same. He published a *History of Greek Sculpture* (London, 1890); *Handbook of Greek Archæology* (London, 1892); *Designs from Greek Vases* (London, 1894); *Terra-Cotta Sarcophagi* (London, 1898); and edited many official publications of the British Museum.

MURRAY, David (1830—). An American educator. He was born at Bovina, Delaware County, N. Y., where his parents had immigrated from Scotland in 1816. He graduated from Union College in 1852. The following year he became assistant in the Albany Academy, and in 1857 was advanced to the principalship. In 1863 he accepted the chair of mathematics and physics in Rutgers College. Having assisted the Japanese Embassy in 1872 in their labor of investigating the educational systems of this and other countries and preparing statistics thereon, he was invited by Japan to assume the supervision of its educational affairs. He removed to that country and was occupied for six years in these duties. At the time of his return to America in 1879 he was decorated by the Emperor with the Order of the Rising Sun. In 1880 he became secretary of the Regents of the University of the State of New York, and held this post nine years. He has published several addresses, and is the author of *Manual of Land Surveying* (1872); an introductory chapter to *Outlines of the History of Japanese Education* (1876); *The Story of Japan* (1894); *History of Education in New Jersey* (1899).

MURRAY, David Christie (1847—). An English novelist, born at West Bromwich, in Staffordshire, April 13, 1847. He was educated at a private school. He began his career as a reporter on the Birmingham *Morning News*, and in 1873 went to London, where he joined the staffs of the *Daily News* and the *World*. In 1879 he published in *Chamber's Journal* his first long novel, *A Life of Atonement*. Other books are: *Joseph's Coat* (1881); *Val Strange* (1882); *Time's Revenge* (1893); *In Direst Peril* (1894); *A Rogue's Conscience* (1896); *Tales in Prose and Verse* (1898); *A Race for Millions* (1898); many other novels; and the interesting essay, *My Contemporaries in Fiction* (1897).

MURRAY, Lord George (c.1700-60). A Scottish Jacobite general, son of the Duke of Athol, Perthshire. His father was loyal to the House of Hanover, but Lord George followed his elder brother, the Marquis of Tullibardine, into the Jacobite uprising of 1715, commanded a battalion at Sheriffmuir, and made his escape to France the following year. He was living in Scotland at the time of the rebellion of 1745, and was the most capable of Prince Charles's generals. To Lord George Murray's personal bravery, sound judgment, and skill in handling undisciplined troops must be attributed the chief credit for the Jacobite victories at Prestonpans and Falkirk, as well as for the Highlanders' safe retreat from England after the raid to Derby. Murray escaped to the Continent when the cause was lost and died in Holland.

MURRAY, George Henry (1861—). A Canadian statesman of Scottish parentage, born at Grand Narrows, Nova Scotia. He began his education in his native place, finished it at Boston University, was called to the bar in 1883 and practiced his profession at North Sidney, N. S. He was elected to the local House in 1889, and after being a member of the Nova Scotia Cabinet (1891) he became Premier and Secretary for his native province (1896). In 1897 he was sent to the Dominion Parliament as Liberal member for Victoria County.

MURRAY, Grenville (1824-81). An English journalist, the illegitimate son of Richard Grenville, second Duke of Buckingham. After studying at Magdalen College, Oxford, and at the Inner Temple, he entered the diplomatic service, and held various posts at Vienna, Hanover, Constantinople, and Odessa. Returning to England in 1868, he founded *The Queen's Messenger* (1869), the first of the English satirical society papers. Driven from England, he settled in Paris, where he figured as the Comte de Rethel d'Aragon, borrowing the title of his Spanish wife. He was one of the pioneers in the gossip and scandal of modern journalism. Among his separate publications are: *The Roving Englishman* (1854); *Round About France* (1878); and *Side Lights on English Society* (1881), containing a mock dedication to the Queen.

MURRAY, Hugh (1779-1846). A Scottish geographer, born at North Berwick. After 1816, when he became a fellow of the Royal Society of Edinburgh, he applied himself to the study of geography. He was chiefly noted for his share in the *Encyclopædia of Geography* (1834). He also compiled historical or geographical works upon *The Southern Seas* (1826); *Polar Seas* (1830); *Africa* (1830); *British India* (1832); *China* (1836); *British America* (1839); and *The United States* (1844).

MURRAY, James (c.1725-94). A Scotch soldier, and the first British Governor of Canada. He was the fifth son of Alexander, fourth Lord Elibank, and entered the army about 1740. In 1757 he was sent with his regiment to America, where he commanded a brigade in the siege of Louisburg in 1758, and led the left wing of Wolfe's army in the battle on the Heights of Abraham, September 13, 1759. The next year he successfully defended Quebec against an attack by a superior French force under De Lévis, and later in the same year assisted General Amherst in reducing Montreal. He was appointed Governor of Quebec in October, 1760, and of all Canada in 1763, and continued in that position until 1766. He became Governor of Minorca in 1774, was besieged in Fort Saint Philip in 1781 by the French and Spanish under the Duc de Crillon, and after a desperate defense was forced in 1782 to capitulate. Upon his return to England he was tried by a court-martial, but was acquitted. He became a full general in 1783, and died near Battle, in Sussex. For an account of his career in America, consult Parkman's *Montcalm and Wolfe* (Boston, 1884; new ed. 1898).

MURRAY, James Augustus Henry (1837—). A distinguished English lexicographer, born at Denholm, Roxburghshire, Scotland, in 1837. After his elementary studies at home and in Edinburgh, he continued his work at London University. Having taught at Hawick, he became master of Mill Hill School, near London, a position which he retained for fifteen years (1870-85). Already distinguished as a scholar, he had been twice elected president of the Philological Society (1878-80, 1882-84). For that society he assumed, in 1879, the editorship of the *New English Dictionary on Historical Principles*, the most exhaustive work in lexicography ever attempted in any language. In 1885 Dr. Murray moved from Mill Hill to Oxford, where his Scriptorium is a notable feature of the city. Before beginning this work, he had published many valuable monographs, and edited for the Early English Text Society the *Minor Poems of Sir David Lyndesay* (1871); the *Complaynt of Scotland* (1874); and the *Romance and Prophecies of Thomas Ereeldoune* (1875). In 1884 he was granted a civil list pension of £270. He has also been honored by degrees from English, Scotch, and German universities. A full account of the beginning of the dictionary and of its making is to be found in Dr. Murray's address to the Philological Society (1879). See Dictionary.

MURRAY, or **MORAY,** James Stuart, Earl of (1531?-1570). A Scotch statesman. He was the natural son of James V., of Scotland, and half-brother of Mary, Queen of Scots. Destined for an ecclesiastical life, he was educated from 1541 to 1544 at Saint Andrews, and early received ecclesiastical benefices. He accompanied his sister Mary to France in 1548, returning the following year to gain as a youth military experience and renown by driving a strong party of English from the coast with great loss. It is probable that he began to sympathize with Protestants as early as 1552, and it is certain that he was an attendant on Knox's lectures in 1555, and joined with others in urging his return from Geneva the following year. From 1556 on he was the consistent leader of the Scotch reformers, and after 1558 till his death he was the most powerful single factor in Scotch politics. He was present at Mary's marriage to the Dauphin of France, afterwards Francis II., and was sent to France in 1561 to invite the widowed Mary, after the death of the Queen Regent, to return to Scotland as its Queen. For a few years Lord James Stuart, as Mary's chief minister and adviser, seemed to subordinate his own ambition to the good of Scotland, the preservation of his religion, the future union of England and Scotland, and the success of his sister's reign. In 1562 Mary created him Earl of Mar, and shortly after Earl of Murray. When it became evident that she would not be acknowledged by Elizabeth as her successor, Mary turned to a Catholic alliance, which forced Murray to break with his sister, and a series of intrigues and counter-intrigues began. At first, inclined to favor the marriage of Mary with Darnley, he soon saw that it meant Catholic supremacy, hence he opposed it finally by an appeal to arms, but was defeated and forced to take refuge in England (1565). In 1566, after intriguing with Bothwell, professing at the same time friendship for Darnley, and being cognizant, at least, of the plan to murder Rizzio, Murray returned to Edinburgh to regain his power. For the moment outwardly reconciled to his sister, he went to France, but returned shortly at the request of the lords, who had taken arms, to become Regent of the Kingdom. After Mary's escape from prison, he defeated her forces at Langside, near Glasgow, 1568, and on her flight to England he became one of the commissioners sent to that country to conduct the negotiations against her. Later, however, he urged Elizabeth to permit Mary to return to Scotland, but was assassinated in 1570 by Hamilton of Bothwellhaugh, before his plans had matured. He was a cold, ambitious man, endowed with great abilities, personally moral, but in politics without scruples. Consult authorities cited under Mary Stuart.

MURRAY, John (1741-1815). The founder of the Universalist body in America. He was born at Alton, England, December 10, 1741. At the age of eleven his parents removed to Cork, Ireland. He became a Methodist under the preaching of Wesley and Whitefield. Having read a book by James Relly, a Universalist, he was led to adopt his views, and for this was excommunicated at Whitefield's Tabernacle, London. Persecution for opinion, pecuniary embarrassment, and grief for the loss of his wife, caused him to seek retirement in America. He preached his first sermon in America September 30, 1770, in a small church, in an obscure place in New Jersey, called 'Good Luck.' Believing fully in the doctrine of universal salvation, he gave himself to earnest labor, first in New Jersey and New York, afterwards in Newport, Providence, Boston, Portsmouth, Norwich, and other places in New England. In 1774 he fixed his residence in Gloucester, Mass., where he was represented as a Papist, and a secret emissary of Lord North in the interest of the English Ministry. He was abused, and by a vote ordered to leave the town, but the interference of powerful friends saved him, and he was allowed to remain. In 1775 he was appointed chaplain of a Rhode Island brigade encamped near Boston. Ill health compelled him to leave the army, and he returned to Gloucester, where he was settled over a society of Universalists. He was instrumental in the organization of a convention of his sect, which met at Oxford, Mass., September, 1785, and took the name of Independent Christian Universalists. In 1793 he was installed pastor of a society of Universalists in Boston, where he remained till his death, September 3, 1815. He published *Letters, and Sketches of Sermons*, 3 vols., and an autobiography (1813), continued by his wife (9th ed. by Demorest, 1870).

MURRAY, originally **MACMURRAY,** John (1745-93). The first of four great English publishers, John MacMurray, of the stock of the Murrays of Athol, was born in Edinburgh. Having served as lieutenant of marine (1762-68), he retired on half pay and began to publish and sell books in London. John MacMurray purchased the bookselling business of Paul Sandby, opposite Saint Dunstan's Church, London, and, dropping the Scottish prefix, became a bookseller and purchaser at '32 Fleet Street.' He brought out the *English Review*, and published the first two volumes of the elder Disraeli's *Curiosities of Literature*, etc. He died November 16, 1793, and was succeeded in due time by his son JOHN (1778-1843). One of the earliest hits of John the second was Mrs. Rundall's *Domestic Cookery* (1808), which had been through sixty-five editions by 1841. With the coöperation of Scott, Canning, and others, he founded the *Quarterly Review*, a Tory organ, in opposition to the Whig *Edinburgh Review*, then at the height of its influence. The first number was published February 1, 1809, under the editorship of William Gifford. The new periodical was completely successful, and brought Murray into communication not only with the chief writers, but also with the conservative statesmen of the time. A still more fortunate acquaintance was that with Lord Byron, whose *Childe Harold* (first two cantos) was published by Murray in 1812. Murray now removed from Fleet Street to Albemarle Street, where the business is still carried on. Almost all the literary magnates of the day were four o'clock visitors in Albemarle Street. Murray paid Byron nearly £20,000 for his works, and his dealings with Crabbe, Moore, Campbell, and Irving were princely. The second John Murray died in 1843, and was succeeded by his son, JOHN MURRAY the third, who was born in 1808. He was educated first at the Charter House, and afterwards at Edinburgh University. Many great works in history, biography, travel, art, and science were issued by the third Murray. Among his successes were Livingstone's *Travels and Last Journals*; Smiles's *Life of George Stephenson*; and Darwin's *Origin of Species by Natural Selection*. At his death (April 2, 1892) he was succeeded by his son, the fourth John Murray (born in 1851). Consult Smiles, *A Publisher and His Friends* (London, 1891).

MURRAY, Sir JOHN (1841—). An English naturalist and oceanographer. He was born at Coburg, Ontario, studied at Victoria College there and at the University of Edinburgh, and devoted himself to natural science. In 1868 he went through the Arctic regions on a whaler studying fauna and flora; from 1872 to 1876 was a naturalist of the *Challenger* expedition; and after six years' service as assistant became editor of the scientific reports of the *Challenger* voyage. He contributed to the *Narrative of the Cruise of H.M.S. Challenger* (1882-85) and wrote the *Challenger Report on Deep-Sea Deposits*, with Renard (1890). Murray was knighted in 1898.

MURRAY, JOHN CLARK (1836—). A writer on philosophy and ethics, born at Paisley, Scotland, March 19, 1836. He studied at Glasgow, Edinburgh, Göttingen, and Heidelberg. In 1862 he became professor of mental and moral philosophy in Queen's University, Kingston, Canada, and in 1872 he was called to a similar chair in McGill University, Toronto. He is author of *An Outline of Sir William Hamilton's Philosophy* (1870); the *Ballads and Songs of Scotland* (1874); *Memoir of David Murray* (1881); *Handbook of Psychology* (1885); *Solomon Maimon, an Autobiography*, translated from the German (1888); and an *Introduction to Ethics* (1891).

MURRAY, LINDLEY (1745-1826). An English grammarian, born at Swatara, Lancaster County, Pa., April 22, 1745. He was educated at an academy of the Society of Friends, and, on his father's removal to New York, was placed in a counting-house, from which he escaped to a school in New Jersey. He afterwards studied law and had a good practice in New York. During the Revolutionary War he engaged in trade with such success as to accumulate a handsome fortune. His health failing, he went to England and purchased an estate at Holdgate, near York, where he devoted himself to literary pursuits and botany. His garden rivaled the Royal Gardens at Kew. In 1787 he published his *Power of Religion on the Mind*, which passed through twenty editions. His *Grammar of the English Language* was issued in 1795, and was followed by *English Exercises*, the *Key*, the *English Reader, Introduction and Sequel*, and a *Spelling Book*, which went through some fifty editions. Murray died February 16, 1826. Consult the *Memoir of Murray*, containing an autobiography by Frank (York, 1826), and *Life* by Egle (New York, 1885).

MURRAY, or **MORAY,** Sir ROBERT (?-1673). A Scotch statesman. He was educated at Saint Andrews University, entered the French army, and, through the influence of Richelieu, rose to the rank of colonel. He was chosen secret envoy to negotiate a treaty between Scotland and France, and while at Newcastle in December, 1646, formed a plan for the escape of Charles I., which came to nothing through the King's irresolution. In 1651 he was appointed justice-clerk, and soon afterwards was made a Privy Councilor and a Lord of the Session, but never took his seat upon the bench. After the Restoration as Lord of Exchequer and Deputy Secretary he was one of the triumvirate, the other two members of which were Lauderdale and the King, that ruled Scotland from 1663 till 1670. He was one of the founders of the Royal Society, the oldest scientific society in Great Britain. As a chemist and musician he had considerable reputation in his time.

MURRAY, WILLIAM, first Earl of Mansfield. An English jurist. See MANSFIELD, WILLIAM MURRAY, FIRST EARL OF.

MURRAY, WILLIAM HENRY HARRISON (1840—). An American clergyman, lecturer, and man of business. He was born at Guilford, Conn., and was graduated from Yale College in 1862. From 1868 to 1872 he was pastor of the Park Street Church, Boston, and during his incumbency he gave several series of popular sermons, or Sunday evening lectures, before large audiences in Music Hall, and later published these discourses in two volumes, *Music Hall Sermons* (1870-73). He subsequently withdrew from the ministry, and later followed a varied career in business, lecturing, and writing. Besides several volumes of sermons and tales, he is the author of *Adventures in the Wilderness, or Camp Life in the Adirondack Mountains* (1868); *The Perfect Horse* (1873); *Adirondack Tales* (1877); and other stories.

MURRAY, WILLIAM VANS (1762-1803). An American diplomat, born in Cambridge, Somerset County, Md. He received a classical academic education in America, and in 1783 went to London, where he studied law for two years in the Inner Temple. Returning to Maryland in 1785, he was admitted to the bar, and began the practice of his profession, in which he soon attained prominence. From 1791 to 1797 he was a Federalist member of Congress. In 1797 he was appointed by President Washington United States Minister to the Netherlands, and in 1799, with

Oliver Ellsworth and William R. Davie, was sent to Paris to negotiate a treaty which should adjust the difficulties that had brought France and the United States to the verge of war. The successful negotiation of the convention signed at Paris, September 30, 1800, was said to be largely the work of Murray. He was the author of a valuable brief treatise on *The Constitution and Laws of the United States.*

MURRAY BAY, or **MALBAIE.** A summer resort of Charlevoix County, Quebec, Canada, on the left bank of the Saint Lawrence River, 90 miles east of Quebec, with which it has steamboat communication (Map: Quebec, F 3). Picturesquely situated on the Murray estuary which forms the bay, it is the principal watering place on the north shore of the Saint Lawrence, and is much frequented for its romantic scenery, invigorating air, bracing though cold bathing, its boating, and fishing. The town, of which lumber mills constitute the chief industry, is at the mouth of the Murray River, the dependent summer colonies being at Pointe à Pic (population, in 1901, 537) and Cap à l'Aigle, the extremities of the bay, three miles distant. It was one of the stations for United States prisoners of war in 1776. Population, in 1901, 826.

MURRAY RIVER. The principal river of Australia, draining, together with the Darling, practically the whole southeastern quarter of the continent. It rises in the Australian Alps near the eastern boundary of Victoria, and flows for two-thirds of its course northwestward, forming the boundary between Victoria and New South Wales (Map: Australia, G 5). After entering South Australia, it makes an abrupt turn to the south, and enters the Indian Ocean through Encounter Bay, 40 miles southeast of Adelaide. Its length is about 1500 miles. For the first 60 miles of its course it passes between precipitous rocky cliffs, in one place, known as the Murray Gates, reaching an enormous height, while some of the highest peaks of the continent are close to either shore. After passing through the Gates the hills become gradually lower, and finally the river enters the immense Australian Plains. Here the Murray is sluggish, with numerous windings, and flanked by lagoons. It receives here scarcely any tributaries except a few very large ones coming from the mountains. Among these are the Murrumbidgee (q.v.), which is longer than the main stream from the point of confluence, and the Darling (q.v.), whose length exceeds that of the entire main stream. During the dry season the river shrinks even in its lower course to a width of less than 300 feet, but in winter its volume increases enormously, and great inundations occur. In the wet season it is navigable for small steamers for the greater part of its course as far as Albury, but its mouth, owing to sand bars, is inaccessible for large vessels. There are a number of ports on its shores, whose total shipping probably amounts to more than one and a half million tons annually.

MUR'RAYSHIRE. A maritime county of Scotland. See ELGINSHIRE.

MURRE (also *marre*, of uncertain etymology). Any of several species of guillemot (q.v.).

MURRELET, mŭr'lĕt (diminutive of murre). Any of several small murre-like birds confined to the North Pacific Ocean. The black-throated murrelet (*Synthliborhamphus antiquus*) is a handsome black and white bird, about ten inches long. It breeds from Sitka northward, and is found as far south as Oregon in winter. A Japanese murrelet is closely allied to it. The remaining four species represent another genus (*Brachyrhamphus*) chiefly distinguished by a more slender and less compressed bill. Two of the species are Arctic forms, one coming south to southern California in winter, while the other two occur in southern and Lower California.

MUR'RELL, WILLIAM (1853—). An English physician. He was educated at University College, London, where he was scholar and demonstrator (1875-78). Having received the title of *lauréat* from the French Medical Academy in 1881, he served as medical examiner at Edinburgh (1882-87), and in the Royal College of Physicians in London (1886-90), and became physician and lecturer at Westminster Hospital. He wrote: *Angina Pectoris* (1880; medal from the French Academy); *Bronchitis* (1890); *Materia Medica* (1900); and *Forensic Medicine and Toxicology* (1902).

MUR'RUL. See WALKING-FISH.

MURRUMBIDGEE, mŭr'rŭm-bĭj'ē. A river of New South Wales, the second largest tributary of the Murray. It rises on the northeast slope of the Australian Alps, in the southeastern corner of the State, within 40 miles of the Pacific coast (Map: Australia, H 5). It flows first northward through a hilly country, then westward through the great plains till it enters the Murray 90 miles, in a straight line, southeast of the mouth of the Darling. Its length is 1350 miles, but, though it is longer than the Murray from the point of confluence, it is not of great commercial importance, owing to its shallowness. During the wet season it is navigable 500 miles for light-draught steamers. Its principal affluent is the Lachlan (q.v.).

MURSHIDABAD, mōōr'shē-dȧ-bäd'. The capital of a district of Bengal, British India, on the left bank of the Bhaghirathi, a branch of the Ganges, 115 miles north of Calcutta (Map: India, E 4). Azimganj, on the opposite side of the river, with ferry communication, is usually reckoned part of Murshidabad. The town covers a great area, several miles in length and breadth. The buildings are for the most part of mud, but there are several brick structures—mosques and tombs—along the river bank; and centrally situated is the Nizamat Kila or Nawab's palace, a building of great beauty, completed in 1840. The town is on the most frequented water route from Calcutta to the United Provinces. Its trade was formerly of great importance. Its banking connections are still considerable, Jain merchants here being among the wealthiest in India. The rearing of silkworms and the weaving of silk are the chief of many industries, which include ivory carving, the manufacture of gold and silver lace, of hookah pipes, musical instruments, etc. Murshidabad was the last Mohammedan capital of Bengal, and after the British annexation remained the capital until 1790, when the administrative seat was settled at Calcutta. Population, in 1891, of Murshidabad and Azimganj, 35,756; in 1901, of Murshidabad 15,168, of Azimganj 13,383, total 28,551.

MURU′MURU PALM. See ASTROCARYUM.

MURVIEDRO, mōōr-vyā′drȯ. A small town of Spain, in the Province of Valencia, occupying the site of the ancient Saguntum (q.v.) (Map: Spain, E 3). Population, in 1900, 6784.

MURZUK, mōōr-zōōk′ or **MOURZOUK.** The capital of Fezzan (q.v.), North Africa, situated in an unhealthful region in latitude 25° 50′ N., and longitude 14° 10′ E. (Map: Africa, F 2). It is surrounded by a wall and has an extensive palace. The inhabitants manufacture leather and textiles. The population is estimated at 6500.

MUSACEÆ, mů-zā′sė-ē (Neo-Lat. nom. pl., from *Musa*, from Ar. *mauz*, banana-tree), THE BANANA FAMILY. A natural order of generally stemless monocotyledonous plants, which resemble trees in appearance, and sometimes rival palms in stateliness. The long sheathing bases of the leafstalks combine to form a false stem. From the midrib to the margin of the leaf blade are many fine parallel veins. Hence the wind tears the tissue between them and makes the leaves very ragged. The flowers are borne on spadices in cymes or racemes often with bright colored bracts which are protected by spathes. The fruit is either fleshy or a three-valved capsule. The species (about 60) are widely distributed in warm climates, and are of great value, the fruit of some, particularly of the genus Musa, being much used for food, the fibres of the leaves of others for cordage and for textile purposes. A very interesting species is the traveler's tree (q.v.) of Madagascar. The principal genera are Musa, Strelitzia, Ravenala, and Heliconia. The species of the first three are found almost wholly in the Old World, those of the latter in the New. See PLANTAIN; BANANA; HEMP, MANILA.

MUSÆ′US (Lat., from Gk. Μουσαῖος, *Mousaios*). A legendary Greek poet, and personification of the powers of the Muses. His parents were said to be Eumolpus or Antiphemus and Selene, and in story he was closely connected with Orpheus, of whom he is variously called teacher, son, and pupil. He is especially associated with the Eleusinian mysteries, which he was said to have founded, and many poems apparently connected with this worship, or oracular, were attributed to him. He had no existence outside of legend. A later Musæus, who probably flourished about the end of the sixth century of the Christian Era, was the author of a very pleasing amatory poem, in Greek, entitled *Hero and Leander*, discovered in the thirteenth century, of which the first edition was published by Aldus Manutius about 1494; critical edition by Dilthey (Bonn, 1874). See HERO.

MUSA IBN NOSEYR, mōō′sȧ ĭb′′n nȯ-sīr′ (c.660-713). An Arab governor of Northern Africa, who gave permission to Tarik (q.v.) in 711 to make an expedition into Spain, which led to the Moorish conquest of the Peninsula. Musa, jealous of the success of his subordinate, crossed himself in 712 with an army of eighteen or twenty thousand men. He made conquest after conquest, but was checked in 713 by an order of the Caliph to repair at once to Damascus. He left immediately, his son Abdul Aziz taking command. When Musa arrived at Damascus he was deprived of his command, disgraced, and killed, while his son met his death in his palace at Seville, at the hands of a messenger from Damascus. Consult Burke, *History of Spain*, vol. i. (London, 1895).

MUSÄUS, mụ-zā′ụs, JOHANN KARL AUGUST (1735-87). A German writer, best known for his *Volksmärchen der Deutschen* (1782-86), a collection of tales blending genial humor, quaint fancy, and common sense. Musäus was born in Jena, March 29, 1735. He studied theology, became in 1763 tutor of pages at the Court of Weimar, and in 1770 professor at the Weimar Gymnasium. His literary career began (1760) with a successful parody of Richardson's *Grandison*. Then, after eighteen years' silence, he satirized Lavater's whimsical theories in *Physiognomische Reisen*. His sprightly and genial *Freund Heins Erscheinungen in Holbeins Manier* (1785) are interesting because they show the rising influence of Wieland. He died at Weimar, October 28, 1787, before completing *Straussfedern*, a series of tales. In 1788 appeared the clever skits *Moralische Kinderklapper*. Other posthumous writings were gathered in 1791 with a notice of Musäus by his pupil and relative, Aug. von Kotzebue (Leipzig, 1791). There is a *Life* by Müller (Jena, 1867).

MUSCÆ VOLITANTES, mŭs′sē vŏl′ĭ-tăn′tēz (Lat., flying flies). The term applied to floating grayish spots before the eyes. Whoever will look through a minute pin-hole in a card at the clear sky may see floating before his sight a number of translucent tubes or fibres, and many little beads, of which some are separate, some attached to the tubes, and some apparently within them. Some of the tubes or fibres are straight, others looped or twisted, and others again forked. All these objects are bright in the middle, and bounded by fine black lines. The doublings and crossings of the loops or knots in the twisted fibres appear as black points. Though the eye be fixed, these bodies change their position with greater or less rapidity. Now, in ordinary light and vision these objects are usually unobserved, though some persons can easily see them, especially when looking at a bright surface. They are caused by shadows cast upon the retina by cells which occur normally in the vitreous humor. They occur most often with errors of refraction and disturbances of digestion. They are of no importance whatever. After a sudden movement of the eyes they appear to settle downward. Fixed black spots, not moving at all while the eyes are motionless, are suggestive of actual disease and demand an ophthalmoscopic examination.

MUS′CARDINE (Fr. *muscardine*, *muscadin*, It. *moscardino*, *moscadino*, musk lozenge, from *moscato*, ML. *muscatum*, musk, from Lat. *muscus*, musk), or SILKWORM ROT (*Botrytis bassiana*). A serious fungous disease of silkworms. It consists of erect branching threads, with clusters of spores at the ends of short lateral branches. The spores germinate on healthy silkworms, especially those in the last stage before spinning their cocoons. They germinate also on the caterpillars of other lepidopterous insects, and on the common house-fly. Diseased worms die suddenly, become discolored, and are soon hard and dry. Within twenty-four to thirty-six hours their bodies may be covered with a whitish powder, the spores of the fungus. For the prevention of this disease absolute cleanliness in the breeding house is necessary: rooms should be cleansed and fumigated after an outbreak to prevent infection of the new brood.

MUSCAT, mŭs-kăt′. An old name for the Arabian State of Oman (q.v.).

MUSCAT, MUSKAT, or **MASKAT,** mŭs-kăt′. The capital of Oman, in Southeastern Arabia, situated on the Gulf of Oman (Map: Turkey in Asia (Arabia), T 11). It is fortified and has a good harbor, which makes it one of the most important commercial centres in Arabia, and the port for almost all the trade of Oman, amounting to over $5,000,000 annually. Though situated amid beautiful surroundings, it is poorly built and unclean, and its climate is very hot and unhealthful. The population is estimated at 40,000. Muscat is the seat of a British Resident and has been declared to be under British influence. In the sixteenth century Muscat was captured by the Portuguese, but was restored to the ruler of Oman in the seventeenth century.

MUS′CATEL (also *muscadel*, OF. *muscadel*, *muscadet*, Fr. *muscadet*, from ML. *muscatellum*, muscatel wine, diminutive of *muscatum*, musky odor, from Lat. *muscus*, musk). The name given to many kinds of sweet and strong French and Italian wines, whether white or red. Among the finest are the white Rivesalt and red Bagnol wines from Roussillon, the Lunel from the Pyrenees, and the Lacrymæ Christi and Carigliano of Naples. See WINE.

MUSCATINE, mŭs′kȧ-tēn′. A city and the county-seat of Muscatine County, Iowa, 210 miles west of Chicago; on the Mississippi River, and on the Chicago, Rock Island and Pacific, the Burlington, Cedar Rapids and Northern, and the Iowa Central railroads (Map: Iowa, F 3). It is built on high bluffs at a bend of the river; and among noteworthy features are the Musser Library (public), a soldiers' monument, and a high bridge across the river. The city carries on considerable trade in lumber and agricultural produce, being known especially for the watermelons grown on Muscatine Island, just below the city. It is an important industrial centre, its establishments including flour and oatmeal mills, pickle works, foundries and machine shops, rolling mills, sheet iron, boiler, and engine works, manufactories of various lumber products, lead works, potteries, button factories, box and packing case factories, brick and tile works, carriage and wagon shops, etc. Settled in 1833, Muscatine was incorporated first in 1839. The government, under a charter of 1851, subsequently amended by State special charter laws, is vested in a mayor, elected every two years, and a unicameral council, which controls important powers of confirmation and election in administrative offices. The police judge, treasurer, wharf master, assessor, and school board are chosen by popular vote. The city owns and operates the water-works. Population, in 1890, 11,454; in 1900, 14,073.

MUSCHELKALK, mụsh′*e*l-kälk (Ger. shell-lime). The middle member of the Triassic or New Red Sandstone period in Continental Europe. In Germany the formation consists chiefly of limestones, which abound in the remains of mollusca; hence the name muschelkalk. The beds are of much economic importance, containing salt, marl, and gypsum.

MUSCI, mŭs′sī (Lat., mosses). The technical name of the group of plants known as mosses, one of the two subdivisions of bryophytes, the other being the Hepaticæ (liverworts). Mosses are adapted to all conditions, from submerged to very dry, and are most abundantly displayed in temperate and Arctic regions. They have great power of vegetative multiplication, new leafy shoots putting out from old ones, thus forming thick carpets and cushions. Bog mosses often completely fill up bogs or small ponds and lakes with a dense growth which dies below and continues to grow above. These quaking bogs or 'mosses' furnish very treacherous footing. In their depths the dead moss plants become slowly modified into peat.

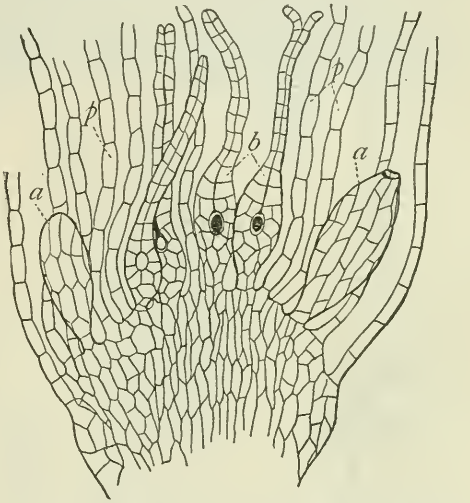


FIG. 1. The so-called flower of a moss in longitudinal section, showing antheridia (*a*), archegonia (*b*), and paraphyses (*p*). Outside all are longitudinal sections of leaves.

There are two great groups of mosses, the Sphagnum forms (peat or bog mosses) and Bryum forms (true mosses). The life history of a true moss shows a distinct alternation of generations (q.v.). When a spore germinates, there is first developed a small, green, thready

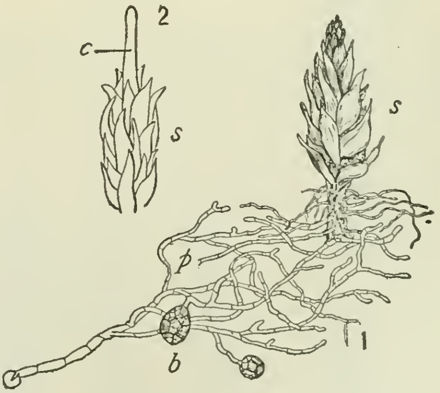


FIG. 2. 1, gametophyte, showing original spore (*x*), protonema (*p*), buds (*b*) which develop the leafy branches (*s*). 2, a young sporophyte (*c*) emerging from the leafy plant (*s*).

body (protonema), upon which appear buds that give rise to the ordinary leafy moss plant. Upon this leafy plant the sex organs (antheridia and archegonia) are borne (Fig. 1), and hence it is the sexual phase (gametophyte) in the alternating generations. The sex organs produce a fertilized egg, which upon germination does not reproduce a leafy moss plant, but a structure of totally different character, namely a stalked spore-case (sporogonium), full of asexual spores, commonly called the moss 'fruit.' Since this sporogonium has no sex organs, it is the sexless phase (sporophyte) in the alternation. When these spores germinate they produce leafy moss plants (gametophytes) again, and so alternation continues. (See Fig. 2.) The spore-case (capsule) of an ordinary moss, generally pendent from a slender stalk (seta), is a very complicated structure. It is usually somewhat urn-shaped, with a little conical or flattish lid (operculum), which is thrown off when the spores are to be discharged. Often also the mouth of the urn is guarded by beautiful hair-like or tooth-like structures which converge toward the centre, and are collectively known as the peristome (around the mouth). Through the centre of the capsule there runs an axis of sterile tissue, called the columella; while capping the top of the capsule like a loose hood is the calyptra, which is the dead and ruptured female sex organ (archegonium) that has been carried up by the elongating sporogonium (Fig. 3). See BRYOPHYTES.

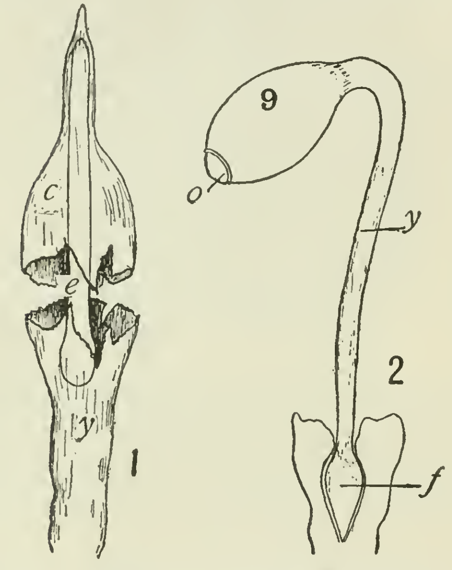
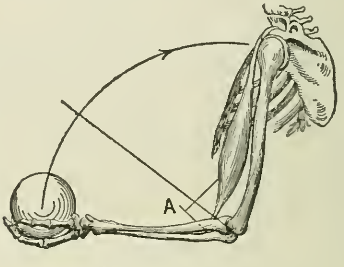


FIG. 3. 1, the young sporophyte (*e*) rupturing the bladdery archegonium and carrying up the upper portion (*c*) as a hood (calyptra). 2, mature sporophyte (sporogonium), showing foot (*f*), seta (*y*), capsule (*c*), and operculum (*o*). Both diagrammatic.

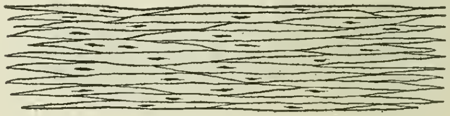
FOSSIL MOSSES. The earliest fossil mosses, Muscites, allied to the modern genus Polytrichum, are found in the Carboniferous rocks of Commentry, France. Throughout the Mesozoic formations fossil mosses are rare, though their existence during the Liassic is inferred from the presence in rocks of that age of a beetle of the genus Birrhus, which at the present time is known to live in mosses only. Fossil mosses are quite common in the Tertiary rocks and especially so in the amber.

MUS'CIDÆ (Neo-Lat. nom. pl., from Lat. *musca*, fly). A family of dipterous insects comprising the typical or true flies. The bristle of the antennæ is feathery and the abdomen is smooth except for a certain number of bristles near the tip. The larvæ as a rule feed upon decaying animal or vegetable matter, more abundantly upon the former. The group comprises many species, and includes some of the most common and abundant forms, such as the house-fly, the horn-fly, and the stable-fly (qq.v.).

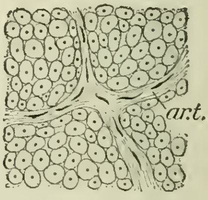
MUSCLE AND MUSCULAR TISSUE. While contractility is a property of all active, living protoplasm, it is in muscular tissue that this property reaches its highest development, the ability to contract along certain definite lines being the peculiar function of this tissue. Muscle tissue occurs in three different forms: (1) *Striated Voluntary Muscle.* This form of muscle is found in all those muscles which are under the control of the will, in fact all those which in the common use of the term are called 'muscles,' such, e.g. as the biceps, triceps, etc. (2) *Non-striated Involuntary Muscle.* This form of muscle occurs in the muscles which are not under the control of the will, those which carry on the automatic functions of life, such as the muscles of the intestine, which control its peristaltic action, or the muscles of the arteries and veins, which govern their contractility. (3) *Striated Involuntary Muscle* or *Cardiac Muscle.* This is a peculiar form of muscular tissue found only in the heart. It appears to occupy a sort of intermediate position between the other two forms.



A. BICEPS MUSCLE.



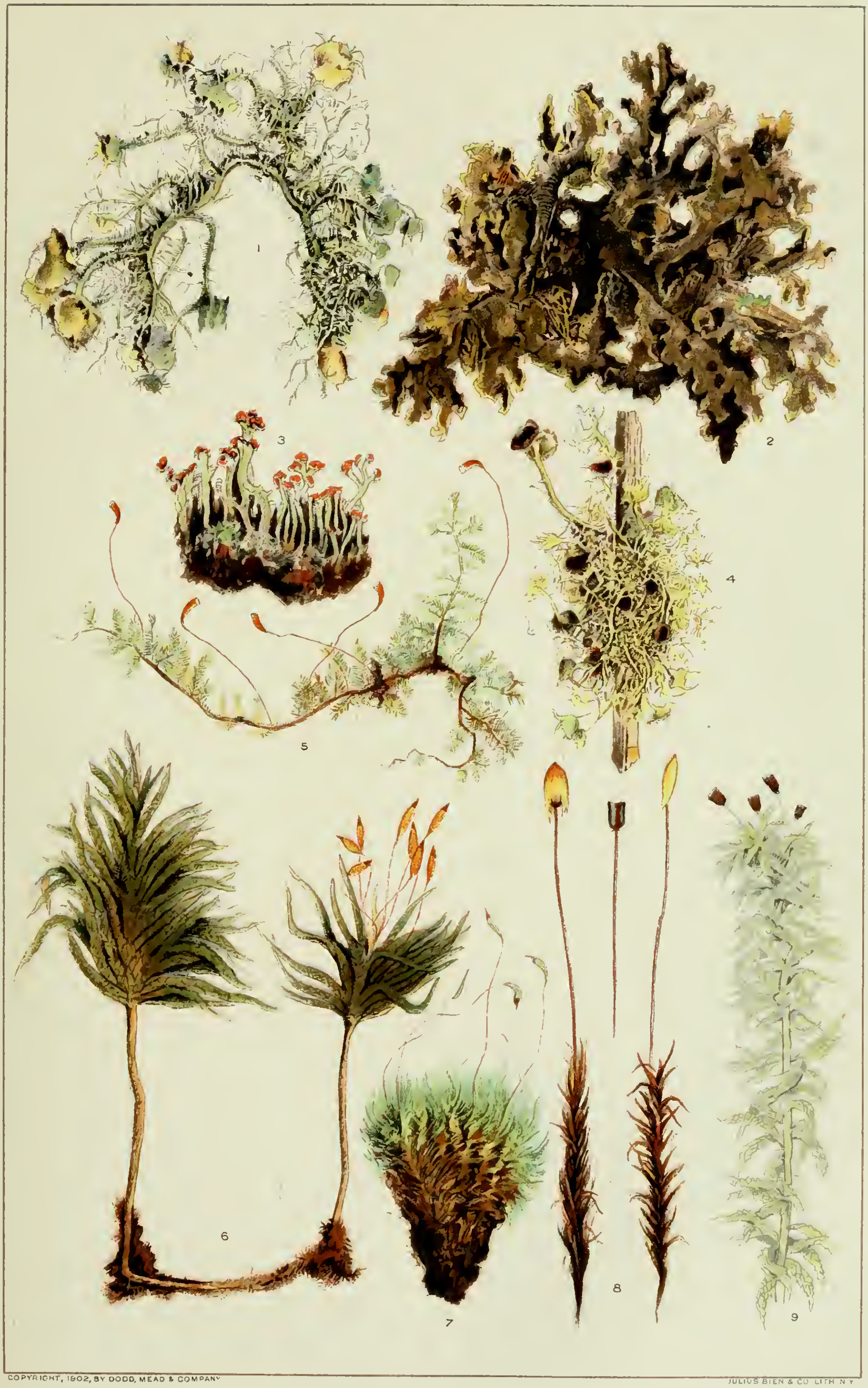
INVOLUNTARY MUSCLE IN LONGITUDINAL SECTION.



INVOLUNTARY MUSCLES IN TRANSVERSE SECTION. *Ar.t.*, areolar tissue.

(1) *Non-striated Involuntary Muscle.* This form of muscular tissue, while not occurring in any such large masses as does the voluntary muscle, has an extremely wide distribution. It forms the muscularis mucosæ and muscular coats of the gastro-intestinal canal, the muscular walls

MOSSES AND LICHENS



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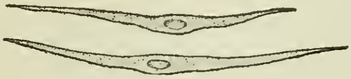
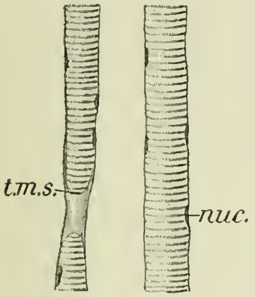
1 BEARD MOSS - USNEA BARBATA
2 SAFFRON-COLORED STICTA - STICTA CROCATA
3 CRESTED CLADONIA - CLADONIA CRISTATELLA
4 YELLOW EVERNIA - EVERNIA VULPINA
5 FERN MOSS - THUIDIUM RECOGNITUM
6 TREE MOSS - CLIMACIUM AMERICANUM
7 BROOM MOSS - DICRANUM SCOPARIUM
8 HAIR-CAP MOSS - POLYTRICHUM COMMUNE
9 PEAT MOSS - SPHAGNUM SQUARROSUM

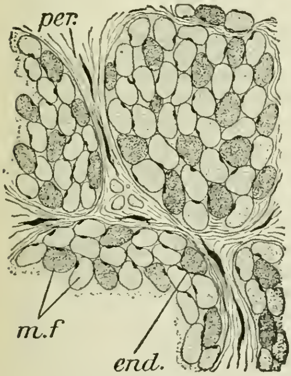
of the arteries and veins, of the trachea and bronchi, of the larger ducts of glands, and occurs in the urinary tract, and in the male and female generative organs, etc. It consists of long, slender, spindle-shaped cells from .075 to .230 millimeter in length and from .004 to .010 millimeter broad. Its substance shows fine longitudinal markings. A delicate sheath or cell wall has been described and within this is the semifluid granular protoplasm of the cell body. In the centre of the latter lies a long rod-shaped nucleus toward each end of which a few fine granules are found. These cells are arranged in bundles, the individual cells being held together by a cement substance, the bundles being surrounded by more or less connective tissue. Blood-vessels ramify in this connective tissue where they break up into capillaries which form a network among the muscle cells. Nerves, mainly of the sympathetic system, pass to the individual muscle cells.


VOLUNTARY MUSCLE.
Smooth muscle fibres from the small intestine of a frog.



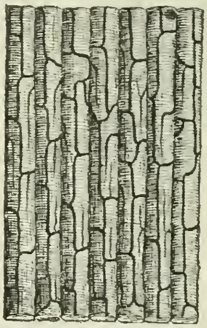
VOLUNTARY MUSCLE.
nuc., nuclei; *t.m.s.*, termination of muscular substance.

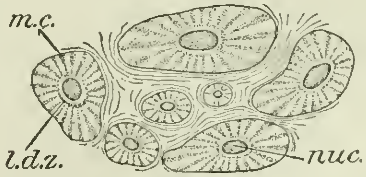
(2) *Striated Voluntary Muscle.* This form of muscular tissue constitutes the ordinary voluntary muscles of the skeletal system, and occurs in the pharynx, larynx, diaphragm, generative organs, etc. It is composed of long cylindrical fibres, each one of which represents a highly specialized development of a single cell. The muscle fibre consists of the muscle substance proper, the muscle nuclei, and an external sheath or sarcolemma. The muscle substance of a fibre shows a longitudinal striation which indicates its division into ultimate fibrillæ, while transversely it consists of alternate light and dark bands or disks. The light disk is crossed by a delicate dark line, the line or membrane of Krause. A light line across the dark disk (Hensen's line) has also been described, but is probably an artefact.



VOLUNTARY MUSCLE IN TRANSVERSE SECTION.
m.f., muscle fibres; *end*, endomysium; *per*, perimysium.

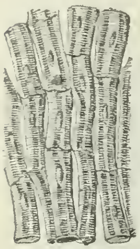
The minute bit of muscular tissue separated off by Krause's line at either end and by the dividing line between the fibrillæ on each side is known as the 'sarcous element of Bowman,' while the appearance presented by the cross-cut ends of the fibrillæ composing a single fibre is called 'Cohnheim's field.' Each fibre is inclosed in a transparent, very delicate, but tough and elastic sheath, which cannot always be readily seen, but often shows distinctly, stretching between the separated fragments of a fibre which has been broken within it, its toughness and elasticity allowing it to resist a force sufficient to rupture its more brittle contents. This sheath is known as the sarcolemma or myolemma, the former term being derived from the Greek words *sarx* (flesh) and *lemma* (skin or husk), the latter from the Greek words *mus* (muscle) and *lemma*. Just beneath the sarcolemma, in the muscle protoplasm, lie the muscle nuclei. They are oval or spindle in shape, their long axes corresponding to those of the fibre. The individual muscle fibres are held together by a delicate connective tissue called the endomysium. The muscle fibres are bound together into bundles or fascicles by a coarser connective tissue, the perimysium, while the entire muscle is surrounded by a connective tissue sheath, the epimysium. In short muscles single fibres may extend the entire length of the muscle. In longer muscles the single fibres do not extend the entire length of the muscle, averaging 25 to 50 millimeters in length. Very long fibres, 100 to 120 millimeters long, are sometimes found. The fibres taper somewhat at their ends and terminate, if in the middle of the muscle, by a blending of the sarcolemma with the endomysium of the neighboring fibres; if in tendon, periosteum, or perichondrium, by union of the sarcolemma with the connective tissue. Striated muscle is extremely vascular. The larger vessels run in the perimysium, where they branch, and these smaller branches give off capillaries which form a rectangular meshed network among the individual fibres. The larger nerve trunks run in the perimysium, where they subdivide and send branches to the muscle fibres. Here they terminate in special 'end plates.' See Nervous System.


INJECTED VOLUNTARY MUSCLE.



SECTION OF CARDIAC OR HEART MUSCLE (striated involuntary muscle).
m.c., muscle columns; *l.d.z.*, zone of less differentiated sarcoplasm; *nuc.*, nucleus.

(3) *Cardiac* or *Heart Muscle* (*Striated Involuntary Muscle*). This is a type of muscular



HEART MUSCLE.

tissue peculiar to the heart. It resembles the smooth involuntary muscle in being composed of nucleated cells. These cells are, however, much larger and broader than the smooth muscle cells, are more or less rectangular in shape, and send off lateral branches which join similar branches of neighboring cells, with which they are connected by cement substance. The cell protoplasm shows both longitudinal and transverse striations, but much less marked than in striated voluntary muscle. A cross-section of a cell gives somewhat the appearance of Cohnheim's field, but the fibrillæ show a more or less radial arrangement about the circumference. The nucleus is round or slightly oval in shape and is situated near the centre of the cell.

Development. Muscle is developed from the mesoderm or middle layer of the embryo. Smooth muscle cells are produced by a differentiation of mesodermal cells. Voluntary striated muscle is developed by a still further specialization of these mesodermal cells, the cell nuclei proliferating and longitudinal and transverse striations appearing in the protoplasm. In this way the cells become gradually transformed into the fibres of voluntary muscle. Heart muscle has the same derivation, and represents an intermediate stage of development between the more primitive smooth muscle cells and the more highly specialized striated muscle fibres.

MUSCLE-READING. The intuition of a person's thought by physical contact. Every complete mental process tends to 'issue' or 'express itself' in movement; the psychophysical organism is essentially a motor organism. In many cases these expressive or concomitant movements are involuntary, and unknown to their performer. It is often possible, by close attention to them, to get an inkling of the object or direction of the agent's thought. Some persons, indeed, have a peculiar aptitude for this 'muscle-reading,' or (as it has been wrongly termed) 'mind-reading.' so that they are able, by taking into account all the objective indications presented by the agent, to reproduce in somewhat surprising detail the course of his thought.

Muscle-reading was much in vogue a few years since as a drawing-room game. On the stage, it is customary for the 'mind-reader' to lay the hand of the subject upon his forehead, or to take the subject's hand in his own. By minute observation of the subject's involuntary movements, of his tremor or flush of excitement, etc., it is possible for the reader to guess, in many instances, the number of a watch, the place and character of a hidden object, etc.; the subject being completely unaware that he is giving any suggestion, and the suggestions themselves being unnoticeable to the audience. With the most successful mind-readers the process of observation has become habitual and therefore partly unconscious, so that they are unable to explain their *modus operandi*, even if they desire to do so. Their extreme fatigue, at the conclusion of a performance, indicates, however, that their attention has been under great strain.

This appreciation of unconscious movements and of vasomotor changes in the subject is sufficient to explain all the feats of mind-reading that are on record, surprising as some of these may at first thought appear. On the involuntary whisper, and its significance for telepathy, see Telepathy. Consult also: Jastrow, *Fact and Fable in Psychology* (New York, 1900); Preyer, *Die Erklärung des Gedankenlesens* (1886).

MUSCLE SENSE. A term used, in a wider signification, to mean "the sum total of the sensations which inform us of the condition of our motor organs" (Henri). This usage has its root in the theory that our chief reliance, in perceptions of the movements of our limbs, is upon the sensations set up in the voluntary muscles. Goldscheider has, however, conclusively proved that the perception of movement is mediated, not by sense-organs in the muscles, but by the sensory nerve-endings of the joints (articular sensations). Moreover, the definition proposed by Henri must include (or must tacitly ignore) visual sensations; for we undoubtedly derive a good part of our knowledge of movement by seeing our limbs move. There seems, then, to be no justification for retaining the term 'muscle sense' in the meaning indicated. If we wish to group together the sensations concerned in movement, to emphasize their functional conjunction, we may take Bastian's word 'kinæsthetic' sensations. The kinæsthetic "group of senses furnishes us with data for the perception of the positions and motions of our members and of the body as a whole, and plays a leading part in the perception of space. It includes some senses whose existence or efficiency is disputed (innervation sense and muscle sense), and others whose independence has only of late been generally recognized (joint sense and tendon sense). All are closely united with one another and with pressure and contact, and some are hardly ever dissociated except by disease" (Sanford).

The specific sensation of the voluntary muscle, 'muscular sensation' in the narrower sense, although it is of little functional import (except, perhaps, as the chief sense-basis of the feeling of muscular fatigue), is easily isolated by laboratory procedure. If the position of the arm be kept constant, so that there is no change of articular sensation, the cutaneous sensations ruled out by etherization, and an induction current passed through the body of a muscle, we get a dull, diffuse, vague sensation, which is localized in the substance of the arm. With high degrees of muscular contraction, the sensation takes on a dragging or grinding character, and presently verges on pain (q.v.). It is unquestionably a specific sense-quality, best described as a dull, dead pressure, and most nearly akin to (though by no means identical with) the pressure sensations obtained by lightly pressing a blunt object upon the cutaneous surface. When once known to introspection, it can be reproduced by mechanical stimulation (heavy pressure) as well as by electric current.

There is also a special tendinous sensation, mediated by the tendons which attach the voluntary muscles to the bones. This is the sen- arm is held out for any length of time, when the arm is held out for any length of time, when the fist is tightly clenched, etc. It is radically different in quality from the dead pressure of the muscles, and the sharp pressure (seemingly identical with cutaneous pressure) that comes from the articular surfaces. It plays a large part in the perceptions of weight, resistance, etc., enters into the fatigue-complex of exhausting bodily exercise, and occurs in muscular cramp. Its variations do not necessarily run parallel to the variations of the muscular sensation, for very different degrees of muscular contraction are, obviously, compatible with one and the same amount of pull upon the tendons. Consult: Goldscheider, *Gesammelte Abhandlungen*, vol. ii. (Leipzig, 1898); Bastian, *The Brain as an Organ of Mind* (London, 1885); Henri, in *Année psychologique*, vol. v. (Paris, 1899); Titchener, *Experimental Psychology*, vol. i. (New York, 1901).

MUSCOGEE, mŭs-kō′jē. A town of the Creek Nation, Indian Territory, 154 miles north by east of Fort Worth, Tex., on the Missouri, Kansas and Texas Railroad (Map: Indian Territory, H 3). It is the seat of the Harry Kendall College (Presbyterian), opened in 1894, and is the headquarters of the United States agent for the Indians. The town is the commercial centre for extensive agricultural and stock-raising districts. Population, in 1900, 4254.

MUS′COVITE. A mineral aluminum-potassium silicate that crystallizes in the monoclinic system, and is the most common member of the mica group. Its usual color ranges from gray to brown, but it also occurs in different shades of green, violet, yellow, and sometimes rose-red. It has a vitreous lustre that is more or less pearly or silky, and its specific gravity is from 2.76 to 3. Muscovite is one of the essential constituents of granite, gneiss, mica-schist, and certain other rocks. It is widely distributed in nature, occurring most abundantly in Tyrol, Styria, on the Saint Gotthard, and elsewhere in Switzerland, as well as at Paris, Me., Grafton, N. H., Chesterfield, Mass., and numerous localities of North Carolina, in the United States. The fact that it has a cleavage parallel to the base, and is easily separated, forming thin elastic plates which are transparent to translucent, led to its use as the material for window-panes in Russia, whence its name of *Muscovy glass*, and to its extensive and similar use in stoves under the name of 'isinglass.' It is also employed commercially in wall paper, as a filler, in electrical machines as an insulator, and to a certain extent as a paint. See MICA.

MUS′COVY. A name formerly applied to Russia, whose capital down to the beginning of the eighteenth century was Moscow. The word is still used in ornate style.

MUSCOVY DUCK (corrupted from *musk-duck*). A large South American duck (*Cairina moschata*) in which the male is much larger than the female, and has fleshy wattles on the forehead and lores, and a crest of long feathers. This duck has long been domesticated in Brazil and in Europe, where it is especially in favor in Germany. In this country they are less esteemed, because of their quarrelsome nature and ability to harm one another or their companions in the poultry yard. Two varieties are recognized, 'colored' and 'white,' which are thus described in Howard's *Farmers' Bulletin, No. 64*, of the United States Department of Agriculture (Washington, 1897): The head of the colored muscovy is glossy black and white; the bill is dark-horn in color; eyes, brown; the back in color of plumage is lustrous blue black, which is sometimes broken with white; the color of the breast and body is the same as that of the back. The wing coverts are rich, lustrous green black, and the tail feathers may be either black or white, the latter being preferred. The thighs, like the tail feathers, may be either black or white, white being preferred; the shanks, toes, and webs vary in color from yellow to dark lead or black. The white muscovy in color of plumage is pure white throughout; feathers of any other color will disqualify the bird for show purposes. The eyes in the white variety are of a leaden-blue or gray color, while those of the colored are brown. The shanks, toes, and webs are of a pale-orange or yellow color. The standard weight of the adult drake is ten pounds; adult duck, eight pounds. The flesh is good and loses in cooking the musky odor of the living bird.

MUSCULAR FORCE, ORIGIN OF. This subject has occupied the attention of physiologists for many years, and numerous theories have been offered to explain the phenomena of muscular energy. The older observers, represented by Liebig, held that nitrogenous food went to build up and maintain muscular tissue and that energy was evolved in the splitting up (or oxidation) of this class of food, the waste being represented in the excreted urea. The non-nitrogenous foods (carbohydrates or starches, and fats), on the other hand, were supposed to be entirely devoted to the production of heat. Muscular work should, therefore cause a distinct increase in the elimination of urea. But this theory is invalidated by the fact that the excretion of urea does not keep pace with the production of energy. Later observers have taken the opposite view, that force is generated by the oxidation of non-nitrogenous substances, and that the nitrogen constituents of muscle are rather to be looked upon as forming a part of the machine in which the former substances are burned than as constituting the fuel themselves.

It has been suggested by Herman that muscular activity depends upon the splitting up and subsequent re-formation of a complex nitrogenous body which he calls *inogen*. From the decomposition of this body there result carbon dioxide, sarcolactic acid, and a gelatino-albuminous body. Of these the carbon dioxide is carried away by the blood, and the acid and the albuminous substance, at least in part, go to rebuild the inogen. The other materials of which the inogen is formed are supplied by the blood. Of these materials oxygen and some carbohydrate substance form a part. The decomposition takes place both in resting and active muscle, but is much greater in the latter. This theory explains certain known facts of muscular metabolism; first, that muscle absorbs oxygen and gives off carbon dioxide during both rest and activity, and that increased exchange of these gases takes place during the latter condition; that this process is attended by the production of heat; and that muscle during rest produces nitrogenous crystallizable substances such as kreatin from the metabolism going on constantly during life.

For a full discussion of this subject, see Foster, *Textbook of Physiology* (New York, 1900), and Kirke, *Handbook of Physiology* (Philadelphia, 1902). See also PHYSIOLOGY, HUMAN.

MUSCULAR SYSTEM, Evolution of. The muscular system comprises those tissues or masses of tissue which have the property of contractility and whose function it is to accomplish the movements of the parts or of the whole of the animal body. Contractility is one of the properties of simple protoplasm. Thus, the amœba progresses by the extension of some portion and the contraction of other parts of its body. The cortical layer of Paramœcium is a specially contractile region in the protoplasm. In the Stentor and the stalk of Vorticella there are protoplasmic differentiations that resemble muscle fibres.

Many of the outer-lying ectoderm cells of Hydra show considerable differentiation; they are conical in shape with the broad surface outward. On this external surface a thin, cuticle-like layer has been demonstrated. Internally the cell ends in a contractile basal portion or process which lies parallel to the long axis of the body of the hydra and between the ectoderm and entoderm. The whole of these cells are contractile, but the long processes are specially so. These processes were formerly known as 'neuro-muscular,' but with the discovery of special nerve cells, the muscular function alone must be conceded to them. Like the muscle cells of vertebrates they contract when properly stimulated. Here then are ectodermic muscle cells, the entire protoplasm of which, like that of the amœba, is irritable and contractile, but with a portion of the cell more clearly set apart to perform the contractile function than in any protozoan. In the jelly-fishes, such as Aurelia, a muscle cell is likewise composed of two parts: a contractile portion (which shows cross striations), and, attached to the striated portion, a protoplasmic, non-differentiated, non-contractile portion which may bear cilia on its external surface. This muscle-bearing epithelium is arranged in a bundle or ring around the edge of the sub-umbrella. It is the contraction of this muscular zone that propels the jellyfish through the water. In the tentacles and about the lips unstriated muscle-fibres occur. The contraction and extension of the body of the sea-anemone, as well as of its gullet and mesenteries, and its ability to move slowly from the point of attachment, are accomplished by means of a well-developed muscular system. This consists of bands of longitudinal muscle fibres which run on the mesenteries from the base to the disk; of parietal muscles which pass obliquely across the lower and outer angle of the mesentery; and of a thin sheet of transverse muscles. The contraction of the longitudinal muscles draws the animal toward the base, and that of the transverse muscles causes the contracted animal to extend again. A band of circular muscles at the junction of column and disk causes the disk and contracted tentacles to be inclosed within the body of the anemone. In addition to the bands of muscles, scattered fibres occur both in the body wall and in the gullet, which consist partly of spindle-shaped, nucleated fibres, and partly of such striated muscle processes as occur in Hydra. The latter are mostly found in the transverse muscles of the body and the tentacles, and are of entodermal origin, as also are the muscle bands of the mesenteries. Other longitudinal muscles are of ectodermic origin. Some of the muscles, however, sink so far down into the middle layer or mesoglea as to seem to belong to it alone. This is significant because all the musculature of animals above the cœlenterates lies between the ectoderm and entoderm.

The musculature of flatworms falls under two groups: (1) the dermal musculature, and (2) the dorso-ventral musculature. The dermal musculature lies either under the basal membrane of the epidermis or under the cuticle. It is composed of distinct layers. In each layer all the fibres run in one and the same direction. There are longitudinal muscles, transverse and diagonal muscles. The musculature is stronger on the ventral creeping surface. In cestodes the diagonal layer is replaced by a second circular layer. The dorso-ventral musculature runs from the dorsal to the ventral surface, and is much displaced at sexual maturity by the male and female germ-glands. Below the cuticular layer of roundworms there is a well-developed muscular layer in the form of a tube, and composed of outer circular fibres and inner longitudinal ones. This muscular tube effects the writhings and undulations of the body. As in the cœlenterates, the muscle element is composed of a single cell, made up of a protoplasmic (often glandular) portion and a fibrillar part. The fibrillæ rarely show any evidence of cross striation, the lateral lines are free from muscle fibres, and the longitudinal sheet is thus broken up into bands.

The muscular system of mollusks is also well developed. The muscle fibres, both of bivalves and gastropods, are all of the unstriated sort, because of the slow movements of the animals. These fibres occur usually in distinct bands or sheets, and frequently are combined for greater power to form very large muscles, such as the two abductors of Anodonta, which close the shell. Other important muscles are those of the foot, including two protractors and one retractor; and in the snail those that work the radula of the mouth, the retractors of the horns and penis, and those that pull the head into the shell. The muscles are fastened to the shell, upon which they make certain distinct markings at the points of attachment, called 'scars.'

The musculature of segmented worms, like that of the roundworms, is composed of a dermo-musculature tube which is composed of an outer circular and an inner longitudinal layer of fibres. The fibres are in the form of bands. The pharynx, mouth, gut, parapodia, and septæ have special muscle fibres. In leeches, in addition to the circular and longitudinal bands of muscle fibres, there are bands reaching diagonally from the dorsal to the ventral surface of the body.

Among arthropods the musculature of the Crustacea is well developed and very complex, but there is little evidence remaining of the dermo-muscular tube of worms. It is assumed that the dorsal and ventral pair of longitudinal muscles correspond to the four similarly situated bands of muscle in the Polychæta. Perhaps traces of the circular musculature of annelids are found in the muscles that are attached to the basal parts of the appendages on the one hand, and to the integument of the body on the other. Certainly the firmer exoskeleton makes greater localization of the musculature possible. In the limb-bearing portion of the abdomen and the thorax there are paired dorsal and ventral muscle bands. In the limbless part of the abdomen there is a thick layer or tube of longitudinal muscle fibres, interrupted at each septum by the connective tissue that separates the myomeres. Thus the muscle itself is separated into myomeres. The abdomen is bent upward, downward, or sidewise by the contraction of the muscle fibres in the corresponding portion of the body. The appendages are moved by muscles that pass out into them from the trunk. The muscles are either attached to the cuticular outer covering or to inward projecting parts of it, and often terminate in sinewy pieces that are white and are composed of bundles of cross-striated fibres—the kind of fibre that characterizes all rapidly moving muscle. In Peripatus, however, the muscles are unstripped, save those which work the jaws. In insects, the thorax and metathorax, as in the case of the grasshopper, are crowded with leg and wing muscles. In the cockroach, where the wings are little used, the wing muscles are poorly developed.

The musculature of Amphioxus, like that of the abdomen of Crustacea, is divided into metameres. Of these muscular segments or myomeres there are about sixty, V-shaped on surface view, with the apex of the V extending forward. The myomeres are composed of striated muscle fibres which extend longitudinally and are attached to the septæ immediately in front and behind them. The myomeres of the two sides alternate. The musculature of the dorsal wall is the thicker.

In cyclostomes, as well as in Amphioxus, the muscles of any myomere are attached to the anterior and posterior myocomata of that segment. In selachians a significant change has occurred—the first step toward the complicated conditions of higher vertebrates. Certain of the ventral lateral muscles on either side of the median line become differentiated from the others, in that their fibres move out from the general level in correspondence with their greater functional activity. Thus while the dorsal trunk muscles retain their primitive character, the ventral muscles have become separated into two masses: a pair of strong mid-ventral ones which are known together as the rectus abdominis, and the remaining muscular mass. We next find that in this latter mass the direction of the muscle fibres, which in Amphioxus and cyclostomes is horizontal, has become in selachians oblique; so that, from the mid-ventral line, they pass dorsoposteriorly. The remaining less differentiated portion of the ventral musculature is known as obliquus abdominis, or oblique abdominal muscle. Two kinds of changes have now occurred in the vertebrate musculature: (1) There is the functional differentiation of parts of muscles by which they become cut off from the remainder, and (2) changes in the direction of muscle fibres by which originally axial muscles have become oblique. In the lowest vertebrates the anterior and posterior ends of muscles are attached to the adjacent myocomata. With the development of ribs from the fibrous tissue of the myocomata, muscular attachment has, in part, fallen upon them. The derma, indeed, is differentiated from the same tissue as the myocomata; hence it is not surprising that, in the migrations on the ends of muscles to adapt themselves to the new conditions, we find that some muscles are attached to the derma. Finally, some muscles, whose ends come thus to lie outside of the myomeres, may extend alongside of several somites without signs of metamerism. Thus, by these simple modifications, we gain the complex musculature of the higher vertebrates, where there are trunk muscles of different sizes and lengths, often without metamerism and attached to bony parts such as ribs, or to the skin. In Amphioxus the myomeres are arranged with reference to the sagittal plane from which they extend obliquely outward and backward. In cyclostomes the obliquity is so great that the myomeres overlap each other like the shingles on a roof, so that a cross-section of the body may cut three or four myocomata on each side. In many fishes the free edge of the myocomata, as it appears at the surface, is not merely bowed, but is zigzag.

The most typical condition of the amphibian musculature is shown in Urodela. The dorsal lateral muscles retain most nearly the fish-like condition and lie in metameres. When the ribs and transverse processes of the vertebræ become developed some of the muscles gain attachment to them, and thus give rise to the intercostal and intertransversal muscles. The ventral lateral muscles of fishes are disposed in two regions. In Amphibia they comprise four regions, derived from a migration and splitting of the two lateral muscles of fishes. In addition, lying under the internal oblique, there is a muscle that probably has no representative in fishes. It is unsegmented and lies deeper than the skeleton and immediately within the peritoneal lining of the body cavity. The Anura differ from the Urodela chiefly in the absence of the transversal abdominis, and in the diminution or disappearance of myocomata in the adult.

In reptiles, as in Amphibia, the dorsal musculature retains more nearly the primitive condition. With the ossification of the skeletogenous tissue and the consequent attachment of the muscles to the bone, has come about the differentiation of the so-called interspinales, semispinales, intertransversals, longissimus dorsi, and others. The last-named muscle is to be regarded as a part of the dorsal musculature that has lost its metamerism, and now passes from the pelvic girdle to several of the spines of the thoracic vertebræ. The ventral musculature has become still more complicated, due, according to Wiedersheim, to the changed rhythmic method of respiration, controlled through the more and more greatly developed lungs. To meet the needs of respiration the ribs must be moved. The muscles which perform this function have become more powerful in that the ribs have become buried in them. The musculature of successive myomeres, which projects outside or inside the ribs, becomes united into a single sheet. With the disappearance of the ribs in the lumbar region of reptiles a modification of the intercostals must take place. A continuous muscle is developed between the last rib and the pelvis.

The phylogeny of many of the muscles of mammals is not known. The more important muscles resemble those of reptiles.

Two kinds of muscular fibres are found in the vertebrate body. All the quickly moving voluntary muscles are composed of striated fibres. The involuntary muscles are unstriated. The muscle fibre of vertebrate muscle, like that of invertebrates, is formed by the differentiation of a muscle cell. Only in the muscle cell of the lower invertebrates a much smaller portion of the cell is transformed into fibre structure than is the case in vertebrate muscle fibre. The differentiated portion of vertebrate muscle fibre is composed of fibrillæ and forms the main bulk of the cell. The fibrillæ are imbedded in the undifferentiated part, which also surrounds them in the form of a sheath and contains the nuclei.

Bibliography. Parker and Haswell, *Text-Book of Zoölogy* (London, 1897); A. Lang, *Text-Book of Comparative Anatomy*, parts i. and ii. (ib., 1891-96); Wiedersheim, *Comparative Anatomy of Vertebrates*, English adaptation, by W. N. Parker (ib., 1897); Gegenbaur; Harmer (editor), *Cambridge Natural History*, vols. i.-x. (ib., 1895-1902).

MUS'CULUS, Wolfgang (properly Müslin) (1497-1563). A German reformer and theologian, born at Dieuze in Lorraine. At fifteen he entered a Benedictine cloister at Lixheim, but left it fifteen years afterwards, having been turned to Protestantism by Luther's writings. In 1531 he became pastor at Augsburg, and for seventeen years was prominent in that city. Musculus was long an eager partisan of union between the Lutheran and Reformed churches and took part in the Wittenberg Agreement (1536), and in the colloquies of Worms and Ratisbon (1540-41). At the time of the Augsburg Interim (1548) he went to Switzerland, and in 1549 became professor of theology at Bern. His views were more strongly Calvinistic in his later years, and with Calvin and Vermigli he may be reckoned as a leader of the sixteenth-century Reformation. Consult Grote, W. *Musculus* (Hamburg, 1855).

MUSÉE SOCIAL, mụ'zā̇' sō̇'syȧl' (Fr., Social Museum), The. An organization whose object is to furnish the public with information regarding movements having for their aim the improvement of the moral and material situation of the laboring classes. It resulted from the interest in the social science exhibition at the Paris Exposition of 1889, but was not formally inaugurated until March 25, 1895. The Comte de Chambrun has given the institution an endowment of over 2,000,000 francs. Special collections of all matters pertaining to labor, trades unions, old-age pensions, housing reform, etc., are made and indexed for ready reference. Studies of labor conditions in various countries have been undertaken, and the results published in monographs. Although young, the Musée has proved of great usefulness. It was very active in preparing the excellent exhibit of social economy in the Exposition of 1900. The more important publications of the Musée are contained in the *Bibliothèque de Musée Social*. It issues a small monthly 'circulaire' containing general matter pertaining to labor.

MUSES (Lat. *Musa*, Gk. Μοῦσα, *Mousa*; connected with μανία, *mania*, madness). In Greek mythology, the inspirers of song and music. In the Homeric epic their personality and number are vague, the poet now invoking but one Muse, now a number; only in a very late passage in the Odyssey are nine mentioned. In the *Theogony* of Hesiod the canonical number, nine, and names appear. Originally probably nymphs of fountains on Mount Olympus, they seem to have been worshiped first in Pieria, whence the cult spread southward and established itself on Mount Helicon at Ascra, and in Thespiæ. We also hear of shrines at Delphi and at Athens, both on the Ilissus and on the Museum Hill, which thus obtained its name. There are grounds for believing that, like the Charites and Horæ, the Muses were originally three, but nine was their number on Helicon, and this became universally accepted, as well as the tradition that they were the daughters of Zeus and Mnemosyne (Memory). In art the Muses are frequently represented. On the François vase, an Attic work of the early sixth century B.C., they appear at the marriage of Peleus and Thetis, with Calliope playing on a Pan's pipe at the head. Later artists used them freely, especially in connection with Apollo, or the mythical poets Orpheus and Thamyris. On the basis by Praxiteles at Mantinea they are represented as present at the contest between Apollo and Marsyas. It is to be noted, however, that while there is a tendency to develop definite artistic types for some of the figures, the division of the several branches of poetic art among the Muses and the adoption of fixed attributes to distinguish them is a product of a comparatively late period in the Roman Empire. Even the Hesiodic names did not designate the functions of the Muses, and in the popular usage seem to have been but little employed. The functions of the Hesiodic Muses were thus assigned in the later writers: Clio, history; Calliope, epic poetry; Polyhymnia, the pantomime; Euterpe, music of the flute; Terpsichore, melic poetry and the dance; Erato, the choral lyric; Melpomene, tragedy; Thalia, comedy; Urania, astronomy. Some variations in this classification are found. Consult: Deiters, *Ueber die Verehrung der Musen bei den Griechen* (Bonn, 1868); Bie, *Die Musen in der antiken Kunst* (Berlin, 1887). See also the articles on the individual Muses.

MUSES' LOOKING-GLASS, The. A play by Thomas Randolph published in "Poems with Muses' Looking-Glass and Amytas," 1638. It was performed some time earlier at Cambridge, and is mentioned by Sir Aston Cokain as the "Entertainment." It consists of witty dialogues between personifications of the vices and virtues in the presence of two Puritans, and shows the influence of Ben Jonson on the author. An altered version, entitled the *Mirrour*, appeared in 1758.

MUSEUM (Lat. *museum*, from Gk. μουσεῖον, *mouseion*, temple of the Muses, place for study, museum, from Μοῦσα, *Mousa*, Muse). An institution for the preservation, study, and exhibition of objects of art or those of natural origin. The term was originally applied to a place or temple sacred to the Muses, but a little later was bestowed on institutions for the pursuit of the higher branches of learning, such as art and philosophy, the first recorded use of the word for this purpose being the famous *Museum* of Ptolemy Soter at Alexandria. The application of the word to institutions for the preservation and exhibition of works of art or specimens of natural history is comparatively recent, as are the institutions themselves, and seems to have come into vogue with the systematic gathering of objects for public exhibition. Such collections were originally known as cabinets; and while the term was to some extent restricted to small private collections, it was also given to many of very considerable size, such as the State Cabinet of Natural History at Albany, N. Y.

The germ of the modern museum has been thought by some to lie in votive offerings placed in pagan temples or deposited in churches, and in objects of sacred or historical interest preserved in churches and monasteries. And it may be said that one of the earliest references to the preservation of specimens of natural history is the account of the skins of what are now supposed to have been gorillas brought home by Hanno and presented by him to the Temple of Astarte in Carthage. Museums of art and of natural history had their origin in collections made by the rich and powerful without at first a more definite purpose than to gratify their own pleasure or curiosity. Somewhat later men of science gathered material to further their own special lines of research, and many of these private collections eventually developed into public museums. Thus some of the national museums of Europe had their beginnings in collections made by former sovereigns, while the British Museum grew out of the cabinet and library of Sir Hans Sloane. The Ashmolean Museum, at Oxford, England, was the result of the labors of Elias Ashmole, who began collecting in 1667, while the Museum of the Royal College of Surgeons, London, is based on the anatomical material gathered by the famous surgeon John Hunter, and the Hunterian Museum of the University of Glasgow was founded by his brother, William Hunter. It may be of interest to note that the exploration of America did much to promote the growth of museums and that the cabinets of Sloane and Ashmole, particularly the latter, comprised many specimens from the New World. Incidentally, too, public houses may be credited with some slight share in the development of museums; for, in England at least, they formed small collections of curiosities to attract visitors, and Artedi, in his work on fishes, mentions three taverns where he had seen specimens of American fishes. Directly related to these, and representing another stage in the development of museums, was the establishment of miscellaneous collections, more or less scientific in their nature, to which visitors were admitted upon the payment of a fee. President Adams mentions a collection of this sort in Norwalk, Conn., formed by a Mr. Arnold prior to the Revolution, but the best of the type in this country were those of the Peales in Philadelphia and Baltimore. Two noteworthy foreign collections were those formed by Sir Ashton Lever, at Manchester, in 1775, and by William Bullock somewhat later at Liverpool. These were eventually taken to London, where they flourished at different periods, and their importance may be inferred from the fact that when these collections were sold various foreign museums sent representatives to attend the sale. Such large private establishments were the immediate precursors of our present State or governmental institutions. These represent the general acknowledgment of the value of museums, and are held to mark a stage in the progress of civilization beyond that of the art gallery or library, since the development of science is far later than that of art or literature.

Great public museums are of comparatively recent date, for while Bacon in his *New Atlantis* outlines such an institution, the establishment of the British Museum in 1753 was the first realization of this idea. In 1789 France transformed a royal into a national collection by opening the Louvre to the public, but the United States did not formally establish a national museum until 1876, although it practically came into existence in 1846, when the Smithsonian Institution was made the custodian of the national collections. The influence of the many expositions held during the latter half of the nineteenth century on museums has been very great; the construction of a building for the United States National Museum was a direct result of the Centennial Exposition of 1876, and the Field Columbian Museum, Chicago, owes its origin to the exhibition of 1893. The South Kensington Museum in London, the Ethnological Museum of the Trocadero in Paris, and the Glasgow Art Gallery and Museum are largely due to similar causes.

The development of museums has not merely been in their size and number, but in their scope and functions as well. Originally the specimens exhibited, especially in museums of natural history, comprised the greater or more important portion of the collections, and were mainly for the benefit of men of science. The modern plan is to restrict the number of pieces on exhibition and to select for this purpose those of the greatest educational value; the bulk of material is placed in the reserve series, and is kept thus not merely for study, but for its better preservation, since light is one of the greatest enemies of museum specimens. The constantly increasing size of collections has had something to do in shaping this policy, but it is largely the result of a recognition of the fact that, so far as the general public was concerned, the educational influence of museums depended more on the quality of the things exhibited than on quantity. This has led to careful study of the best methods of arranging and labeling objects on exhibition and so displaying them that they may attract and interest even the casual visitor. No man probably had more to do with bringing about this state of affairs than the late Sir William Flower, Director of the Museum of the Royal College of Surgeons, and subsequently of the British Museum, while in the United States Dr. G. Brown Goode (q.v.) stands preëminent among those who have been most instrumental in making museums instructive to the public. There has been a corresponding evolution in the publications issued by museums, in making them of interest to the general public and not restricting them to papers of a technical nature. We have seen that private collections were formed not only for the preservation of material, but for its study, and this led to the publication of information thus acquired. The germ of museum publications, however, is to be found in the illustrated descriptive catalogue of small private 'cabinets.' The oldest of these works is that issued by Gesner in 1565, describing one of the first systematic collections, that of Johann Kentmann of Dresden. Public museums have followed the same path as private collectors; and while, like individuals, their publication was at first through the medium of scientific societies, the tendency is for museums to become their own publishers. As the transfer of great collections from private to public ownership made them accessible to a greater number of students than before, this in turn has led to the issuing of memoirs by other than regular members of their staff. Many museums also issue guide-books, hand-books, or articles of a somewhat popular nature relating to their collections, and in line with this are courses of lectures on topics illustrated in the various departments of the institution. The steady trend of museum development has been in the line of extending their educational influence and making them of value to the many instead of to a favored few. Dr. Goode summed up the objects of museums as record, research, and publication; the preservation of material, its study, and the publication of information in the shape of books, and the spread of knowledge by the display of specimens. In a broad way museums may be divided into museums of natural history and museums of anthropology, the former including all natural objects, the latter man and his works. Following Dr. Goode, they may be classified under the following heads: museums of art, natural history, history, anthropology, technology, and commerce. Or, following the same authority, museums may be classed according to their purposes as national, local, provincial, or city; college, or school; professional, or class museums, and museums of special research.

The collection of art museums in modern times began in Italy, where in the fourteenth century the rulers and the nobility began to make collections of coins and gems. Busts and statues were added later, and it was not until the seventeenth century that pictures and drawings were also introduced. The oldest important collections on record are those brought together by Cosmo de' Medici (1389-1464), which form the basis of the present Florentine collections, of which the most important are the Uffizi and Pitti galleries, and the Museo Nazionale. The Vatican (q.v.) collections trace their origin to Pope Julius II. (1503-13); besides these the principal museums of Rome are the Museo Nazionale and the Museum of the Lateran. Probably the equal of these in the wealth and diversity of its collection is the Louvre (q.v.), the National Museum of France, situated in Paris, which also contains the Musée Cluny, and the Luxembourg (q.v.). The most important provincial cities of France also have museums, devoted chiefly to painting. In Germany the chief collections are the Royal Museums of Berlin, Dresden, and Munich, and the Germanic Museum at Nuremberg. In England the British Museum (q.v.) is by far of the greatest importance. Austria has the Imperial museums of Vienna. The cities of Italy, notably Venice, Milan, and Naples, have national or municipal museums of importance. The Prado Museum in Madrid is the most important in Spain, which has some provincial museums, notably at Seville. The chief museum in Russia is the Hermitage at Saint Petersburg. In the United States the Metropolitan Museum of Art, New York; the Boston Museum of Fine Arts; and the Corcoran Gallery, Washington, are among the more noteworthy. The United States is perhaps the only great nation without a national gallery.

The museum of natural history covers a wide field and includes many branches, any one of which is capable of separate treatment. Thus there are museums of zoölogy, botany, geology, paleontology and mineralogy, or paleontology may be included as a part of a zoölogical, geological, or anatomical museum. The natural history collections of the British Museum constitute the largest and most celebrated museum of natural history in the world, while other famous collections are those of the Jardin des Plantes, Paris, and those of Vienna, Leyden, and Berlin. The most important museums of natural history in the United States, all of which have been extended beyond the province indicated by the name, are the collections of the Smithsonian Institution at Washington, the American Museum of Natural History in New York, and the Museum of Comparative Zoölogy at Cambridge, Mass.

Historical museums are for the preservation of objects illustrating the history of any country, place, or period, or the development of some special subject, and here it may trespass on the province of the museum of art or of technology. Historical collections form a branch of the United States National Museum, but there are many local collections. The National Museum, Munich, is an example of a general historical museum; the Cluny Museum, Paris, is devoted to a single period; the Naples Museum tells the story of Pompeii; while the Guimet Museum, Paris, illustrates the history of religious ceremonial, and the Museum of Artillery, Paris, traces the development of weapons from the rude axe of the Stone Age to the modern rapid-fire gun. Anthropological museums, in the widest sense, treat of the history of man and his relations to the universe about him. This calls for illustrations of his various activities, so that an anthropological museum may comprise art and historical collections, although these are usually treated separately. The physical characteristics of man, his clothing, weapons, ceremonial objects, household furniture, methods of transportation and of shelter are the subjects most commonly illustrated. Ethnology is that branch of anthropology which deals with the characteristics, occupations, arts, and industries of the races of men as distinguished from one another. Archæology treats of the history of ancient man, and sections of a large museum or an entire museum may be devoted to the illustration of either of these subjects. The Department of Anthropology of the United States National Museum is very extensive, and so is that of the American Museum of Natural History, New York. The Peabody Museum of Archæology and Ethnology, Cambridge, Mass., is particularly rich in American antiquities, and so is the Archæological Museum of the University of Pennsylvania. Abroad there are important anthropological museums in Berlin, Dresden, and Munich; the Trocadero, Paris; and the Pitt Rivers collection at Oxford, the latter being specially arranged to illustrate the development of the arts.

Technological museums deal with various phases of the industrial arts. They display specimens of the raw materials that enter into the composition of a given product, trace the various processes to which these are subjected, show the tools or machinery by which they are manipulated, and finally the finished object or substance. The subjects for technological museums are almost endless; ship-building, spinning and weaving, dyestuffs, drugs, foods, and electric apparatus naturally suggest themselves. The South Kensington Museum (now the Victoria and Albert), London, contains the largest technological collections of any institution. This is now under the charge of the National Board of Education, and its influence is not confined to London, for a part of its work consists in lending carefully selected collections to local museums and technical schools in other portions of Great Britain. In America, the United States National Museum and the Field Columbian Museum, Chicago, have important technological sections, the former having much material illustrating the development of electrical apparatus, while the latter is rich in objects showing the growth of methods of transportation by rail. The Army Medical Museum, Washington, while devoted to the subject of the structure of man, the effects of injuries and diseases, and their treatment, is a technological museum in so far as it traces the development of surgical appliances. Commercial museums are devoted to advancing the interests of trade. They exhibit raw materials and finished products, illustrations of methods of packing and modes of distribution, and gather and furnish information as to prices and character of goods needed in and furnished by different countries. Laboratories for the analysis of various substances and the testing of materials form part of the equipment of such an institution. The Musée de Mille, Ghent, is one of the oldest European commercial museums. The Commercial Museum, Philadelphia, is the sole institution of its kind in the United States.

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MUSEUM PEST. Any one of several species of insects which feed upon the prepared and mounted skins of birds, mammals, reptiles, and upon dried collections of insects and other animals preserved in museums. Perhaps the most abundant and injurious of the museum pests are the beetles of the family Dermestidæ. (See DERMESTID BEETLES; see also BACON BEETLE and CARPET BEETLE.) Others of these insects are the larvæ of small moths of the tineine series. Some of the common clothes moths (q.v.) are museum pests which, possibly originally feeding upon skins, have come to feed upon fabrics made from animal substances, such as wool or hair. One of the most injurious of this group is *Tinea pellionella*, which is one of the case-making clothes moths. Other substances stored or displayed in museums are attacked by other insects: the larva of a little geometrid moth, known as *Carphoxera ptelearia*, feeds on dried plants stored in herbaria; and the allied *Acidalia herbariata*, as its name indicates, has long been known to injure herbarium specimens in Europe, but is on the whole more injurious in herbalists' shops than in museums. Some of the dermestid beetles will even injure the horns of large mammals, and the bones as well, provided they are not thoroughly poisoned. A museum room once thoroughly infested with these creatures can be most readily freed from them by fumigation with bisulphide of carbon or hydrocyanic acid gas.

MUSH, mo͞osh. The capital of a Sanjak in the Vilayet of Bitlis, Asiatic Turkey, on the eastern branch of the Euphrates, 80 miles south of Erzerum (Map: Turkey in Asia, J 3). It occupies an elevation at the entrance to a mountain ravine on the south side of a fertile wheat, vine, and tobacco growing plain. The town is noted for its uncleanliness and has few good houses. It is the see of Roman Catholic and Gregorian bishops, and has an American mission with Protestant schools. There is an active trade in the agricultural products of the district, and embroidered caps are manufactured. It has historical reminiscences of Xenophon and of Moses of Khorene, the historian. In the vicinity at Sasun occurred a terrible massacre of Armenians by the Turks in 1894. Population, about 27,000, one-half being Armenian Christians.

MUSHROOM (OF. *mouscheron*, *mouseron*, from OF., Fr. *mousse*, moss, connected with AS. *mēos*, OHG. *mios*, *mos*, Ger. *Mies*, *Moos*, OChurch Slav. *mŭchŭ*, Lat. *muscus*, moss). The popular name of edible fungi of the order Hymenomycetaceæ, especially species of Agaricus and Morchella. The name toadstool is generally applied to species which have an umbrella-shaped cap. The common idea that all such are poisonous is erroneous, because some of the most highly prized species have this habit of growth, and perhaps most of the others are not injurious. The mushroom as it is generally seen is only the fruiting body of the fungus, which arises from a more or less matted mycelium, or 'spawn.' The mycelium or vegetative part consists of numerous slender white threads running in every direction through the soil. Upon these threads small knots develop, increase in size, and finally appear as the ball-like or button-like young mushrooms, which consist of a stalk, terminated by a cap or pileus, bearing upon its under side numerous thin spore-bearing plates or gills radiating from the centre or attachment of the stalk. Near the top of the stalk is a more or less perfect ring (annulus), the remnant of the delicate veil (indusium) that covered the gills during the button stage, but ruptured as the mushroom grew.

The common mushroom (*Agaricus campestris*), one of more than 1000 species of the genus Agaricus, is common in fields and pastures, seldom in woodlands unless open and grassy, growing throughout the summer, but most abundant in the early autumn. It is the most commonly cultivated species, is extensively grown for market, especially near large cities, and is about the only species imported and offered for sale in American markets. This species never attains a very large size; when young the stalk and fleshy cap are white, changing to light brown when older. The stalk is solid and tapers slightly toward the base. The ring is usually conspicuous, the gills pink when young, changing to brownish purple in older specimens. Mushrooms are usually gathered for market when in the ball or button stage before the veil has been broken. They have a pleasant taste and smell, and when the flesh is bruised, turn a reddish brown. The horse mushroom (*Agaricus arvensis*), a close relative, looks very much like the common mushroom, but is much larger and the top of the cap is more shining white. The stalk becomes a little hollow with age; the gills are white at first, changing to brownish purple when comparatively old.

The methods employed in cultivating the common mushroom do not offer any great difficulties. They may be grown out of doors or where the temperature is fairly constant, as in dry cellars or in caves, abandoned mines, and quarries. Beds are made containing at the bottom a deep layer of fresh stable manure, over which is a layer of well-rotted manure. In this the spawn is planted after the temperature of the bed has fallen to about 90° F. The commercial spawn comes in two forms, bricks and flakes, made of horse manure impregnated with the mycelium of the fungus. When planted, both kinds are broken up and distributed through the bed. The beds, which must be kept moist, but not wet, are then well covered with straw or mats to keep the surface moist. After a week or ten days the mulch is removed and the beds covered with good loam to a depth of two inches. They may be again covered with the mulch, which should be removed when the mushrooms, which should be gathered daily, begin to appear.

In addition to the species of Agaricus described above, there are a great many other edible species of mushrooms belonging to other genera. Among them are the horse-tail or maned agaric (*Coprinus comatus*), the ink caps (*Coprinus atramentarius*), and the glistening comatus (*Coprinus micaceus*). These have black spores; the cap does not expand, but remains more like a partly closed umbrella. When old, these species become very watery and dissolve, forming a black, inky fluid. For eating they should be taken only while young. The parasol fungus (*Lepiota procera*) is a white-spored edible mushroom rather abundant in grassy places. It is rather tall on a slender stem. The cap is whitish or light brown and covered with coarse scales. The ring is free and not fastened to the stalk. Another highly prized species is the chanterelle (*Cantharellus cibarius*), an egg-yellow species common in moist woods. The cap has an irregular, crumpled margin, is more or less depressed on the upper surface, and has shallow, blunt gills prolonged down the stalk. The fairy ring fungus (*Marasmius oreades*), common in lawns and meadows, is also edible. There are some species having the same habit of growing in circles, that are reputed poisonous. The edible ones are white-spored, have hollow stalks, and are seldom more than two inches across the pale yellow or drab cap, which is often concave on top and raised in the centre. One class of gill-bearing fungi exude, when broken, a milky juice. The species of this kind belong to the genus Lactarius. Some have a very acrid juice, but one (*Lactarius deliciosus*) is considered very choice by mushroom lovers. It grows in damp woods in mountainous regions, but is not common in lowlands. It cannot be mistaken for any injurious species, as the milk exuded by it is always red with a tinge of orange, and slowly changes color to greenish. The fungus is a little lighter in color than the milk exuded by it.

Boletus is one of the most common genera. The species are rather difficult of identification and should not be eaten by a novice. Some of the Gasteromycetes, for example, the puffballs (*Lycoperdon giganteum* and *Lycoperdon cyathiforme*), are common edible species. The former attains a diameter of ten inches or more; has a smooth, white, kid-like surface when young, with a firm white or pale yellow flesh. The other is six inches in diameter, flattened and tessellated on top, and contracted at the base. In color it varies from white to brown. The puffballs should be taken while young and before the spores are developed. One species (*Scleroderma vulgare*), related to the ones just described, and suspected of being injurious, may be recognized by its tough, hard, yellowish-brown, warty exterior, and purplish-black interior mottled with white. Among the most highly prized of all the edible fungi are the morels and truffles (*Tuber melanosporum*).

Since several species of mushrooms have not yet been proved harmless and since occasional cases of poisoning are still attributed to their use as food, the following rules, formulated by Farlow, are given as guides for the inexperienced collector: "Avoid fungi when in the button or unexpanded stage; also those in which the flesh has begun to decay even if only slightly. Avoid all fungi which have stalks with a swollen base surrounded by a sac-like or scaly envelope, especially if the gills are white. Avoid fungi having a milky juice, unless the milk is reddish." These rules are not absolute, because there are exceptions to them, but are safe for the novice to follow. See FUNGI, EDIBLE AND POISONOUS.

MUSHROOMS AS FOOD. Since mushrooms and other edible fungi are often said to be nutritious food, to contain large quantities of protein, and to rank close to meat as sources of nitrogenous material, extravagant statements have been made concerning them. When fresh, mushrooms have the following percentage composition: Water, 88.1; protein, 3.5; fat, 0.4; nitrogen-free extract, 6.0; crude fibre, 0.8; and ash, 1.2. Other edible fungi closely resemble them so far as analyses have been reported. Like all green vegetables, mushrooms have a high water content in proportion to their bulk, and as regards protein content, they rank about the same as potatoes, to which they are decidedly inferior in food value, since they contain much less carbohydrates, and the nitrogen present is largely in the form of non-albuminoids, which are thought to have little food value. The numerous studies which have been made show that mushrooms are not thoroughly digested. Recent experiments show that 25 to 59 per cent. is indigestible. See Plates of EDIBLE AND POISONOUS FUNGI.

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MUSHROOM GNAT. The name given by mushroom growers to any of the fungus-gnats of the family Mycetophilidæ. (See GNAT.) These are small, mosquito-like creatures with feathered antennæ, and frequent, as a rule, vegetable matter or fungi, upon which their larvæ feed. The larvæ are slender, white, wormlike creatures, with a distinct black head. The larva of one species of the genus Sciara is especially injurious to mushrooms, which it eats into and ruins. In mushroom cellars, fumigation with tobacco or pyrethrum will kill the flies.

MUSIC (OF., Fr. *musique*, from Lat. *musica*, from Gk. *μουσική*, *mousikē*, music, from *μουσικός*, *mousikos*, relating to the Muses, from Μοῦσα, *Mousa*, Muse). ORIGINS. Music is a mode of motion. It is a modification by art of aërial vibrations, whose impact upon the auditory nerve makes mental varying images. Sound, the raw material from which music is fashioned, is produced by motion.

Matter is the stimulus; sensation is the result. "The kind of motion, however, that goes to produce sound is not that of matter precisely, but rather of the molecules or ultimate particles of which matter is composed. When the state of equilibrium of an elastic body is disturbed by a shock or by friction, it tends to regain its condition of equilibrium, but does so only after a greater or less number of vibrations, or oscillating movements, of the molecules of which the mass of the body is composed." Thus J. A. Zahm, a profound investigator in acoustics and a follower of the great Helmholtz, whose masterly tonal researches are set forth in his *Die Lehre von den Tonempfindungen.* The nature of sound, Lord Bacon observes, "in general hath been superficially observed. It is one of the subtilest pieces of Nature." The nineteenth century has endeavored to wipe away Bacon's reproach, for the studies and experimentings of such men as Helmholtz, Rudolf König, and others have lifted into light the darkest problems of acoustics. The latest researches teach us that sound vibrations—vibrations audible to the ear—have a rapidity which ranges from 16 to 36,500 per second. Heat vibrations begin at 134 trillions per second; light vibrations, visible to the eye, at 483 trillions. The gamut of the rainbow has its velocity measurements. Chemical vibrations, "shown only by certain reactions in prepared photographic plates," are beyond our sense perceptions. Sonorous vibrations, then, are really the slowest of all. Dr. William Ramsay asserts in his *Essay on Smell*, that the sense of smell is excited by vibrations of a lower period than light and heat. Sounds of a musical character rarely extend beyond a minimum of 16 and a maximum of 4138 vibrations, respectively the rates of vibration of the lowest tone of an organ with a pipe of thirty-two feet and the top note of a piccolo. The production of sound, its transmission, and its aural perception may all be demonstrated with a long piece of stretched string. In its position of equilibrium it represents a straight line; pluck it and its elasticity will cause it to return. This is a simple vibration. But the string also goes in the opposite direction, and this is a double vibration. Like a pendulum, the vibrations of the string are isochronous, each occupying exactly the same length of time. By shortening the string or increasing its tension we get vibrations of various velocities, and the ear perceives various pitches from 16 vibrations to the second up to 4224 vibrations. Increase the tension beyond this point, shrillness results, below 16 a dull unmusical whirring. The same results acoustically may be produced with pipes of varying lengths. The vibrations are, as in the case with strings, isochronous; they vary in rapidity according to the length of the pipe; subdivide them and harmonics are produced. Nodes and vibrating segments are the crude material of music; pitch, force, or loudness, and timbre or quality of tone. All these qualities depend upon the rapidity of the vibrations. It is demonstrated: that the number of vibrations of strings is inversely proportional to their length; that the number of vibrations of strings is in inverse ratio to their diameter; that experimenting with two wires at tension, but of differing density, we get the rule that the number of vibrations of a string is inversely proportional to the square root of their density; finally, as Helmholtz shows by varying the stretching weight, that the number of vibrations of strings is directly proportional to the square root of their stretching weights. Thus the longer, thicker, heavier a string is, the slower are its vibrations; the deeper is its tone. The shorter, finer, lighter, tenser it is, the more rapid are its vibrations; the higher is its tone. Now the sound produced by a string vibrating its entire length is its fundamental or natural tone. It can produce many other sounds at the same time, subdividing them as it vibrates; there are the overtones or harmonics, partial and concomitant sounds. The series of harmonics theoretically may be divided infinitely, but for musical purposes they are numbered in accordance with the number of vibrating segments or loops. The nodes exceed by one in number the loops—taking the ends of the tense string as nodes. The fundamental vibrating with one loop is the first harmonic of the tone, and the harmonics on the numerical order are constantly nearer and nearer together, the successive intervals being an octave, fifth, fourth, third, second. We are at the very beginnings of the scale. The clay is ready for the musical sculptor. Mersenne's law is that the loudness of sound varies inversely as the square of the distance of the sonorous body from the ear. So the range of audition is over eleven octaves, but this is for an exceptional ear.

Musical sounds differ from each other in loudness, in pitch, in quality. Biot says "all sonorous bodies yield simultaneously an infinite number of sounds of gradually increasing intensity." This phenomenon is similar to that which obtains for the harmonics of strings, but the law for the series of harmonics is different for bodies of various forms. May it not be this difference which produces the particular character of sound, called timbre (*Klangfarbe*, clang-tint), which distinguishes each form of body, and causes the sound of a string and that of a vase to produce in us different sensations? May it not be owing to the diminution of the intensity in harmonics of each series that we find agreeable certain concords that would be intolerable if produced by sounds equally loud? And may not the quality of each particular substance—of wood or metal, for instance—be due to the superior intensity of one or another harmonic?

We have now some dim idea of the natural laws which give us force or loudness, pitch, and quality in music. The whole subject in all its fascinating range and variety is admirably treated in Zahm's *Sound and Music*. Therein may be learned much about the production and transmission of sound, its velocity, reflection, refraction, resonance, and interference. Of pitch it may be only said here that its standard in music is the A string of the violin, which gives the tuning note for orchestras. It corresponds to A_3 above middle C of the pianoforte. A_3 as a vibration number of 435 was chosen in 1859 as a standard pitch. This is called the French pitch and its exact vibrations are really 435.45. It is the standard pitch of our orchestras, and since 1892 for all pianofortes. (See PITCH.) All the modifications of sound made by the ingenuity of man in his inventions of string, wood, brass, pipe—as in the organ—and percussion instruments, from the drum to the piano, give us variety in tonal timbre and are based on the human voice, which with its bass, tenor, alto, and soprano served as a model for the viol family.

Helmholtz has considered the analogies of light and sound, both being modes of vibratory motion. In his psychological optics, he gives the following analogies between the notes of the piano and the colors of the spectrum:

F,♯	End of the red
g,	Red
g,♯	Red
A,	Red
A,♯	Orange-red
B,	Orange
C,	Yellow
C,♯	Green
d,	Greenish blue
d,♯	Cyanogen blue
E,	Indigo blue
f,	Violet
f,♯	Violet
g,	Ultra-violet
g,♯	Ultra-violet
a,	Ultra-violet
a,♯	Ultra-violet
b,	End of the solar spectrum.

Upon this laboratory experiment some imaginative theorists have endeavored to rear a system of musical æsthetics, but unsuccessfully, though we have come to speak naturally of color in music. Tone and color, while related, as are all things mundane, are far asunder in terms of art. As the receptive organ of tone and its transmitter to the brain, the ear plays as important a part as tone itself. Without it there would be no music, paradoxical as it may sound, for it is the eye that perceives, the ear that hears, the hand that feels, which give us our picture of the world. Under this hypothesis the world then is idea, idealists and materialists meeting amicably on the little strip of territory called sensation. The complete apparatus of the ear, the wonderful 'lute of three thousand strings,' called the cortical fibres after their discoverer Corti, should be carefully investigated by the student. We may now truthfully affirm, after briefly studying the production of sound and its modifications by instruments, that music is a mode of motion.

But music as a pleasure-evoking emotion! Whence comes it, what is its psychologic basis? It is purely human, for not the most fanciful of poets or extravagant of psychologists can torture into formal beauty the songs of birds, the growling of the tempest, the sound of the sea. All these things and many more may furnish the starting point, the spring-board of the composer's imaginings, but artistic they are not. There is no real music in nature. As a play impulse, art has been considered and discussed by many modern writers. Schopenhauer, whose intuitions are often superior to other men's logic, calls art "a momentary liberation," and Herbert Spencer develops his idea, linking it with biological conditions. In his *Principles of Psychology* he says that a characteristic of nerve processes is that the superfluous integration of ganglion cells should be accompanied by an inherited readiness to discharge. Thus the 'aimless activity' we call play is the result of a force expended, a force that man as a highly developed animal has more of than is needed for the struggle of existence. In many animals he finds imitation a factor, but Karl Groos in his *Play of Man* believes in impulse and intuition—"the inherited impulse toward prescribed reactions in certain brain-tracts seems to be in itself a sufficient cause for play without the necessary accompaniment of superfluous energy." Schiller calls play a harmless expenditure of exuberant strength which is its own excuse for action. Lazarus is the exponent of the reaction theory. When we are tired of natural or physical labor we play, thus recreating ourselves. Professor Groos, however, finds in both the surplus expenditure and the recreation theories only partial statements of the truth. For him, play is the impulse toward repetition, and this is a physiological reason for playing to the exhaustion point, which we notice so often, even if we are tired at the beginning. "Let us recall first," he writes, "the tremendous significance of involuntary repetition to all animal life, for just as the simplest organisms in alternate expansion and contraction and the higher ones in heart-beats and breathing are pervaded by waves of movements, so also in the sphere of voluntary activity there is a well-nigh irresistible tendency to repletion." Play, too, furnishes distraction from quotidian cares. It is an educational factor of prime importance, elaborating immature capacities and influencing the evolution of hereditary qualities. Schiller declares that man alternates between weak and sensuous pleasures, and his dictum that man is fully human only when he plays has, as Professor Groos declares, "definite biological meaning." Conrad Lange defines art "as the capacity possessed by men of furnishing themselves and others with pleasure based on conscious self-illusion, which by widening and deepening human perception and emotion tends to preserve and improve the race." This is but an amplification of Schiller's remark. And Art is but the play-impulse immeasurably elevated, yet at its roots possessing a sham objective character. The earliest form of musical art, the pantomimic dance, was "an expression of muscular force simulating the acts of life." It was symbolical, it expressed a feeling, a state of mind. In its genesis art was play of a semi-physiological character. Primitive dancing comprised music and poetry in solution; later on they became separate and independent arts. Rhythm, the father of organized music, played a big rôle, for rhythm is cosmic, it is manifested in the heart beat—the unit of measure for all the temporal arts—the tides and the movements of the bodies in the interstellar depths. Dancing accompanied by rudimentary songs—perhaps of only two or three tones—is the first step of the musical art. Emotions were translated in the rough, yet effectively; the pantomime of the savages is always clear, attempting as it does the expression of love, anger, terror, hatred, and happiness. How much the sexual attributes play in the beginnings of art we cannot say, but music in the light of modern researches may no longer be called the Heavenly Maid. Far from it, indeed, for as Havelock Ellis truthfully says: "In music the most indefinite and profound mysteries are revealed and placed outside us as a gracious, marvelous globe; the very secret of the soul is brought forth and set in the audible world. That is why no other art smites us with so powerfully religious an appeal as music; no other art tells us such old forgotten secrets about ourselves. It is in the mightiest of all instincts, the primitive sexual traditions of the races before man was, that music is rooted. . . . The sexual instinct is more poignant and overmastering, more ancient than any as a source of beauty. . . . Beauty is the child of love." Music is an emotion become æsthetic. Human beings, as Ribot says, began by thinking that beautiful which resembled themselves. Primitive art was addressed to the individual of our own species. As it became more disinterested, it exhibited religious qualities, and eventually was transformed into a ritual, a ceremony for the expression of awe or thankfulness to the deity. It had a specific character and one that had but remote affiliations with our modern conceptions of art. The natural extrusion of sympathy, the conquest of nature by the intellect, has given us two of the most modern arts: music and landscape painting. Neither of these had any real existence in the Old-World civilizations; indeed, a feeling for nature in poetry and painting may be said to date from yesterday. The patient flowering of savage, rhythmic cries into the score of a Beethoven symphony is only comparable—to mention purely human processes—to the evolution from a South Sea Islander's simple mud hut to the magnificent complexities of a Gothic cathedral. From the sheltering needs of the body comes the noble art of architecture; from the social needs of intercourse, self-expression, come poetry and music. Both were the irrepressible and the irresponsible exhibition of surplus energy, of the play impulse. And on this side is music purely sensuous.

Kant defines the Beautiful as that which "through the harmony of its form with the faculty of human knowledge awakens a disinterested, universal, and necessary satisfaction." We are now another remove from the utilitarian; for in a certain sense all art is useless, inasmuch as it bestows no material benefits. Its beauty is its excuse for being, and music being the least representative of the arts, copying no material forms, is therefore easily the most ideal of all the arts and the most inutile. Apprehended in time and not in space, it addresses itself to the imagination. And here we are confronted by the *crux* of Hanslick and other æstheticians of the formal. "Definite feelings and emotions are unsusceptible of being embodied in music," he declares. Music does not express emotion, it expresses itself. It is sound-play; it consists of exquisite arabesques; it is a formal pattern of tone, and all the wonderful things attributed to it exist only in the overheated imagination of its hearers. Precisely so, and it is this almost miraculous subjectivizing process that proves the weakness of Hanslick's thesis. No other art attacks so powerfully the emotions. "Music acts like a burn, like cold, heat, or a caressing contact. Music acts on the muscular system, on the circulation, the respiration . . . and is the most dependent on physiological conditions. The primary effect is a physical one." Beauquier says: "Musical vibration is only one particular mode of perceiving the universal vibration. . . . Musical art is the art of sensibility par excellence, since it regulates the great phenomena of vibration into which all external perceptions resolve themselves, and transfers it from the region of the unconscious, in which it was hidden, to that of consciousness." Again Ribot: "While certain arts at once awaken ideas which give a determination to the feelings, music acts inversely. It creates dispositions depending on the organic state and on nervous activity, which we translate by the vague terms—joy, tenderness, serenity, tranquillity, uneasiness. On this canvas the intellect embroiders its designs at pleasure, varying according to individual peculiarities." Let us admit, then, with Hanslick and the formalists that music does not *express* emotion; yet this does not preclude the idea of an emotional content in the listener, who projects his personality into the forms. In music the forms and the subject are identical; we cannot dissociate the pattern of the love theme in *Tristan und Isolde* from its emotional effect. The sound once set in motion, we are at liberty to dream, to thrill, to weep, to sigh with all the moods superinduced by a master. And this playing upon our nerves, our imagination, is intentional. In modern times music has become an instrument of overpowering emotional significance. Eighteenth-century music with its gay scheme of decoration, its pretty recurring patterns, its play of forms, and its freedom from the overwrought, the intense, can well be utilized by Hanslick as an example of music for music's sake. It expressed little in the latter-day connotation of the word; so to modern music, especially Beethoven, we might truthfully give the title of classic, as it fulfills many of the requisites of antique art: its dignity, symmetry, grandeur, and profound emotional quality. The position of the formalist school is based on a half truth. A study of the nature of emotions would have cleared the ground long ago of incumbering verbalisms. Ribot defines the technique of an emotion thus: "First an intellectual state, then organic and motor disturbances, and then the consciousness of these disturbances, which is the psychic state we call emotion." This clear definition of a very complicated process may be applied to the effects of music upon a sympathetic listener—naturally sympathy must be granted, else all music addresses itself to the deaf. A vast mirror of subjectivity, music appeals to each of us according to our temperaments. It paints upon the background of our consciousness enlarged meanings of ourselves. Composed of alternate sound and silence, it reaches our very soul with its rhythmic pulsings and sensuous qualities. It is at once the most impersonal and most personal of all the arts. It traverses the keyboard of our desires and arouses noble ambitions or sensual crises as well. It is an unmoral art; it can be impressed with equal facility in the service of church or tavern. Its very plasticity makes it an agent for evil and nevertheless a powerful aid to worship. It is because of this easily molded nature that music has served in every camp, has gone to the wars, has sounded the psalms of peace, has been the bone of contention between warring schools and factions, has led the bride to the altar, and intoned the grief for the dead one. Music, in some form or other, has always accompanied man on his march through the ages, tracing in spiritual mimicry his evanescent emotional gestures. Captive to his baser senses, a column of smoke by day, this agile protean art has played the pillar of flame, a burning eloquent sign in the darkened skies of revolt, superstition, and misery. A potent symbol, 'a mighty fortress' during the Middle Ages, music served the Church faithfully, and when enfranchised it has as faithfully recorded the great emotions of secular souls. Ariel and Caliban—to what purposes has this versatile art not been put? At first man played upon a reed to his mate; then he grew in love with his tune for its own sake. To-day, after putting the art through all its probable paces, it has been harnessed to the Drama, and from being the exponent of pure, formal beauty, it is pressed into the service of the Characteristic. The Chinese, thousands of years ago, discovered the charm of ugliness, and it would seem that modern music is striving for that goal. Rosenkranz has written a volume on *Æsthetics of the Ugly*, and in the general hurly-burly, topsy-turveying of the arts, it would not be improbable if music played the part of devil's advocate in the new æsthetic dispensation. The line of demarcation between the beautiful and the ugly is slight, for beauty is a relative quality, and ugliness often proves its capital foil. To show how shifting has been the standard of musical beauty one has only to consult history or personal memories. A decade may transform the musical map, deposing reigning monarchs and elevating to the purple the veriest newcomer. Music is a fickle goddess.

How far symbolism may be pushed in music is seen in the attempts to pin down the phrase to precise meanings. It is true that there is a key-symbolism, that not by chance have the great composers selected certain keys—keys that, in Wordsworth's happy expression, are inevitable. Beethoven's Fifth Symphony is inconceivable in C sharp minor or E flat minor. C minor is a portion of its life. Berlioz has compiled a table of key characteristics and a certain theorist does not hesitate to call F major rugged; B major, energetic; E major, radiant, warm, joyous; A major, frank, sonorous; D major, gay, brilliant, alert; and so on through the list. Here again temperament counts, all else is purely arbitrary. Music has the power of evoking moods, that is a common experience; and it has on the formal side analogies to architecture, for it is structural, it is architectonic, and its subject is imitative of no known model. This has led Walter Pater to asseverate that all the arts in common aspire "toward music, music being the typical or ideally consummate art, the object of the great *Anders-Streben*—reaching forward—of all art, of all that is artistic or partakes of artistic qualities." It is "the blending of the animative thought and embodying vehicle," the absorption of the matter into the form of which music is the one perfect example among the arts, that attracted Pater. "All art constantly aspires toward the condition of music," he wrote, and made of sensual presentation, emotional suggestion, and technical perfection the archetype for all the arts. The danger of this view lies in the slighting of music's tremendous evocation of our subliminal depths, of spiritual shades. These cannot be exorcised by technical loveliness or richness of emotional eloquence. Beethoven has taught us in his symphonies that from tone may be wrung almost an ethical meaning. The Platonic theory of an ideal type for all the arts could not have failed to impress Pater. But it stops at the outer porches of the ear, the tone which should penetrate to the inner sanctuary losing on the way some of its grosser connotations. His doctrine is that art is always striving to be independent of mere intelligence, that the vaguer the subject the greater the impact of the thrill upon our souls. Gustave Flaubert, who is the creator of both the realistic and symbolistic schools, had some such idea: for he wished his prose to be as independent as music, to float in mid-air by reason of its euphony and rhythm. And there can be no doubt that it is the perfect balance found in Beethoven's phrases, both the meaning and the music, that makes of them the greater type for all future symphonists. Poetry is the usual standard for painter, poet, sculptor, and composer, and, as John Addington Symonds shows, this is as much of a heresy as Pater's. F. H. Myers writes: "The range of human thoughts and emotions greatly transcends the range of such symbols as man has invented to express them; and it becomes, therefore, the business of art to use these symbols in a double way. They must be used for the direct representation of thought and feeling, but they must also be combined by so subtle an imagination as to suggest much which there is no means of directly expressing. This power gives birth to the art of the musician, whose symbols are hardly imitative at all, but express emotions which, till music suggests them, have been not only unknown, but unimaginable." To each art its particular province. There is music in Milton; Wagner is a great painter; Bach an architect; and through the marmoreal prose of Flaubert rings the sound of the sculptor's chisel. But this 'reaching forward' is, as Symonds says, "at its best a way of expressing our sense of something subjective in the styles of artists or of epochs, not of something in the arts themselves." The subjectivity of a critic prompts him to select a particular art as the type for all. Wagner, in a superb effort, attempted to house all the arts within the walls of a mighty synthesis. Music, however, won the victory; it is Wagner the composer who will live, not Wagner the dramatic poet or Wagner the scene painter. The intellectualists are quite as wrong in their endeavor to force upon music the office of preacher or philosopher. By reason of its limitations, music is not well adapted for the expression of an intellectual content. It gives us the maximum of sensuous effect, though we do not agree with Symonds that in it is the minimum appeal to the intelligence. If this were so, Bach, Beethoven, Chopin, Brahms, Wagner, Richard Strauss would not be in the same category with Dante, Michelangelo, Milton, Shakespeare, Shelley, Swinburne, and Rodin. Besides, has not Spencer said, "The emotions are the masters, the intellect is the servant"? Great intellectuality, great emotional temperaments go to the making of great composers as well as of great architects, poets, dramatists, painters, and sculptors. Architecture is not emotional like music, but it is more concrete, it arouses the sense of the sublime—which music does, too, under certain conditions. Sculpture is impressive in its symbolism of the human form and its evocation of harmonious lines; of all the arts it is the most unlike music. Painting, with its illusions of life on a flat superficies, has certain affinities with music, while music and poetry have several qualities in common—the subtleties of sound and the power of continuous narration—though here music speaks a tongue not to be translated into words. It gives the sense of situation, not action, the prism of the arts, as Symonds phrases it, "each distinct, but homogeneous, and tinctured at their edges with hues borrowed from the sister arts. Their differences derive from the several vehicles they are bound to employ. Their unity is the spiritual substance which they express in common. Abstract beauty is one and indivisible. But the concrete shapes which manifest this beauty decompose it, just as the prism analyzes white light into colors."

We have rapidly surveyed music on its acoustical, psychological, and æsthetical sides; there remains the evolutionary. From a mere cry in the submerged, prehistoric world it has passed into the daily life of man, a magnificent art work in which the spiritual and the sensuous are harmoniously blended or struggle for precedence. A presentative art, it has nevertheless been made representative in the acoustic parellelisms of Richard Wagner and others. Furnishing the motive power for ballets, music is the handmaid of religion, and by some authorities is considered to have therapeutic powers. In history it has figured as a healer of sick souls, and to-day in its loftier manifestations it is a balm and a stimulant to the weary in mind and body. And in the last analysis is not music an aural mode of motion?

Evolution. The history of musical art is an effort to record, to systematize and bring into general harmony a vast mass of hopelessly intractable material, conflicting facts, many *lacunæ* and irreconcilable traits which try the temper of the most ardent historian. Evolution there has been, and, despite pessimistic doubts, genuine progress; but it is an evolution that often curves in upon itself, its line of progress is more fancied than real. To draw a straight line from the earliest musical lispings to the omnipotent utterances of Beethoven, is the ideal of the critic; but the task is a difficult one. Musical history is a history of suppressions, evasions, and empirical classifications. Like the evolutionary processes in the physical world, progress is often seemingly crab-wise. If science aims at discovering law and reason in nature, a notation of the actual, the art of music furnishes an example of purely arbitrary progress. The artist does not create in the abstract, but in the concrete, so that two art products are independent and never alike. To explain one by the other is at once the cardinal fault of criticism and its excuse for existence. Palestrina and Wagner are poles asunder, and it is a bold man who claims precedence for either. And yet nothing of Palestrina's has been lost; his harmonic seeds are come to a flowering. Has Wagner surpassed Gluck in certain elementary qualities? Who since the death of Beethoven has symphonized so marvelously? Has the rush and sweep of the Handelian chorus ever been repeated, or who can equal Bach in polyphonic mastery? Music is the youngest of the arts, but it behooves us to ask if the nineteenth century is literally its seminal epoch. So there have been factitious groupings, vague theorizing by some compilers of musical history, who, be it said with emphasis, have made much of tantalizing, incomplete records. To be sure, schools usually followed the strong men, and there is a chain of development during the past few hundred years, enough to furnish credible criticism. Before that the roots are in the darkness of the mother churches, or the mediæval twilight of the cloisters. There has been much sublime guessing to build up a fabric capable of withstanding adverse comment. But it has been accomplished, and in Naumann, Ambros, Wallaschek, Rowbotham, Grove, Rockstro, Parry, Henderson, Finck, Apthorp, Hale, Krehbiel, Elson, Ernest Newman, Hadow, and others we may catch glimpses of a baffling whole. One fact is unalterably demonstrated by the researches of these scholars: that so far from music being a universal language, it is more subject to geographical limitations than is speech. It is a veritable tower of Babel in its multitudinous dialects, its jargons and eloquence. The divine stammering of the men who made ecclesiastical music is offset by the heathenish rhythmic howlings of the Bushmen; and the melancholy monotony of the Chinese pentatonic scale is drowned by the full orchestra of Tschaikowsky. Men of many climes may converse by mute signs, but set them all to music-making, each after their kind, and the result will be anarchy. It is one of the pleasing fancies of the poet, this catholicity of music. Facts, however, contradict the idea; just as surely as they deny the assumption that vocal music, i.e. words with song, is superior to absolute music, i.e. music that is self-sufficient, that needs no illustration, no libretto to explain its existence. Absolute music then is the highest reach of the art, the most dignified and satisfying. No doubt the human larynx is the most perfect of instruments, and the sound it produces touches the heart, for it is human. But poetry pure and music absolute cannot be blended without a loss to both. Vocal tones preceded instrumental ones; indeed, one school asserts that singing came before speech. Grell and Engel maintain that speech is but degenerated singing and that music with words is the archetype of the art. Music and articulate speech are far from resting on a common basis, though both begin at the human throat. Half the heresies of music originate in this confounding of widely disparate things. It was a stumbling block for Beethoven, Richard Wagner, and for Schumann and Richard Strauss. Even among the savages the break is clear between impassioned speech and song.

Rowbotham ingeniously groups prehistoric music under the drum, pipe, and lyre types; instruments of percussion, wind, and string. Man drummed and thrummed before he piped, and he piped before he plucked, and he probably yowled to the moon before the rhythmic noises of nature, dripping of waters, sounds of wood and wind, stimulated his phono-motor centres to imitation. (See MUSICAL INSTRUMENTS). The rhythmic chantings were part of a ritual, the soul of the savage worshiped its fetish; the beginnings of religion and art are identical. These manifestations belong properly to culture study. (See FOLK MUSIC; see also the Music of Arabia, China, Egypt, India, Japan, Turkey, Russia, Scandinavia, of the Magyars, Celts, Negroes, North American Indians, and Hebrews, under ARABIAN MUSIC; CHINESE MUSIC, etc.) The earliest musical system of which we possess any authentic record was invented by the Greeks or rather absorbed from Phœnician and Egyptian systems. The Hebrews also borrowed their forms from other nations. The invention of the lyre is attributed to the Egyptian god Thoth in the pretty fables. The Greek play is the prototype of modern opera. (See OPERA.) It was sung, though the music has not been vouchsafed us. Two thousand years ago Athens thrilled at the *Antigone* of Sophocles, yet not a note of it has been preserved. The Greeks, sensitive to all the arts, made music part of their daily lives. Its influence upon them, as described by poets, must have been extraordinary. Yet in the three hypothetical Hymns of Apollo, Nemesis, and Calliope, and the first Pythian Ode to Pindar, we find little that would touch modern nerves. Theoretical writings of Pythagoras, Aristoxenus, Euclid, and others have come down to us and show that the Greek knew the perfect intervals of the natural scale—the octave, fourth, fifth, and greater tone. But their system is a highly artificial, needlessly complicated one, and finally blossomed into the modes: Dorian, Ionian, Phrygian, Æolian, Lydian, Mixolydean, etc. (See GREEK MUSIC; MODES.) The Romans derived their musical knowledge from the Greeks, but did not pursue its study seriously. The early Christians who found in the Imperial city a harbor of refuge brought with them new forms, echoes of the liturgy heard in the Temple of Jerusalem. Saint Ambrose, Bishop of Milan, made about the year A.D. 384 a general collection of these melodies and at the same time laid down a code of technical laws. Two centuries later Saint Gregory the Great is claimed to have made a second collection (c.590 A.D.) and based it on a more comprehensive system. The four modes or scales bequeathed by Ambrose were increased to nine. The combined melodies received in early times the names of *cantus planus*, plain chant; the older being known as the Ambrosian Chant (q.v.) —still sung in Milan—the later one as the Gregorian Chant (q.v.). (See PLAIN CHANT.) From these liturgical chants has sprung the noble music of the Roman Catholic Church. Gevaert doubts with historic accuracy the historic basis of the Gregorian chants; believing that the Christian Church derived its modal scales and its melodies, not from the old Hebraic psalmody, but from the secular *Kithara* song of the Roman Empire, which comes from the Greek. These psalm tunes, whatever their origin, are the oldest ecclesiastical music we possess. Later music was treated as arithmetic by Boëtius and the art became a mere mathematical exercise. In the latter half of the ninth century Hucbald, a monk of Saint Amand in Flanders, proposed a new division of tetrachords, and attempted the arrangement of vocal music in parts, and invented a new system of notation. Semiography or sign writing was the method of notation that superseded the notation of Gregory. Figures called Neumæ (see NEUMES) were placed over the words to which the tunes were sung. Though the ascent and descent of the melody were not at first shown, Hucbald remedied that by a series of horizontal lines arranged like the modern stave; in the spaces he wrote the words of his hymns. His *Musica Enchiriades* contains information about notation and the Organum or Diaphony, which was the first form of harmony, consisting chiefly of consecutive octaves, fifths, or fourths added to the plain song of the church. (See HARMONY.) Guido of Arezzo (c.1000-c.1050), another monk, distributed the twenty notes then used into groups of six, called hexachords. He invented solmization (q.v.), which is the naming of the notes of each hexachord by the syllables Ut, Re, Mi, Fa, Sol, La; the origin of these syllables being a verse of a hymn to Saint John, each line of which began with one of them, and each of which was sung to phrases a note higher each time. Ut was supplanted by Do, and Si was added to complete the necessary seven notes of the octave. (See SCALE.) Franco of Cologne made the first recorded attempt to measure the relative length of notes in his 'cantus mensurabilis' or 'measured song.' Four standards of length were adopted: (1) *maxima*, or *duplex longa;* (2) *longa;* (3) *brevis;* (4) *semibrevis.* A time signature was put at the beginning of the music, which showed whether each long note was to be equal to two or three shorter ones. (See MENSURABLE MUSIC.) Diaphony merged into discant; the former doubling the melody at the fifth or fourth, the latter varying the monotony of the organum by the addition of ornamental notes, passing notes. This discant was usually extemporaneous, though composers soon employed it, when it was called 'contrapunctus a penna,' in contradistinction to 'contrapunctus a mente.' Counterpoint, or note against note, was born; motets were sung, rough attempts at part-singing lent it at least a beginning. See COUNTERPOINT.

Much of the musical development of the twelfth and thirteenth centuries was centred in Paris. The troubadours, trouvères, jongleurs, and minnesingers, who cultivated poetry and music, play no small part in the advancement of the art. They developed epic, lyric, and dramatic art, and spread over France, Germany, even the south of England. Some of the better-known were Thibaut, King of Navarre, Count of Champagne, Adam de la Hale, who wrote *Robin and Marion*—a play with music and dialogue interspersed—and later Walter von der Vogelweide, Wolfram von

Eschenbach, Frauenlob, and Hans Sachs. England gives us the round 'Sumer is icumen in' (see RONDO), and there are fragments of works by Marchault de Muris, Tunstede, and De Handlo in the fourteenth century which are not promising examples. The Netherlands in the early part of the fifteenth century showed signs of re-awakening energy, the first representative composer being Dufay, in the service of Philip le Bon of Burgundy. His style was crude. showing the influence of John Dunstable, an Englishman (c.1400-1453), who at one time was regarded as the greatest composer in Europe. After Faugues, Caron, Busnois, the next figure of importance is Okeghem, who lived until 1513. He, too, was a Fleming. He is known to fame, however, as the master of Josquin Deprès (born about 1450), a genius. He wrote church and secular music with equal facility and was in the Papal choir from 1471 to 1484. His pupils were Jean Mouton and Nicholas Gombert. Obrecht, chapel-master at Utrecht, was another man of ability. The art of printing from music types was first practiced in the early part of the sixteenth century (1501). This led to an increased activity among composers, and soon came an interesting list of names, such as Adrian Willaert (1490-1562), attached to Saint Mark's Cathedral, Venice; Philip Verdelot (about 1500-67), composer of madrigals, canzonas; Jacques Arcadelt (c.1514-c.1575), and others. Constanzo Festa was the first Italian composer of prominence (1490-1545). But we must not forget other Netherland men, Jacques Clemens, Cyprian Van Rove, Walraent, Phillipus del Monte, and Orlando di Lasso (1520-94), who continued to write good music even after the Italian supremacy. Orlando di Lasso is famous for his setting of the Penitential Psalms, which contain much lovely and characteristic music. Then for a time the Italians, Zarlino, the two Gabrielis, Claudio Merulo (1533-1604), Marenzio, a great organist, and Palestrina held the field. The latter was born at the town from which he takes his name about 1514. He studied under Claude Goudimel, a Frenchman. The "Pope Marcello Mass" was written in 1565, and in it the climax of ecclesiastical music was reached. Palestrina was the greatest master of pure choral style; he closed an epoch when he died in 1594. His contemporaries and pupils were Morales, a Spaniard; Nanini, Vittoria, also a Spaniard and second only to Palestrina; Giovanni Croce, and Allegri. In Germany, Heinrich Isaak, Johann Walther—the friend of Luther—Gallus, Stalzer, and Hans Leo Hassler (1564-1612), the latter a pupil of Andrea Gabrieli, passed on the torch of tradition, keeping it aflame by their own honest efforts. In England there was a musical activity that has not been paralleled since in the history of the nation. Christopher Tye, John Merbeck, Thomas Tallys, his celebrated pupil William Byrd, Edwards, Whythorne, Nicholas Yonge, Thomas Morley, Thomas Weelkes, John Dowland (1562-1626), Thomas Batesen, Orlando Gibbons (1583-1625), John Bull, W. Forster, Benjamin Cosyris, John Blow, wrote wonderfully sparkling, vigorous, and original music. All England sang their catches, roundelays, madrigals, motets, and the more cultivated played their virginal and lute music. Indeed, the beginnings of music for the clavichord, harpsichord, and modern pianoforte may be found in the literature of Byrd, Gibbons, Bull, and others. The school culminated in Purcell (1658-95). Whether because of Puritanical influences or the advent of the Italians and later George Frederick Handel, an overwhelming composer, certainly England has produced no such original genius as Henry Purcell.

The currents of music now begin to run swifter, opera and oratorios absorbing the ears of the civilized world thanks to the work of Monteverde, Lully, Purcell, Alessandro Scarlatti, Lotte, Durante, Leo, Handel, and Bach. (See ORATORIO.) This article will in the main confine itself to purely instrumental music and its progress. The crudeness of the viol family was giving way to the finished specimens of Italian violin-makers' art, and with improved instruments came music of a better quality and wider range. (See VIOLIN.) The organ, which aided the growth of types of choral music, was now become a more highly differentiated instrument, and music *per se* was heard from its pipes. (See ORGAN.) The forerunners of the pianoforte (see PIANOFORTE) were engaging the attention of composers, and the orchestra (see ORCHESTRA), from a simple gathering of heterogeneous instruments, many of them obsolete to-day, was gradually approximating its present size. Parry divides the history of instrumental music into three well-defined periods: the first extends from the early experiments in the fifteenth and sixteenth centuries up to the time of Bach; the second up to Beethoven; the third to the present day. Contrapuntal methods prevailed during the first; the second saw the development of pure harmonic forms of the sonata order, culminating in Beethoven; the third was marked by modifications of the form with greater freedom in contrapuntal devices, and the patent factor of orchestration playing a powerful part. There was much graceful, fantastic dance-music written for the clavecin and harpsichord by Purcell and Lully, while Chambonières and Couperin composed what are now known as suites, then called *ordres*, composed of lively dance movements out of which the sonata grew. (See SONATA.) Cambert and Lully also wrote ballads with overtures. Both Couperin and Rameau (1683-1764) contributed excellent music for the clavecin, and, being supple performers, did much to advance the purely formal side of composition, while in their suggestive titles we see the humble beginnings of programme music. Organ-playing was growing apace, Gabrieli, Merulo, Sweelinck of Amsterdam, Reinken, Frescobaldi, Scheidt, Froberger, a pupil of Frescobaldi, Kerl, Pachelbel, and Buxtehude the Dane, all helping to rear the mighty fabric of fugue and sonata which culminated in Bach. In Italy, Amati, Stradivarius, and Guarnerius stimulated the genius of Arcangelo Corelli (1653-1713), who gave the world his sonatas and concertos for stringed instruments accompanied by harpsichord or organ. The first set of twelve were called "Sonata da Chiesa," the second set of twelve "Sonata da Camera." The first, patterned after the churchly form, was in four movements, and is a prototype of the modern sonata; the second is a dance suite, consisting of Allemande, Corrente, Sarabande, Giga or Gavotte. And the music, as we can testify to-day, is sweet, sane, and dignified. Then followed a gifted group of Corelli's pupils, Somris, Locatelli, Geminiani, Veracini, Vivaldi, and Tartini. Being virtuosi, they all helped to solidify the technique of their instrument as well as of musical forms. Among the Germans of this period may be mentioned Von Biber (1638-98). Handel (1685-1759), busy as he was with opera, oratorios, and the fatiguing duties of an impresario in London, found time to compose suites for the harpsichord as well as concertos for organ, violin sonatas, and overtures for his choral works. He was hardly a pathbreaker, for he followed obvious Italian models, though he stamped everything he wrote with the seal of his vigorous genius. Johann Sebastian Bach (1685-1750) was first and last the ideal organist; into its literature he poured the purest treasures of his extraordinary genius. A set of fugues, concertos, and toccatas (see CONCERTO; FUGUE) that have never been equaled, the richness of which is far from being exhausted, were given the world by this modest cantor of Leipzig, who still found time to compose the *Well-Tempered Clavichord*, that unique collection of forty-eight preludes and fugues for a clavier tuned in equal temperament, so that all keys are equally available instead of some being in particular tune in order that a few others might be so. (See TEMPERAMENT.) He also wrote the English and French suites and partitas for the clavier, as well as the Italian concerto and those delightful lessons, two-part and three-part inventions. On Bach's prodigality of utterance, the astounding variety and depth of his music, its science, its art, its formal beauty and emotional signficance, there is little need to dwell now. The great Passions, the violin compositions, and the clavier and organ music, chorales and motets are a part of the world's most precious art heritages. His perfection, his inauguration, form the matrix of all latter-day music. He has influenced Beethoven, Schumann, Chopin, Mendelssohn, Wagner, Brahms, and Richard Strauss enormously. The orchestra of his days was still in an amorphous condition and he wrote for it as he did for other instruments, thoroughly, and as a medium for the expression of his ideas. Personality in music revealed itself with no uncertainty in Bach's case. Some of Bach's predecessors, Kulman, Matthesen, and Muffat, wrote sonatas and suites. Domenico Scarlatti (1683-c.1757), the son of Alessandro, wrote operas and church music, as did his father, but soon became the most famous harpsichordist of his day, the Liszt of the eighteenth century. His compositions show the expert virtuoso, and are remarkable for being the first works of the kind in which the fugue and dance are not essential. The key-grouping and arrangement of the movements, with phrasal repetition, set his music ahead of its time and link it with Mozart and the early sonata masters. Galuppi and Paradesi followed in his footsteps. Slowly the contrapuntal style gave way to the harmonic, the Italians simplified the scheme by writing luscious melodies with a slight accompaniment, and after Corelli (1653-1713) the decadence began. Tartini, Viotti, Rode, Baillot, all noble artists, continued the Corelli tradition. Bach's sons, Karl Philip Emanuel and Johann Christian, were worthy descendants, though without his masterful grip. The former made the model for the sonata that Haydn followed, and Johann Christian wrote sonatas, symphonies, and operas. Symphonies (see SYMPHONY) had been attempted by Abel, Esser, Wagensail, but the form received its first shaping by Haydn and Mozart. Haydn (1732-1809) began by studying the clavier sonatas of Philipp Emanuel Bach and ended under the influence of his one-time pupil Mozart (1756-91). The Haydn string quartets and some of his symphònies and piano sonatas are inimitable. Mozart polished the symphony during his short, crowded life, and left us such masterpieces as the E flat, C major, and G minor symphonies. On his way to Paris in 1777 he stopped at Mannheim, where Stamitz conducted the best orchestra in Europe. There he learned the possibilities of instrumentation. Mozart had the real color-sense, and his orchestral writing shows a feeling for the varying *timbres*, and a balance of the various choirs hitherto unsuspected. His orchestra was a more elastic and highly organized instrument, and it lent itself to the most complicated types of composition. The wood and brass choirs were individualized, and writing for the string quartet had reached a degree of perfection. The dexterity displayed by Mozart was not lost on Haydn, and some of it was reflected in the operatic composers who followed him, though it may be confessed that Gluck (1714-87), his great contemporary, benefited little by his novel researches; indeed, he possibly never went out of his way to hear the D major symphony, which is said to have been given in Paris while the composer of *Orfeo* was there. Nineteenth-century operatic composers like Weber, Berlioz, Meyerbeer, Wagner, and Verdi in his later years, were the first to concern themselves with the possibilities of orchestra color enhancing the dramatic situation or contributing atmosphere.

After Muzio Clementi (1752-1832), the Italian pianist, went into pianoforte manufacturing and presented to the world a pianoforte that could withstand muscular attacks, and give out a great volume of tone because of its hammers instead of jacks, he paved the way for the Beethoven pianoforte sonata. He did more. He wrote his *Gradus ad Parnassum*, a collection of studies in style and invention that are in the curriculum of every pianist and student to-day. His inventive skill gave to pianoforte technique many new figures, and his was the technical foundation for the Beethoven sonatas. He is truthfully the father of modern pianoforte music, and until the appearance of Liszt, his pupils, J. B. Cramer, the Irishman; John Field—who originated the Nocturne form—and others whose style he influenced, Dussek, Pleyel, Steibelt, and Moscheles, dominated the entire field of pianoforte playing. In Beethoven (1770-1827) classical music reached its apex, and romantic music—so called—had its birth. The greatest of symphonists, his influence, like Bach's, has permeated every department of music. A short-time pupil of Haydn, admired by Mozart, this gigantic genius seems to have included in his mighty symphonies and sonatas all that had been. In his early efforts we see Haydn, in his ninth symphony and last piano sonatas may be found the seeds that sprouted into the luxuriant forests of the Wagner music-drama, and gave birth to the dream-haunted imaginings of Chopin, Schumann, and Berlioz. Beethoven has been called the Homer, the Michelangelo, the Shakespeare of music. He has more affinities with the great Englishman than with the Greek or Italian. He is intensely human, and his temperament, hugely passionate and poetic as it is, is never the ruler of his noble intellect. Nature dowered Beethoven with manifold gifts; gifts not only of originality, but of character. In the slow revolution of music, it may be remarked that the most original men are not always the elect; their very originality sometimes degenerates into the bizarre, and a splendid isolation is their fate. But Beethoven, with all his revolutionary instincts, began in a conservative manner, building on the foundations of his predecessors, keeping in the line of tradition The bases of his tonal palaces are dug deep, but their towers pierce the very skies. His thirty-two sonatas, concertos, chamber music, and nine symphonies represent the *summum bonum* of human musical effort and, as Parry truthfully says, "bear the marks of a higher degree of concentration and a wider range of design" than those of his forerunners except Bach, "and the sum of the result is the richest and most perfect form of abstract instrumental music which exists in the whole range of music." Beethoven literally re-created the sonata form, adding to it new movement, filling it with an incomparable emotional and intellectual content. The symphony he enlarged and vivified, buried the old tones of formalism, and gave it the scherzo, gave it power, majesty, tenderness, and supreme beauty. The orchestra became a new instrument in his treatment of it, and for the first time each member of the instrumental army was given liberty. Color, grace, delicacy, and elasticity are revealed in the Beethoven orchestration. (See INSTRUMENTATION.) Unity in variety, the highest law in all artistic creation, is the distinguished characteristic of this wonderful man's work. There is little need to dwell upon Hummel (1778-1837), a pupil of Mozart and a refined pianist; or upon Ries and other imitators of the Beethoven style. Karl Maria Von Weber (1786-1826) proved himself to be a versatile composer and one who greatly influenced Wagner. *Der Freischütz* is still played. In his overtures to *Der Freischütz, Oberon, Euryanthe,* Weber revealed a fine color sense and a genuine fantasy. His piano music is brilliant, effective, and some of it chivalric, though in formal sense he broke away from the classic and reveled in the romantic. Franz Schubert (1797-1828), unique as a *lied* composer (see LIED), wrote many symphonies, two of which, at least, are famous, many piano sonatas, minor pieces, and chamber music. His charm lies in his rich melodies, the most fragrant and original since Mozart's, and a personality of rare attractiveness. His very profusion enchants. With Louis Spohr (1784-1859) we have little in common nowadays, despite his valuable contributions to violin literature. His music in the larger choral and instrumental forms sounds antiquated. Felix Mendelssohn-Bartholdy (1809-47) was one of the best equipped musicians of the century, a writer of refined melodies, a master of orchestration and a man of delicate imagination. He wrote his *Midsummer Night's Dream* when a mere youth, and he never surpassed it, though there is more depth in the Hebrides overture (1830). From an idol of the mid-Victorian reign, Mendelssohn has become a man to-day comparatively neglected and certainly underestimated. He wrote absolute music in a pure style and did not attempt to transcend its sphere, or rather his own limitations. He was an accomplished organist and pianist, and wrote with skill and ingenuity for both instruments. The Mendelssohn piano music—not the familiar *Songs Without Words*—is a mine of good things—the *Variations sérieuses,* for example. (See VARIATIONS.) His oratorios *Elijah, Saint Paul,* and the *Reformation Symphony,* with its chorale, are built upon a close study of Bach and Handel. To Mendelssohn the musical world owes a debt of gratitude for his labors in unearthing many Bach manuscripts. Of the many symphonies Mendelssohn wrote, the most frequently heard are the *Scotch* and the *Italian.* His violin concerto is a model of its kind.

Hector Berlioz (1803-69), a Frenchman of colossal ambition, elected to tread in the footsteps of Beethoven, composing music in the grand manner and devoting himself to the development of orchestral resources, with the result that he died the greatest composer of France and may be truly entitled the father of the programme school in music. What he did for it was chiefly in a loosening of formal knots, in rhythmic devices and orchestral color. The affixing of romantic titles, such as *King Lear, Waverly, Les francs juges, Lelio, Harold,* and the rest, is not an original device, while Franz Liszt, affected as he was by Berlioz's original discoveries in instrumentation, is really the intellectual protagonist of the movement, for he invented the *Poème symphonique,* a species of foreshortened symphony. (See SYMPHONY.) Berlioz had not so much new to say, but he was an incomparable stylist. His music is agitated, dramatic, fantastic, and also fascinating. In his *Te Deum* he has almost compassed the sublime, and he forged a passport to posterity in his *Damnation of Faust.* Like Liszt, Schumann, and Wagner, Berlioz was a man of pronounced literary ability. Frédéric Chopin (1809-49) stands alone in an age crowded with musical greatness. The most poetic of all composers, using poesy as subject matter rather than the ordinary phraseology of music, he contrived to write for the pianoforte, an instrument abused by vapid virtuosi, a mass of music as individual as Bach's or Beethoven's. He had no predilection for the sonata form, though he left three solo sonatas and one for piano and violoncello; but he idealized various dance forms such as the polonaise, valse, mazurka, krakowiak, composed most original ballads, scherzos, nocturnes, fantasias, impromptus, and as a companion book to the *Well-Tempered Clavichord* wrote twenty-seven studies and twenty-five preludes which are invaluable contributions to piano literature. More than this, Chopin was a melodist of rare quality and an inventor of harmonies the most daring of the century. Even Wagner shows a close study of Chopin in his harmonic system. An apparition in art, this Pole sang the sorrows of his native land in exquisite accents, played the pianoforte as no one before or after him, and literally formed a new technical school. His early music shows traces of Hummel and John Field, but his native originality soon lifted him out of the track of routine. His influence affected Liszt and the younger school, the Neo-Russians, and Wagner. Robert Schumann (1810-56) is another original composer quite as subjective as Chopin, but without the latter's formal sense, a sense cultivated by devotion to Bach's music. Schumann's imagination is tropical and his indirect influence in modern music has been a powerful one. Not a great symphonist, he nevertheless composed four charming symphonies, and chamber music of

CHRONOLOGICAL CHART OF COMPOSERS

	15th Century		16th Century		17th Century		18th Century		19th Century	
Italian..........		Festa (1490-1545)	Animuccia (c. 1500-71) A. Gabrieli (c. 1510-86) Palestrina (c. 1514-94) Cavalieri (c. 1550-99)	Merulo (1533-1604) G. M. Nanini (c. 1540-1607) Caccini (c. 1546-1615) G. Gabrieli (1557-1612) Peri (c. 1560-1630) F. Anerio (1560-1630) Monteverde (1567-1643) Frescobaldi (1583-1644) Allegri (1584-1652)	Cavalli (c. 1600-76) Benevoli (1602-72) Carissimi (c. 1604-74)	Corelli (1653-1713) A. Scarlatti (1659-1725) Buononcini (1660-1750) D. Scarlatti (1683-c. 1757) Durante (1684-1755) Porpora (1686-c.1766) Tartini (1692-1770) Leo (1694-1766)	Logroscino (c. 1700-63) Pergolesi (1710-36) Jomelli (1714-74) Piccini (1728-1800) Sacchini (1734-86)	Paisiello (1741-1816) Cimarosa (1749-1801) Clementi (1752-1832) Zingarelli (1752-1837) Viotti (1753-1824) Cherubini (1760-1842) Spontini (1774-1851) Rossini (1782-1868) Donizetti (1797-1848)	Bellini (1802-35)	Verdi (1813-1900)
German........		Isaak (c. 1450-1517) Hofhaimer (1459-1556) Agricola (1496-1556) Senffl (1492-1555)		Sweelinck (1562-1621) Hassler (1564-1612) Prätorius (1571-1621) Schütz (1585-1672) Schein (1585-1630) Scheidt (1587-1654)	Froberger (1605-67)	Pachelbel (1653-1706) Keiser (1674-1739) J. S. Bach (1685-1750)	Graun (1701-59) Gluck (1714-87) H. P. Bach (1714-88) Mozart (1756-91)	Haydn (1732-1809) Beethoven (1770-1827) Hummel (1778-1837) Spohr (1784-1859) Weber (1786-1826) Marschner (1795-1861) Schubert (1797-1828)	Lortzing (1803-51) Mendelssohn (1809-47) Schumann (1810-56) Hiller (1811-85) Flotow (1812-83) Wagner (1813-83) Franz (1815-92) Kiel (1821-85) Raff (1822-82) J. Strauss (1825-99) Brahms (1833-97)	
French..........	Dufay (c. 1400-74)		Goudimel (c. 1505-72)		Cambert (c. 1628-77) Lully (1638-87)	Couperin (1668-1733) Rameau (1683-1764)		Grétry (1741-1813) Le Sueur (1760-1837) Isouard (1775-1818) Boïeldieu (1775-1834) Auber (1782-1871) Hérold (1791-1833) Meyerbeer (1791-1864) Halévy (1799-1862)	A. C. Adam (1802-56) Berlioz (1803-69) F. C David (1810-76) Ambroise Thomas (1811-96) Gounod (1818-93) Offenbach (1818-80) Bizet (1838-75)	

English.........	Dunstable (c. 1400-53)		Tallys (c. 1520-85)	Byrd (c. 1538-1623) Morley (1557-1604) Dowland (1562-1626) Bull (1563-1628) Orlando Gibbons (1583-1625)	Humfrey (1647-74) Purcell (1658-95)	Handel (1685-1759)	T. A. Arne (1710-78)	J. Field (1782-1837)	Benedict (1804-85) Balfe (1808-70) Bennett (1816-75) Wallace (1824-65) Barnby (1838-86)	Sullivan (1842-1901)
Flemish........	Binchois (c. 1400-60)	Hobrecht (c. 1430-c. 1506) Okeghem (c. 1430-c. 1513) Josquin Deprès (c. 1450-1521) Willaert (c. 1490-1562) Gombert (c. 1495-1570)	Arcadelt (1514-c. 1575) Orlando di Lasso (1520-94)					Gossec (1734-1829)		
Russian........									Glinka (1804-57) Rubinstein (1830-94) Tschaikowsky (1840-93)	
Danish..........						Buxtehude (1639-1707)			Gade (1817-90)	
Hungarian...									Liszt (1811-86) Heller (1814-88)	
Spanish........				Vittoria (c. 1540-c 1608) Morales (fl. 1550)						
Polish...........									Chopin (1809-49)	
Bohemian.....									Smetana (1824-84)	

a high character, notably the pianoforte quintet. (See QUARTET; QUINTET.) The concerto for pianoforte in A minor is justly beloved by artists and public alike. It contains passages of rare romantic beauty. But it is in his songs and smaller pieces for the pianoforte that the peculiarly introspective nature of this German musician is seen at its best. The *Carnaval*, *C major Fantasia*, *F sharp Minor Sonata*, the *Symphonic Studies*, the *Fantasiestücke*, *Kreislcriana*, *Toccata*—most spiritual of technical studies—*Papillons*, and the rest are Schumann's monuments. As a song-writer he ranks below Schubert and with Robert Franz and Brahms. Franz Liszt (1811-86), after bewitching the world with his wondrous pianoforte playing, composed an incredible quantity of music, and the twentieth century will doubtless give him the laurels of the composer he craved. His pianoforte music is in the highest degree stimulating; his orchestral compositions, *Symphonic Poems*, and symphonies *Faust*, *Dante*, and the superb *Graner Mass* proved too tempting for his son-in-law, Richard Wagner, who assimilated their melodic content and harmonic audacities in his music-dramas. Liszt's is still music of the future. The exact antipodes of this gifted Hungarian was Johannes Brahms (1833-97), who, finding the classic forms sufficiently strong for his new wine, poured it out with gravity and unhurrying serenity. His four symphonies (colored by Hungarian feeling), his piano and chamber music, are the revelations of a noble nature. Brahms is not dramatic in the theatric sense, but he has epic breadth of utterance, and his music is always noble. A romantic in feeling, his Teutonic reserve checked extravagance; and yet his later piano music, with its formal freedom and novel content, proclaims Brahms to be far from the ascetic classicist his critics style him. He is the great symphonist since Beethoven, and in his chamber music is second only to the Bonn master. His songs prove him to be a born romanticist and a poet of recondite moods. Raff, Rubinstein, Henselt, Heller, Bruch, Hiller, Rheinberger, Gade, Reinecke, Scharwenka, Moszkowski, Saint-Saëns, Grieg, Svendsen, Goldmark, Bruckner, Dvořák, César Franck, Bizet, D'Albert, Gounod, Chabrier, Humperdinck, Massenet, Godard, Bungert, Debussy, C. M. Loeffler, d'Indy, the Russians, Glinka, Dargomyzhky, Rubinstein, Borodin, Balakireff, Mussorgsky, Cui, Rimsky-Korsakoff, Glaziunoff, Rachmaninoff, Scriabine, Tschaikowsky; the memorable army of virtuosi and singers, Paganini, Bottesini, Wieniawski, Popper, Joachim, Davidoff, Wilhelmj, Kalkbrenner, Thalberg, Bülow, Clara Schumann, Karl Tausig, Joseffy, Rosenthal, Essipoff, Paderewski, Pachmann, Sophie Menter; the singers, Sontag, Malibran, Albani, Rubini, Lablache, Mario, Jenny Lind, Tamburini, the two Pattis, the De Reszkes, and others whose name is legion—all these are derivative composers or interpreters. Grieg and Dvořák deserve especial mention for their national characteristics—Norwegian and Bohemian. Grieg is a harmonist of rare skill, and Dvořák a master of orchestration. His sympathetic music displays influences of Schubert and Smetana (1824-84), the latter Bohemia's representative musician. Tschaikowsky (1840-93), Russia's one supreme composer, is treated at length elsewhere, as is Richard Strauss.

MUSIC IN THE UNITED STATES is largely the history of the past quarter of a century. Before that, Italian opera ruled the eastern shore of the land, and previous to the advent of Italian opera in 1825—a company that included Garcia and his daughter, Malibran—the psalmody was the sole musical pabulum of our nation. Struggling for independence, transfixed by many wants and dangers, it is not surprising that hymn-tunes of the most primitive order should prevail. Our ancestors were too busy fighting, or toiling for daily food, to find solace in the arts. And the Puritan draped the country in the deepest morality, so that music with difficulty conquered a place. Thomas Hastings, Lowell Mason, and Dudley Buck have done much to elevate church music, though our real musical culture began not with the numerous visits of Italian opera, but with the formation of local orchestras; the Philharmonic Society of New York, the Boston Symphony Orchestra, the Chicago Symphony Orchestra, the Pittsburg and Philadelphia orchestras, and also the many choral societies throughout the country. Theodore Thomas was our pioneer in matters symphonic, and, both with the Philharmonic and Chicago Symphony Orchestra, his work will never be forgotten. Carl Zerrahn, Carl Bergmann, Henschel, Louis Maas, Leopold Damrosch, Asger Hamerik, Anton Seidl—who first taught us the beauties of the Wagner music-drama—Frank Van der Stucken, Arthur Nikisch, Wilhelm Gericke, and Emil Paur have all contributed their quota to the general fund of culture. Resident conductors are George Chadwick, Victor Herbert, the Damrosch brothers, Walter and Frank, Fritz Scheel, Arthur Mees, F. X. Arens, B. J. Lang, E. Heimendahl, Jules Jordan, and many others, while in the domain of popular music the names of Gilmore and Sousa have become classic. The so-called vein of negro music, so dear to folk-lorists, was mostly written by white men. John Howard Payne wrote "Home, Sweet Home," to which Stephen C. Foster's "Old Folks" is a close second in popularity. But the present generation of composers contains men in its ranks of real worth, though their culture has been attained under European masters: John K. Paine, William Mason, Pratt, Gleason, George W. Chadwick, W. W. Gilchrist, Arthur Foote, Converse, Edward A. MacDowell, Horatio W. Parker, Frank Van der Stucken, Henry Holden Huss, Harry Rowe Shelley, Edgar Stillman Kelley, Walter Damrosch, Arthur Whiting, Reginald de Koven, Rubin Goldmark, and last but not least that most brilliant pianist and composer of Creole music, Louis Moreau Gottschalk (1829-69), who was long considered a representative American by Europeans. Music is now a necessity in America, and the culture of choral singing makes several of the larger universities like Harvard, Yale, Columbia, Pennsylvania, Ann Arbor, and Oberlin, have chairs of music. Foreign artists find in the United States a veritable gold mine, for singers draw higher salaries here than in any other part of the globe. So we have enjoyed the great music-makers of the world, from Malibran to Ternina. Many of the famous virtuosi, Thalberg, Von Bülow, Essipoff, Rubinstein, Joseffy, Rosenthal, Paderewski, de Pachmann, d'Albert, Fannie Bloomfield Zeisler among pianists; and Vieuxtemps, Sivori, Ole Bull, Camilla Urso, Wieniawski, Sarasate, Wilhelmj, Reményi, César Thomson, and Ysaye, violinists, are a few of the prominent artists who have earned applause and money on these shores. Dr. Antonin Dvořák made New York his home for three years as the director of the National Conservatory, and composed here his *New World Symphony.* American singers, especially women, are better known abroad than our native composers; Albani, Clara Louise Kellogg, Annie Louise Cary, Minnie Hauk, Emma Thursby, Antoinette Sterling, Lillian Nordica, Emma Nevada, Emma Eames, Sibyl Sanderson, Lilian Blauvelt, Zélie de Lussan, and others have honored their country with artistic triumphs. Adelina Patti spent the early years of her life in New York, and, as well as Christine Nilsson, Parepa, Gerster, Melba, Sembrich, and Lilli Lehmann, has been adored by enthusiastic operagoers. Thus far America has not produced a genuinely representative composer.

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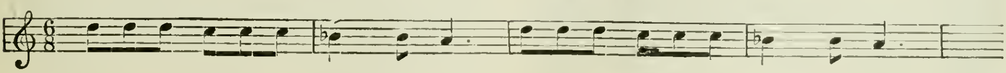
MUSIC, PSYCHOLOGY OF. The psychology of music deals with the mental processes which furnish both the motives for its production and the ground of its appreciation. It has an individual and a social aspect; for music as an art involves not only the individual consciousness, as such, but also, since it is a means of expression and communication, the modification of one mind by another.

The mental elements primarily involved in music are sensations of tone. Of the 10,000 or 11,000 tones which may be distinguished in consciousness, music uses a comparatively small number. Our own elaborate musical system includes only 85 or 90, ranging from about 40 to 4000 vibrations per second; something less than seven octaves. The simple tonal sensation is produced by an uncompounded pendular vibration of the air. The note or simple clang is composed of a number of simple sensations, called partials or partial tones, one of which (the lowest) is the fundamental; the others are called overtones. The character ('timbre,' 'clang-tint,' 'quality') of the note is determined by the number and intensity of the various partials. (See CLANG-TINT.) Every simple tone has three aspects or attributes (see SENSATION): quality, intensity, and duration (qq.v.). Quality is pitch (high or low); intensity is degree (a tone is 'loud' or 'soft,' strong or weak); duration is temporal length (long or short). To these some psychologists add a fourth attribute, extension or voluminousness; a tone is said to be 'big' or 'thin,' 'broad' or 'pointed.' It is a question whether the spatial attribute is not reducible to simple qualitative differences plus associations from vision and pressure. By the combination and variation of the first three attributes, all classes and forms of music are produced. There is, first of all, the combination of qualities and intensities in the note, which is the practical basis of music. Above this stand the alternations of intensities which produce rhythm, the successive rise and fall of pitch forming the essence of melody, and the synchronous combinations of pitches (see FUSION) known as harmony. Music began, doubtless, with the simplest of these combinations. We find in primitive music a small number of qualities used over and over, without the finer shadings of intensive differences, with little or no appreciation of harmony, but often with a strongly marked rhythm, accentuated by various bodily movements. (See ÆSTHETICS, PRIMITIVE.) But the growth of music has been marked not so much by complications in quality, intensity, and duration—great as these have been—as by another factor in development which has proceeded *pari passu* with the mental evolution of the race. This factor is the capacity to group and unify series of units, the capacity to form perceptions and associations between isolated tones. A perception (q.v.) is always something more than the summation of a series of sensational elements. It is the reading of meaning, of significance into the series taken as a group or whole. Musical perception has developed in precisely the same manner as have other forms of perception, by the widening and deepening of meaning. Compare, e.g. a savage's perception of a protruding stratum of rock with a geologist's. One is poor, simple, shallow—as bare as the rock itself; the other is rich, complex, deep—as complicated as the conditions under which the rock was formed: it contains group after group, and leads to complex trains of associations. The case is similar with music. Primitive man used a simple musical alphabet and spelled out simple, childish phrases. Take as an instance the following example which the aborigines of Australia were accustomed to reiterate over and over for hours:



Put this beside Wagner's "Ring of the Nibelungs." The two may be said to represent almost the extremes of musical culture, the capacity to combine tonal elements into significant unitary wholes. The monotonous chant of the Australian, no less than the creations of Wagner and Beethoven, contains a design, an organization, a putting into definite form of a number of detached elements. It is this which distinguishes music from a haphazard arrangement of tones or the isolated calls and cries of animals, however important these may have been in the genesis of music.

But if music implies form, it also implies content. It is a vehicle of expression no less than a way of arranging and organizing tones. When now we come to inquire into the processes which lie behind musical production, we find that they are various and highly complex. We shall, however, get an insight into their nature if we look upon music both as a means of conscious expression and as a medium of communication. Regarded in this light, music takes its place beside gesture speech and writing. It differs from speech, however, in that it gives voice to feelings and emotions instead of to ideas. Speech is primarily a medium for the communication of 'thought,' and when it attempts to express emotion and sentiment borrows straightway from music—either rhythm (in taking poetic form) or melody (in constructing recitative or song)—or it may go back to the common root of speech and music, and enrich itself from the language of gesture and mimetic movement. But while music's ultimate appeal is to the sensibilities, it cannot be said to exist apart from the intellect or the will. Such absolute disjunction could only rest on the fallacy that intellect, feeling, and volition are separable faculties of the mind. (See FACULTY.) Music arouses not only feeling, but also thought and action. The complex nature of the 'musical consciousness' is indicated by the fact that it is now called a feeling, now an emotion, now a perception, and now a sentiment. (See these words.) It is, indeed, all of these. The pleasurable feeling which music induces is undeniable: it arouses an emotion in the sense that it presents 'situations' which call forth organic sensations squarely faced by the attention; it includes the organization of auditory sensations into unitary perceptual wholes; and, finally, it involves sentiment by taking the form of the æsthetic judgment, e.g. 'these elements combined in this way are beautiful.' Nor does this exhaust the contents of musical expression. There may be, both in the motive of the artist and in the consciousness aroused in the hearer, imaginations, retrospections, moods, desires, associations, resolves, and volitions. Thus far does the 'musical consciousness' range. The key to its complexity is furnished by a review of the large number of modes through which music appeals to consciousness. In the first place, simple tones have an affective value, which is different at different parts of the scale. Secondly, the simple clang or note varies not only, as we have seen, in sensational elements, but also in pleasantness and unpleasantness, as its clang-tint changes. Thirdly, the same element of fusion which amalgamates the partials in the note is also present in the chord. Fourthly, the chord is also more or less pleasant, more or less consonant or dissonant. Other elementary factors are the indefinite number of possible accentuations, of pitch sequences, repetitions, and alternations, of similarities and contrasts. Add to these the possibilities of modulation from key to key, the host of figures in each of which there is the charm of the like and the diverse, of symmetry and of complexity, and of unity maintaining itself in variety; add the employment of various instruments, including the human voice, and centuries of experience lending their wealth of associations, and the intricacies of musical composition and appreciation receive at least a partial explanation. The explanation cannot be completed except by a comprehensive account of the genesis and development of music. (See ÆSTHETICS; MUSIC.) There are two or three stages in the evolution of music which deserve mention here on account of their psychological importance. The first is the production of the scale. It is very difficult for us to conceive what music would be without a definitely formulated scale. We have so constantly in mind the scale which has formed the basis of Western music for centuries that it is almost impossible to appreciate the mental processes of people who have had music without a definite scale, or even of those whose scheme of intervals differs from ours. And yet, it is certain that a formulated scale follows upon musical practice. The scale came from melodic utterances as rhythm came from the regular movements of the dance. We find in the music of savages informal and unsystematic vocal expressions of feeling which are sometimes no more than intoned wails or howls, sometimes haphazard collections of simple figures repeated with little order or unity. When these become definite enough to be remembered and to be repeated from time to time, material for the formation of scales begins to collect; but the scale as an abstract arrangement of musical intervals appears only at a comparatively late stage of intellectual progress. The nucleus of the scale was probably at first a single interval—an interval which was agreeable and expressive. A comparison of various scales, Eastern and Western, ancient and modern, points to the fifth and the fourth as the first intervals to be selected. Gradually other notes were added and two general types of scales were formed: the pentatonic (scales based on five notes), in use in China, Japan, Java, and the Pacific Islands, and the heptatonic (based on seven notes), the scales of India, Persia, Arabia, ancient Greece, and modern Europe. In all countries the octave seems to have been more or less explicitly recognized. The fact that most Caucasian races have produced seven-note systems, and the peoples of Eastern Asia five-note systems, indicates that the general structure of the scale depends ultimately upon artistic impulses which are common to a given type of mind. The attempt to derive the heptatonic scale from an earlier, more primitive pentatonic, seems to have failed. The two types appear to be equally primitive. Instruments giving a diatonic scale date as far back as the Stone Age. Doubtless, the choice of the interval of the semitone depends largely on the fact that the semitone is the smallest interval that the human voice can produce with ease and accuracy. Wallaschek, however, is of the opinion that the voice even with the aid of the ear would never have produced regular scales without help from musical instruments. Simplicity in construction and use of instruments determined, he believes, the formation of the two great types of scales. But there is no reason why vocal utterance itself should not have produced intervals of varying degrees of pleasantness and unpleasantness which would supply sufficient motive for the choice of a definite scale. The modes of Greek music furnish a good instance of scale construction upon a melodic basis; while our own major and minor scales illustrate the effect which harmony produces upon scale-making. The fact that the scale, as we have it now, was a thousand years in the making gives evidence at once of its evolutionary character and of its dependence upon antecedent and contemporary musical practice. From a melodic system was gradually developed the tonal sequence in which every note has its artistic functions in relation to every other note. This principle of tonality, relation of the various parts of the scale to the tonic, has had a gradual development no less than the selection of tones. Helmholtz remarks that primitive music, since it depends largely upon verbal expression to complete its meaning, has little need for tonality. This is true even in Greek and early Christian music. He argues that tonality is a purely æsthetic product, which has been increasing up to modern times. The latest modification of our scale has been the introduction of regular chromatic intervals (represented by the black keys upon the piano), for the purposes of modulation and the assimilation of keys. It would require, however, a great number of extra notes to produce the pure diatonic scale on each note taken successively as tonic. Various compromises have, therefore, been made by tempered intonation, in which the pure intervals are more or less modified. The present method of tuning in use among Western peoples is based upon the system of equal temperament, which divides the scale into twelve equal parts, or semitones. This system allows no perfectly pure interval except the octave, but is extremely simple and affords opportunity for varied musical expression.

From what has been said of the scale, it may easily be seen that its function is to furnish a stable basis for musical construction. It represents the results of æsthetic instincts and judgments which have been accumulating for centuries, and it is, at the same time, the embodiment of the principle consciously or unconsciously underlying every musical composition.

A second factor of psychological importance in the history of music is the growth of polyphony and harmony (qq.v.). It has often been said that the earliest form of musical expression was melodic. It is certainly true that there are great racial as well as temporal differences in the apprehension of harmonic relations. Hottentots, e.g. have shown a keen native appreciation for European harmonies which have failed to move the Chinese and other Orientals. But, at the same time, it may be laid down as probable that the same tonal peculiarities which had led to the development of melody have led also to the production of harmony, whether these peculiarities rest, ultimately, in the fusion of simple tones (Stumpf) or depend upon clang-relationship (Helmholtz). It must, however, be admitted that there are periods in which either melody or harmony seems to have an almost independent development. The history of European music furnishes a good illustration. Western music was essentially melodic in ancient Greece. The early Christians borrowed the melodic Greek modes in mutilated form. To these was added, very gradually, a new element. Ecclesiastical tunes were sung with the intervals of the fifth and the fourth, and attempts were made to sing different tunes together. Then came a long era of development of polyphonic music. Contrapuntal arrangement reached a high degree of perfection in the service of the Church. But the movement away from simple melody was destined to extend much further than the perfection of counterpoint. Choral singing had already laid the basis for the elaborate system of harmony which now began to be formulated. By the end of the sixteenth century the independent significance of chords and their artistic connection, apart from the progression of 'voices,' came to be recognized. This was the real opening of the modern era of harmonic music. There are two chief factors which contributed to its establishment: (1) the Church's demand for intelligible chorus and congregational singing, for which the complicated polyphonic forms were not suitable; and (2) the rise of the opera, which in its revival of ancient tragedy called for solo singing with harmonic accompaniment. The wealth of harmony has been greatly augmented by the development of instrumentation, which has reached its climax in the modern orchestra.

In making a survey of the achievements of Western music, it is important to keep in mind the fact that our system is largely a product of taste and by no means the only possible way of utilizing the tonal elements at man's disposal. Other races and other epochs have solved their musical problems in other ways. These, if not so agreeable to us as our own, have been satisfactory to their inventors. Neither can our canons of taste be regarded as more fixed than are others. They are, on the contrary, extremely variable. Even since mediæval times so radical a change has been effected in æsthetic preference as the substitution of first the fifth and the fourth, and later the major third, for the octave as the most agreeable interval. What further changes will take place it is unsafe to predict.

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MUSIC, ROYAL ACADEMY OF. See CONSERVATORY.

MUSIC, SCHOOLS OF COMPOSITION. In order to make possible a general view of the numerous composers that have contributed to the erection of the structure of music, musical historians have agreed to classify various composers into schools. The composers thus classed together under a certain school show common influences or tendencies, but dividing lines between the various schools are often imperfectly marked.

I. *The Old French School* (c.1100-1350).—The principal merits of this school are the invention of the *Fauxbourdon* (a progression of voices in sixths and thirds) and the *Discant* (contrary motion of voices). This contrary motion led to counterpoint, and this again to the establishment of a system of notation in which the different values of the notes in regard to time were definitely fixed. (See MENSURABLE MUSIC.) After a *discant* was once set in contrary motion to a *cantus firmus* composers soon conceived the idea of adding a third and even a fourth voice. But the masters of the Old French School did not stop here; they succeeded also in imparting complete independence to the individual voices. Three art-forms were developed: the *motet, rondellus* (rondeau), and *conductus* (conduit). In all these forms are found well-defined passages of writing which to-day we call 'canon' and 'imitation.' The prominent masters are: Leonin, Perotin, De Garlande, Franko of Paris, De Vitry, De Machault, De Muris.

II. *The Gallo-Belgic School* (c.1350-1500).—The masters of this school began to feel the emptiness of consecutive fourths and fifths, and so used sixths and thirds more freely. Greater attention was given to the leading of the voices, and technique made great strides. Occasionally the compositions rise above the level of mere technicality. The principal masters are: De Zeelandia, Faugues, Dufay, Binchois, Busnois, Regis.

III. *The School of the Netherlands* (c.1450-1600).—This school divides itself into four distinct periods: (A) Okeghem developed the art of canonic writing to such an extent that it became merely ingenious trickery. Instead of unified forms, the works of this school present a conglomeration of detached details. Okeghem's successors were: Hobrecht, Tinctor, Jannequin, Brumel, Compère. (B) The leader of the second period is Josquin Deprès, a pupil of Okeghem. He and his contemporaries strove to make their skill subservient to artistic purposes by emphasizing the symmetry of form and by paying attention to the development of their themes. The leading composers are, besides Deprès, Agricola and Mouton. (C) The extreme artificiality of the two preceding periods led to a reaction in favor of a more simple and natural style. The masters started from Josquin's principle of symmetry. They also developed the purity of harmonic writing, and insisted upon definite melodic phrases. Several of them carried this style to Italy, where they became the founders of new schools. These composers were: Gombert, Willaert, Goudimel. Arcadelt, Van Rore. (D) The fourth period shows the influences which the Italian schools had begun to exert over the mother school. Whereas the importance of the earlier schools rests entirely upon the vocal works, the fourth period marks the rise of instrumental music (organ) in the works of Sweelinck, who practically became the founder of the famous school of the North German organists. The whole school of the Netherlands reached its culmination in the works of Orlando di Lasso, a master scarcely inferior to the great Palestrina. The great musicians of this period are: Sweelinck, Lasso, Di Monte, Pevernage.

IV. *The Old English School* (c.1220-1600).—(A) England possesses the oldest known specimen of polyphonic writing, the famous canon "Sumer is icumen in." As long as the school of the Netherlands was regarded as the oldest, this manuscript puzzled musical historians. Coussemaker in 1865 proved the existence of the still older French School (I.), and so this canon is now assigned to the year 1226. During the fifteenth century a school showing the same general characteristics as the Old French School must have existed in England, if we may judge from a few preserved compositions by John of Dunstable. (B) The reign of Henry VIII. witnessed a considerable musical activity, but no new style was created. The representative composers, Redford, Johnson, Merbecke, and Tye, show the influence of the School of the Netherlands. (C) These men really prepared the way for the next generation, when the style of the School of Venice predominated. Of this period numerous large choral works and madrigals have been preserved. The chief composers are: Farrant, Tallis, Byrd, Gibbons.

V. *The School of Venice* (1527-1612).—Willaert brought the musical art of the Netherlands to Venice, where he settled in 1527. Under the influence of the more impressionable Italian musicians, he gradually acquired a new style. In the style of the Netherlands each voice was practically independent, and its relation to a definite chord was not strongly pronounced. The Venetian masters established the chord as their basis, and, instead of simultaneous progressions of voices, we find, rather, progressions of chords. The independence of the separate voices was restricted, but not abolished. The custom of writing for a double chorus was introduced, the madrigal was perfected, and for the first time vocal works with instrumental accompaniment appear. The great composers of this school are: Willaert, A. Gabrieli, Van Rore, Zarlino, Merulo, Donati, G. Gabrieli.

VI. *The School of Rome* (1535-1674).—The founder of this school was Goudimel, who settled in Rome about 1535. While the Venetian School regarded the chord as a basis, and gained their effects largely by means of modulation, the Roman masters restored greater freedom to the individual voices, and subordinated technique to art. The introduction of secular themes into sacred works had led to serious abuses, but the Roman masters, especially Palestrina, proved that the contrapuntal style is not antagonistic to the dignity proper to church music. To the Roman School also belongs the honor of having originated the oratorio (Carissimi) and a distinct instrumental style (Frescobaldi). Merulo in Venice had done much to develop the toccata, but not until Frescobaldi appeared did instrumental music become entirely free from the influence of vocal music. The greatest masters are: Goudimel, Festa, Animuccia, Palestrina, Nanini, Anerio, Allegri, Frescobaldi, Carissimi.

VII. *The Spanish School* (1540-1608).—Spain at no time succeeded in establishing an original school. During the sixteenth century several Spanish composers lived in Rome, and returning to their native land, carried with them the art of the Roman School, so that in reality the Spanish School forms only a part of the Roman School. The most prominent Spanish masters are Da Vittoria and Morales. The Portuguese composer à Goes shows the influence of Gombert, which can be accounted for by the fact that this Flemish musician spent some years in Spain.

VIII. *The German Polyphonic School* (1500-1625).—This school divides itself into two periods, the former showing Flemish, the latter Venetian, influences, but in the frequent and bold use of dissonances the German masters go beyond their predecessors. The chief composers showing Flemish influences are: Isaak, H. Finck, Senffl, Hermann Finck. Those showing Italian influences (almost all pupils of G. Gabrieli) are: Gallus, Gumpeltzhaimer, Hasler, Aichinger, Prätorius.

IX. *The School of Protestant Church Music* (1540-1672).—(A) In Germany, the Reformation popularized church music by the introduction of congregational singing. For untrained voices simple music was needed, and this need gave rise to the *chorale,* which originated in the singing of sacred words to popular folk-songs. The musicians whose importance rests chiefly upon their chorales are: Luther, Walther, Eccard, Calvisius, Franck, Schein. (B) From the earliest times it had been customary in the Catholic Church to recite during Holy Week the Passion of Our Lord according to the Gospels. Luther desired to preserve this custom for the Reformed Church. He translated the text and had various composers furnish the music. Thus arose the "Passion," to the cultivation of which many German masters devoted their best energies. Along this line vocal polyphonic music steadily developed until, in the works of Schütz, German music reached an originality that places it on a level with the famous Italian schools. The German School combines the beauty of the Roman School with the massiveness of the Venetian. In addition, there is a tenderness and a subjective, passionate element quite distinct from the colorless solemnity of the early Italian music. The important masters are: Schütz, J. C. Bach, J. M. Bach.

X. *The School of German Organists* (1620-1722).—(A) While vocal music was steadily advancing, instrumental music, although of later date, was not neglected. Sweelinck had founded a great school in the Netherlands, which trained many Germans, who carried the art into their native land. There the cities of Hamburg and Lübeck became the centres of a new instrumental school whose basis was the chorale. The principal forms cultivated were the *toccata*, *ciaconna*, *fugue*, and, toward the end of the period, the *sonata*. The great North German masters were: Scheidt, Scheidemann, Reinken, Buxtehude, Kuhnan. (B) While the North German masters developed the style of Sweelinck, a group of composers in the middle and south of Germany worked along similar lines, but under the influences of Frescobaldi and the Roman School. The authority of the Italian sonata writers had by this time extended to Germany, and the forms of the *sonata da chiesa* and the *sonata da camera* were cultivated. Nor was the *fugue* neglected. All the great composers used the Italian forms, but infused their own individuality into them, and thus prepared the way for J. S. Bach, who wrested the leadership in musical affairs from Italy and transferred it to Germany. The German masters who aided in this great work are: Kerl, Froberger, Pachelbel, Muffat, Biber.

XI. *The School of Florence* (1594-1676).—While the earlier Italian composers cultivated almost exclusively the polyphonic style of vocal music, a school with widely different tendencies sprang up in Florence. The revival of the learning of Greece led to an attempt to reconstruct the ancient drama. Thus arose the monodic style, in which one voice sings while instruments furnish the accompaniment. In 1594 Peri set an entire drama, *Dafne*, to music in this manner. Crude as the attempt was, it found favor, and in less than half a century the new style had conquered all Europe. Its development was not confined to Florence; in fact, its greatest exponent, Monteverde, was a native of Cremona, although he lived chiefly in Mantua and Venice. But as the style originated in Florence, it seems advisable to classify all composers identified with its development under the Florentine School. This school first dispensed with the preparation of dissonances, and greatly developed the orchestra, establishing the strings as its foundation. The works of this school were first designated by the title *Dramma per musica.* About 1650 we find *Opera per musica,* which soon afterwards became simply *Opera.* The principal names of this division are: Peri, Caccini, Monteverde, Cavalli. See OPERA.

XII. *The School of Naples* (1675-1757).—As early as 1475 a Flemish master, Tinctor, settled in Naples, but not until two hundred years later did a distinct school arise. From Rome and Venice the Neapolitans adopted the polyphonic church style, from Rome the oratorio, and from Florence the musical drama. The new school paid more attention to the melodic outline of the highest voice, perfected the form of the *aria* (q.v.), and introduced it into their dramatic works. Whereas the Florentine musical drama consisted of continuous recitative by a single voice, the Neapolitans introduced not only the aria, but also choruses, duets, trios, etc. The Florentines had emphasized the *dramatic*, the Neapolitans emphasized the *musical* element. They also cultivated the form of the concert overture. (See OVERTURE.) Transferring the form of the *sonata da chiesa* to compositions for the clavichord, and introducing a secondary against a principal subject, they prepared the way for the modern sonata. The principal masters are: Stradella, A. Scarlatti, Durante, Logroscino, Leo, D. Scarlatti.

XIII. *The Early School of French Opera* (1645-1764).—After the Old French School had been supplanted by that of the Netherlands, we have no more records of music in France until 1645, when a work of the Florentine monodic style was produced in Paris. The rise of the French drama through the works of Corneille, Racine, and Molière turned the general attention to the stage. Lully became the founder of a distinct school of French opera. The characteristics of this school are better dramatic characterization and the raising of the chorus to an active participation in the dramatic development. The orchestra also is increased by the addition of kettledrums and trumpets, and the character of the wood-wind is recognized. The important names are: Cambert, Lully, Marais, Rameau.

XIV. *The Later School of Venice* (1650-1739).—The German Protestant masters had introduced a subjective and emotional element into their church music. This became the keynote of the later Venetian masters. A distinctive feature is the development of some particular theme which begins in a lower register and gradually rises higher and higher, leading to an effective climax. The growth of the orchestra also gave the composers an opportunity to heighten the effect of their vocal polyphonic works. The chief masters of this school are: Legrenzi. Lotti. Caldara, Marcello.

XV. *The English School of the Restoration* (1660-94).—After the death of Gibbons in 1625 music declined rapidly in England. This decline is due to the unsettled state of affairs during the reign of Charles I. and the fanaticism of the Puritans, who objected to the cultivation of music, and destroyed many valuable manuscripts. When, at his accession in 1660. Charles II. attempted a restoration of music, practically a new start had to be made. In spite of many drawbacks, however, music soon attained its former importance. Purcell, the greatest musical genius England has ever produced, now appeared, and under his inspiration English music rose to such a height that for a short time England boasted a national school of opera. The principal composers of the Restoration are: Humfrey. Wise, Blow, Purcell.

XVI. *The School of Italian Sonatists* (1620-1800).—Up to the seventeenth century the organ was the great means of developing instrumental music (toccata, ricercare, fugue). By the beginning of that century the violin had been considerably perfected and attracted a number of musicians in Northern Italy. These composers prepared the way for our highest musical art-form, the sonata. About 1650 a distinction began to be made between *sonata da chiesa* and *sonata da camera;* the former consisted of several movements of contrapuntal writing, the latter employed various dance-forms. Great attention was paid to thematic development. The instrumental concerto was introduced and the *concerto grosso* (q.v.) was cultivated. The principle of musical dualism, first announced by Scarlatti, was strongly emphasized. While in the eighteenth century all the art-forms in Italy declined, this school of sonata writers was the only one that made progress in the art. The principal masters are: Legrenzi, Bassani, Torelli, Veracini, Corelli, Tartini. Boccherini.

XVII. *The School of the German Singspiel* (c.1630-1800).—(A) In the beginning of the seventeenth century there arose in Germany the so-called 'school comedy'—dramatic representations by students. Each act was preceded by a short musical dialogue introducing mythological personages. This custom led to the establishment of the German singspiel (q.v.), in which the acting personages were shepherds, shepherdesses, nymphs, etc. These *singspiele* finally gave rise to a national German opera in Hamburg. but not until Hiller in Leipzig established the *singspiel* upon the basis of the folk-song did this form rise to an artistic level. The composers of this school are: Strungk, Kusser, Keiser, Mattheson, Handel. Telemann. Hiller, Dittersdorf, Schenck, Weigl, Winter. (B) While the *singspiel* was popular with the masses, the German princes, decrying everything that was German, favored the Italian opera. Especially Vienna and Dresden became strongholds of the foreign style. Many German composers began to write Italian operas, and thus aided the rapid decline of dramatic composition. Among these composers we find: Hasse, Graun, Doles, Naumann. See OPERA.

XVIII. *The Italian School of Decadence* (c.1750-1810).—With the aria the Neapolitan School had given to music that form which was soon to bring about a general decline of dramatic music. Dramatic truth counted for nothing; sensuous charm of melody and display of vocal art were paramount. Composers became the slaves of singers. The ballet became an important factor in the opera. Naturally composers did not waste time in studying counterpoint and polyphonic writing when success was so easily won by writing pretty melodies over the plainest harmonic accompaniment. The principal names of this school are: Porpora, Pergolese, Jomelli, Piccinni, Sacchini, Paisiello, Salieri, Cimarosa, Zingarelli, Righini, Paër. See OPERA.

XIX. *The Classic Masters* (c.1700-1827).—As the contributions to music by our great classic masters are fully treated under the separate titles, mention is made of them here merely for the sake of completeness. BACH marks the culmination of the polyphonic period of music (see POLYPHONY), as well as the beginning of the new homophonic-harmonic period. (See HOMOPHONY.) In him the *passion* (q.v.) and the *instrumental fugue* reach their highest development. He brings equal temperament (q.v.) into universal use. HANDEL brings the *oratorio* (q.v.) and the *vocal fugue* to perfection. Taking up English music where the premature death of Purcell had left it, he becomes the founder of a new English school. GLUCK reforms the opera by emphasizing the dramatic in opposition to the purely musical element, without, however, disturbing the forms of the aria, chorus, duet, ensemble. etc. He greatly advances the art of orchestration. HAYDN perfects the *sonata* (q.v.) and establishes the modern form of the symphony and string quartet (q.v.), as well as the symphony orchestra, by individualizing the separate instruments. He is the 'father of modern instrumental music.' MOZART invents no new forms, but fills those existing with the contents of his wonderful genius. He is a universalist, equally great in all the forms he handles. In the works of BEETHOVEN absolute music reaches a point which would indicate the highest possible development, beyond which no progress can be imagined. He greatly enlarges the forms of Haydn and Mozart, and replaces the *minuet* (q.v.) of the symphony by the *scherzo* (q.v.). He strikes passionate accents never heard before in music, and discloses marvelous depths of emotion. SCHUBERT creates the art-song (kunstlied). (See LIED.) In the field of instrumental music he follows the path opened by Beethoven, but preserves his own strong individuality.

XX. *The English School Since Handel* (1750-1829).—When Handel settled in England in 1718 the national opera of Purcell had been entirely superseded by the Italian. Handel's own Italian operas exerted no uplifting influence, and have shared the fate of the works by his contemporaries. But when Handel began to cultivate the oratorio he laid the foundation of his fame as well as that of the English School. Unfortunately, he remained the only master. His contemporaries and immediate successors were unable to carry on his work, although they made earnest efforts. They, therefore, turned their attention to the opera—not the foreign Italian product, but the national English opera. They even succeeded in establishing a style of their own different from the German *singspiel* or the French *opéra comique.* The spoken dialogue occupied altogether too much space, and although the musical numbers were not lacking in a certain freshness and melodious charm, they were utterly devoid of all dramatic expression. Hence this national opera died with its authors. The most prominent composers are: Arne, Arnold, Dibdin, Storace, Hook, Shield.

XXI. *The French Grand Opéra* (1774-1864).—A peculiarity of the French opera is the fact that several of the masters who have contributed most materially to its advancement were foreign born. After the death of Rameau, French national opera was at a standstill, during which time the Italian opera gained ground. Then a German, Gluck, appeared with his reforms. The success of his *Iphigénie en Aulide* in 1774 marks the beginning of a new era of French opera. The new style was taken up by two Italians, Cherubini and Spontini, who finally established the *grand opéra.* Then native French composers began to take part. The characteristics of this school are: the prevalence of tragic subjects; the absence of spoken dialogue; the great attention paid to declamation, which very often degenerates into empty rhetoric and hollow bathos; a heavy orchestration, whose aim is for striking effects; and elaborate ensembles and finales. The introduction of a ballet after the second act is indispensable. In the choice of subjects those taken from history are specially favored. This school may be divided into two periods, roughly separated by the year 1830. The characteristics just mentioned apply more strictly to the second period (Meyerbeer); while the works of the first period, as a rule, are marked by a greater earnestness of purpose as far as the purely musical setting is concerned. The principal composers are: Gluck, Berton, Gossec, Cherubini, Lesueur, Spontini, Auber, Rossini (*Tell*), Meyerbeer, Halévy. See OPERA.

XXII. *The French Opéra Comique* (c.1760-1870).—This school presents three sharply marked periods. The productions of the first period somewhat resemble the German *singspiel.* The subjects are taken from everyday life or fairy tales. The secco-recitative of the Italian *opera buffa* (see OPERA) gives place to the spoken dialogue; for the aria is substituted the French *chanson.* The works of the second period (c.1800-30) show the influence of German romanticism. The purely comic subjects are replaced by a mixture of comedy and romanticism. The music assumes a more serious character and better musical characterization is attained; the orchestra becomes an important factor, and the ensemble is strongly influenced by that of the *grand opéra.* In fact, some of the masters of the *grand opéra* belong equally to the *opéra comique* (Cherubini, Auber, Halévy). In the works of the third period we find very often that the only comical thing about them is their designation as *opéra comique.* Composers do not hesitate to choose tragic subjects. And yet such works are called *opéra comique,* because they differ from *grand opéra* by the fact that there is spoken dialogue. Nothing can very well be more tragic than Bizet's *Carmen.* But it contains spoken dialogue; hence it is *opéra comique.* In *opéra comique* there is generally a healthier musical atmosphere, less striving for mere effect, more truthful dramatic expression, less artificiality. The great masters of this school are: Philidor, Monsigny, Grétry, Cherubini, Méhul, Isouard, Auber, Boïeldieu, Hérold, Halévy, A. Thomas, Bizet, Delibes. See OPERA.

XXIII. *The School of Bel Canto* (1813-68).—We have seen that the opera in Italy declined rapidly after the middle of the eighteenth century. With the appearance of Rossini a new school may be said to begin. Even before him singing was the chief attraction; but his predecessors relied upon the technical skill of the singers to please the audience. Rossini surpassed all Italian operatic composers before him in the power of melodic invention. It is this sensuous charm of melody that distinguishes the school of the *Bel Canto* from the school of Decadence. Besides Rossini, the principal exponents of this style are Donizetti and Bellini. Of only secondary importance are Generali, Mercadante, and Pacini. See OPERA.

XXIV. *The German Romantic School* (1818-80).—The German romantic opera was developed from the *singspiel.* About the middle of the eighteenth century witches, gnomes, ghosts, and all kinds of spirits were introduced into the *singspiel,* which thus gradually gave rise to a new kind, the *Zauberoper* (magic opera). Although the texts of these productions were silly, and the attention was distracted from the purely musical element to the scenic decorations, yet this *Zauberoper* led opera into the realm of the mysterious, phantastic, and wonderful, where it has scored its greatest triumphs. The real beginning of the Romantic School is marked by the appearance of Weber's *Freischütz* (1818). With the appearance of romanticism music becomes more and more the individual, subjective expression of each composer, so that it is exceedingly difficult to arrange composers into schools. One characteristic of the Romantic School in general is the great advance in orchestral tone-coloring over the classic masters, and a decided preference for dissonances. Not only the different instruments become so many separate voices, but a distinction is made even between the various registers of the same instrument. Harmony becomes greatly enriched and is the principal means of emotional expression, while rhythm assumes greater diversity and complexity. Music in general becomes more intense and passionate. The instrumental composers at first fill the classical forms with romantic contents, and then originate new forms. In the field of dramatic music the principal composers are: Weber, Spohr, Marschner, Lortzing, Holstein, Kretschmer, Goldmark, Götz, Nessler, Brüll. Those who devoted their energies to instrumental and choral works are: Spohr, Schumann, Mendelssohn. The latter master has much in common with the classicists, and became the head of a school whose principal representatives are: Hiller, Reinecke, Jadassohn. The influence of Schumann is perceptible in another group of masters, of whom the most prominent are: Franz, Volkmann, Jensen, Huber. Midway between these two schools, and preserving characteristics of their own, are Raff and Rheinberger.

XXV. *Wagner — Liszt — Brahms* (1843-97).—Among the great German masters of the nineteenth century three stand forth so prominently that it is impossible to classify them. Wagner and Liszt became founders of two distinct schools, whereas Brahms stands alone, without followers. Wagner began as the successor of the romantic opera of Weber. His reformatory work is concerned not with the opera in particular, but with dramatic composition in general. He emphasizes the drama and asserts that music must only follow and intensify the text. He practically banishes the chorus, ensembles, etc., and substitutes the monologue. The voices declaim in a highly dramatic kind of recitative, while the development of the musical ideas is assigned to the orchestra. The unifying principle of his works is the leitmotiv (q.v.), which constitutes the basis of the *music-drama* (q.v.). The music-drama is a combination of the dramatic, musical, and plastic arts into one new art-form. Wagner demands first of all a *drama*, not a text or libretto (q.v.); all the resources of music are to be employed toward a true interpretation of this drama; and the plastic arts are to combine with music. The orchestra is enormously enriched by new tone-colors and means of expression. (See Melos; Opera; Wagner.) Liszt applied Wagner's principle of descriptive music to purely instrumental music, and became an exponent of 'programme music' (q.v.). Unable to make the classic form of the symphony serve his purpose, he invented the *symphony poem*. In the field of piano-music he becomes the originator, with Schumann and Chopin, of modern pianoforte technique. Together with Wagner and Berlioz he also laid the foundations of a new school of conducting (the interpretative conductor). (See Conductor; Liszt.) Brahms, in an age of musical excitement and innovations, stands forth as the keeper of classical forms. He successfully carries on the style of Beethoven's third period, faithfully preserving the form, but showing the possibility of filling it with new and original contents. Thus he proves that absolute music is unlimited in its scope and power of expression; that its capabilities were not exhausted even by the titanic Beethoven; that any original genius can employ those forms for conveying his ideas; that the polyphonic art of Bach can successfully be combined with the homophonic-harmonic art of Beethoven and with Romanticism. See Brahms.

XXVI. *The Berlin Academicians* (1830-1900). —While Brahms was not hostile to the development of music, a number of composers refused to recognize that Romanticism was an advance in the art of music. They closed themselves to the new influences and sought their ideals in the past. The strongholds of this school were several Berlin institutions, notably the *Singakademie*. (See Choral Societies.) The energies of these masters were directed to the cultivation of the polyphonic style of the older Italian schools and Bach. But some of the later masters finally adopted the principles of Romanticism. The important names are: Dehn, Grell, Kiel, Bargiel, Blumner, Becker, Bruch, Hofmann, Herzogenberg, Gernsheim.

XXVII. *The Neo-German School* (1847—). —The beginning of Liszt's activity in Weimar in 1847 may be regarded as the commencement of this school. Liszt attracted a great number of young musicians who enthusiastically devoted themselves to the cultivation of programme music, carrying out Liszt's ideas. But the Neo-German masters did not devote their energies entirely to the field of instrumental music. Wagner's works attracted more and more admirers, and composers began to imitate him. Up to the present day a great many dramatic works constructed upon Wagner's principles have been written. The failure of all would seem to indicate that one might almost be justified in stating that Wagner's art-form is one suited to his own gigantic genius, but hopeless for lesser masters. This would seem to be confirmed by the fact that the new dramatic works that have achieved success are all by non-German composers who adopted many of Wagner's ideas, but not his form *in toto*. The Neo-German School has been marked by earnest effort, but its composers have made no lasting impression. The only one whose work seems destined to outlive contemporary criticism is Richard Strauss, a man of pronounced originality and as a master of orchestration equal to Wagner himself. The dramatic composers of this school are: Cornelius, Ritter, Bungert, Kistler, Humperdinck, Kienzl, D'Albert, Weingärtner, Schillings, S. Wagner. The instrumental composers are represented by: Krug, Nicodé, Mahler, Hausegger.

XXVIII. *The Modern Italian School* (1851—). —Beginning about 1750, the history of Italian music is practically the history of the decline of the opera. When Verdi scored his first success in 1839 no one dreamt that this man, beginning in the degenerate style, would raise the Italian opera to a high level. In *Rigoletto* (1851) there is a very perceptible effort for dramatic truth and characterization, which the school of Bel Canto entirely ignored. The successive works advance along this line until in *Aïda* (1872) we have a rare combination of exquisite melody, dramatic characterization, and truth of expression. *Otello* (1887) and *Falstaff* (1893) mark the culmination of Italian opera. Wagner's principle of dramatic truth is strictly observed. Nevertheless these works are not imitations of Wagner. Verdi has retained all the forms of the opera, but has knit them together into an artistic whole. The principle of the leitmotiv is not used. The orchestration shows a mastery never exhibited by any previous Italian composer. The influence of Verdi is noticeable in a number of composers known as the *Veriotic* School (Mascagni, Leoncavallo), who for some years attracted much attention. Among the many operatic composers, none of whom can approach Verdi, the following deserve mention: Boito, Ponchielli, Marchetti, Faccio, Coronaro, Puccini, Smareglia. The elevating influence Verdi exerted upon dramatic music turned some serious composers to the field of instrumental and choral music, which had been sadly neglected in Italy. The principal instrumental and choral composers are: Pinelli, Sgambati, Cesi, Grazzini, Mancinelli, Martucci, Franchetti, Perosi.

XXIX. *The Modern French School* (1830—). —So far we have spoken of musical development in France only in connection with the theatre. Instrumental music had not been cultivated to a very great extent. But we cannot disregard the name of the family of Couperin during the seventeenth and eighteenth centuries. Several members have become famous through their contribution to the perfection of the suite-form (q.v.). Under article XXII. the history of dramatic music up to the death of Meyerbeer has been given. Berlioz first awakened a deeper interest in instrumental music. This master was led to instrumental composition through the influence of Beethoven, but, uninspired by the classic forms, he became the originator of programme music (q.v.). His works, all conceived in large forms, lack symmetry of construction and have not yet found universal recognition. But Berlioz first aroused general interest in France for instrumental music and, independently of Wagner, did much for the art of orchestration. Soon other composers began to cultivate instrumental music; and these used the classical forms. After Berlioz's ideas of programme music had been adopted by Liszt, who established the symphonic poem as a recognized art-form, French composers accepted the idea. All through the past century German classical and romantic influences have been at work in France. The mingling of these influences with the individuality of the French masters has been productive of excellent results, and to-day France can boast an influential instrumental school. The principal masters are: David, Franck, Lalo, Saint-Saëns, Bizet, Delibes, Godard, d'Indy, Chausson, Chaminade, Halm. But dramatic music did not remain at a standstill; the German romantic opera and lyric drama influenced French dramatic composers. Although the grand opera (the historic and heroic opera of Meyerbeer) was in danger of losing sight of dramatic truth in its striving after mere effect, the *opéra comique* and the later lyrical French drama are distinguished for truth of expression and successful musical characterization. Wagner's works have exerted only a wholesome influence, for French composers wisely did not imitate his form, but only followed the German master in the art of orchestration, as well as in a few other principles which can be safely adopted without danger of losing individuality. The most prominent dramatic composers are: Gounod, Saint-Saëns, Bizet, Massenet, Chabrier, Guiraud, Reyer, Massé, Bruneau.

XXX. *The Polish School* (1830—).—The Slavic and Scandinavian nations took no important part in the development of music until the last century. (For a complete account the reader is referred to the articles on SCANDINAVIAN MUSIC and SLAVIC MUSIC.) Polish music is chiefly represented by the works of Chopin, who is one of the founders of a new school of piano-playing. His original harmonic combinations have become a great means in modern emotional expression. He also showed how embellishments can be made an important factor of expression. The other Polish masters show less national characteristics, and those living at present in Germany are more German than Polish. The principal Polish masters are: Moniuszko, Kurpinski, Dobrzynski, X. and Ph. Scharwenka, and Moszkowski.

XXXI. *The Russian School* (1836—).—The beginning of a distinct school may be dated from the first performance of Glinka's *Life for the Czar*. At first the national school cultivated chiefly dramatic composition, but soon composers turned also to instrumental music, in which line several have achieved marked success. The characteristics of Russian music are strength and great variety of rhythm, amounting almost to irregularity. The prominent masters are: Bortnianski, Verstowski, Glinka, Dargomyszki, Seroff, Borodin, Cui, Balakireff, Mussorgski, Tschaikowsky, Rimski-Korsakoff, Arenski, Glasunoff, Rubinstein.

XXXII. *The Scandinavian School* (1840—).—Like the Russians, the Scandinavians established a distinct school by emphasizing the national element in music as it was presented in their folk-music. Denmark made the beginning, but Norway soon took the lead. The characteristics of the school are an artistic use of dissonances and an emphasis of rhythm, rather than of melody. The principal masters are: (Denmark) Berggreen, Hartmann, Gade, Enna; (Sweden) Hallstroem, Södermann, Hallén, Sjögren; (Norway) Kjerulf, Svendsen, Nordraak, Grieg, Sinding. See SCANDINAVIAN MUSIC.

XXXIII. *The Bohemian School* (1866—).—The attempts of Russian composers to establish a national opera led Bohemian musicians to make the same experiment in their own country. A distinct Bohemian school may be said to begin with Smetana's *The Bartered Bride* (1866). Smetana also was the first notable instrumental master. He, and still more Dvořák, have made the Bohemian school famous, but the merit of the instrumental works overbalances that of the dramatic compositions. The forms cultivated are those of the German classic and romantic masters. The principal composers are: Schraup, Skuhersky, Schebor, Rozkosny, Smetana, Dvořák, Fibich. See SLAVIC MUSIC.

XXXIV. *The Modern School of the Netherlands* (c.1800—).—Although after the time of the great contrapuntal schools of the fifteenth and sixteenth centuries we meet no distinct school in the Netherlands, music was not neglected in those countries. But the influences of the neighboring countries, France, and especially Germany, always predominated, thus preventing the rise of a national school. Both Belgium and Holland have produced a number of excellent composers. But the importance of the Netherlands during the nineteenth century rests more upon the contributions to musical history. In this line Belgian writers are second to none in the world. Without the labors of Fétis, Coussemaker, and Gevaert our knowledge of the musical past would be very incomplete. Besides, Belgium has produced some of the greatest instrumental performers (De Bériot, Vieuxtemps, Léonard, Servais). The more prominent of the composers are: (Belgium) Janssens, Benoit, Mertens, Wouters, van den Eeden, Tinel, Mathieu, Gilson; (Holland) Verhulst, Koning, Coenen, Silas, Hol, Thooft, de Hartog.

XXXV. *The Modern English School* (1830—).—The predominance of spoken dialogue had caused the downfall of the English opera. About 1830 some English composers attempted to write national operas with a moderate amount of dialogue. The works of Weber assisted them in their efforts, but as these earlier works were of a lighter character English opera soon assumed the character of operetta. The appearance of Sullivan established this form upon a firm basis. In the field of grand opera England has as yet produced no successful work. The cultivation of instrumental music, through the influence of Beethoven, has yielded more satisfactory results, but the best work has been accomplished in the field of choral music. The modern English composers have not succeeded in developing a characteristic style, but their works show solid workmanship and mastery of form. The weak point is thematic invention; the themes lack spontaneity. The list of English composers is a very long one. The following deserve special mention: (Dramatic music) Bishop, Balfe, Barnett, Macfarren, Wallace, Benedict, Sullivan, Stanford; (Instrumental and choral music) Costa, Bennett, Barnby, Stainer, Parry, Cowen, Mackenzie, Coleridge-Taylor.

XXXVI. *The American School* (1880—).—We have seen that the English school of the Restoration (XV.) was obliged to rebuild what the Puritans had destroyed. Music beginning in America with the Puritan psalm-tunes and under Puritan influence naturally could not develop. Its growth came only with foreign influences; and even then considerable time had to elapse before any works by American composers appeared. Even at this present day there is no American school showing distinctive traits; the best works show German influences. The use of American themes (negro or Indian melodies) adds perhaps local color, but is not sufficient to create a school. It is a significant fact that the best works in which national themes are employed were written by a Bohemian, Dvořák. Among the composers who have produced works of sterling merit are: Gilchrist, Foote, Chadwick, Bird, Horatio Parker, van der Stucken, Klein, MacDowell.

For further information the reader is referred to the separate articles on FOLK-MUSIC; MUSIC; OPERA; ORATORIO, and on the various important composers, forms of music, and musical instruments. Consult also: J. Hawkins, *A General History of Music* (London, 1875); *Oxford History of Music* (Oxford, 1901 et seq.); W. S. Rockstro, *General History of Music* (London, n. d.); A. W. Ambros, *Geschichte der Musik* (Leipzig, 1887-91); W. Langhans, *Geschichte der Musik im 17., 18., 19. Jahrhundert* (Leipzig, 1884-87); A. Svoboda, *Illustrierte Musikgeschichte* (Stuttgart, 1892); E. Naumann, *Musikgeschichte* (Berlin, 1885), translated also into English by F. Praeger (London, n. d.); A. Soubies, *Histoire de la musique* (Paris, 1900).

MUSICAL ART SOCIETY. See CHORAL SOCIETIES.

MUSICAL DICTATION. A branch of musical training of very recent date. The instructor sings or plays short musical selections or phrases which the pupil is required to fix in musical notation on paper. The object of musical dictation is not only to train the ear, but chiefly to develop the power of quickly grasping and fixing musical ideas. The beginning is made of course with simple melodies progressing in simple intervals. Gradually melodies with more difficult intervals are introduced. The next step is to melodies with a simple harmonic basis. A class for musical dictation was established at the Conservatory in Paris in 1871. Some of the German conservatories soon followed (Hamburg, Dresden, Karlsruhe, etc.). An elaborate treatise on the subject was published by A. Lavignac, *Cours complet de dictée musicale* (Paris, 1882). Smaller works are: Götze, *Musikalische Schreibübungen* (Breslau, 1882); and *Musical Dictation* (London, 1886) by Dr. Ritter (in Novellos series of Music Primers).

MUSICAL DRAMA, or MUSIKDRAMA. A term now generally employed to distinguish the later works of Wagner (*Tristan und Isolde*, *Die Meistersinger*, *Die Nibelungen*, *Parsifal*) from his earlier ones, or operas (*Rienzi*, *Der fliegende Holländer*, *Tannhäuser*, *Lohengrin*). Of a musico-dramatic work Wagner demands that the literary drama be the *first* and music the *second* consideration; whereas in the opera the music was almost the sole consideration. In his introduction to *Oper und Drama* Wagner declares emphatically: "The error in the art-form of the Opera consisted in the fact that a *means* of expression (music) was made the *end;* the *end* of expression (the drama) a *means*." After *Lohengrin* Wagner wrote chiefly theoretical works dealing with the method to be followed by the poet and composer in the production of a new form of art, which was to take the place of the opera. Several years elapsed before he began the composition of *Die Nibelungen*, according to his new artistic convictions. In the musical drama the fundamental material from which the music is constructed is the *leading motive.* (See LEITMOTIV.) By this means artistic unity is obtained, whereas in the opera the different *numbers* may be artistic wholes, but can never be welded intimately together into the higher unity of the entire drama. Wagner's musical dramas have exerted a powerful and lasting influence upon all dramatic composers. For full information, the reader is referred to Wagner's *Oper und Drama*, vols. iii.-iv. of his *Gesammelte Schriften und Dichtungen*, (Leipzig, 1887); *Das Kunstwerk der Zukunft*, vol. iii. of same ed.; *Eine Mitteilung an meine Freunde*, vol. iv.; *Zukunftsmusik*, vol. vii. See also articles MELOS; OPERA; WAGNER.

MUSICAL FESTIVAL. The performance of some large choral or orchestral work with a very large chorus or orchestra. The real era of musical festivals begins with the festival performances of the great Handel Commemoration held from 1784 to 1787 and again in 1791. It is true that previous to this time regular musical festivals were held in England; but they were practically unknown on the Continent. In England choral singing had always been more extensively cultivated than in any other European country, and the efficiency of English choirs led Handel to turn his attention in the direction of writing for large choral bodies in his oratorios. Since the first performance of the *Messiah* in 1749 it has remained a custom in London to perform that work with greatly augmented chorus and orchestra every year at Christmas. These performances on a grand scale in the English capital roused a feeling of national pride in the Germans, who felt that the great master belonged to them by birth. Festival performances of Handel's oratorios were first given in Berlin on the London plan and were imitated in other German cities. Soon the works of other composers were performed in a similar manner. And as on such occasions there was always a large orchestra, it was but natural that this body of instrumentalists was utilized in the performance of large orchestral works. Thus at the beginning of the nineteenth century several organizations devoting their energies to the production of any great work, whether choral or purely instrumental, sprang into existence in various parts of Germany. Among these the oldest and even to-day most famous are the *Gesellschaft der Musikfreunde* in Vienna and the *Niederrheinische Musikfeste*, which take place yearly in some city of the Lower Rhine District. The United States has not been behind in following the example of England and Germany, and many festivals are held almost yearly in several of the larger cities. On such occasions it is nothing unusual to find a chorus numbering from one to two thousand voices and an orchestra of from one to two hundred performers. These musical festivals have also powerfully affected the mode of conducting and have done very much toward establishing the universal custom of conducting by means of the bâton. Whereas formerly the conductor always presided at the piano, the handling of large bodies of singers and players necessitated the undivided attention of the conductor upon those whom he directed; and the singers, in turn, became likewise more dependent upon signs and gestures from the conductor. (See CONDUCTOR.) For an account of the principal musical festivals, see BAYREUTH MUSICAL FESTIVAL; BETHLEHEM MUSICAL FESTIVAL; CINCINNATI MUSICAL FESTIVAL; GESELLSCHAFT DER OESTERREICHISCHEN MUSIKFREUNDE; GEWANDHAUSCONCERTE; LEEDS MUSICAL FESTIVAL; LOWER RHENISH MUSICAL FESTIVAL; SACRED HARMONIC SOCIETY; SALZBURG FESTIVAL; SOCIÉTÉ DES CONCERTS DU CONSERVATOIRE; SONS OF THE CLERGY; TONKÜNSTLER SOCIETÄT; MUSICAL SOCIETY OF LONDON; THREE CHOIRS FESTIVAL; WORCESTER FESTIVAL.

MUSICAL INSTRUMENTS. The origin of many musical instruments dates back to the earliest times. Not a few of these ancient instruments are the prototypes of some of our modern ones. Monuments recently unearthed at Thebes and in the upper valley of the Nile contain representations of harps and flutes; and the relation of our modern instruments to the old Egyptian models is not difficult to perceive. In the case of other instruments the relationship is not so easy to trace, owing to the considerable modifications which they underwent in the course of centuries and in passing from one nation to another. Even so recent an instrument as our grand pianoforte can be traced through its many and vital changes to the dulcimer (q.v.) known to the Arabs and Persians. Hand in hand with the evolution of the art of music went the invention and perfection of musical instruments. Many of these were extensively used and admired in their day, but soon were superseded, so that to-day our museums are filled with various instruments of all times and nations preserved only as curiosities. Thus the large family of lutes is now entirely obsolete; and yet at one time these instruments enjoyed the same popularity as the pianoforte does to-day, and no orchestra was complete without them. If we except the stringed instruments, it may safely be asserted that no instrument found in the modern orchestra is the same as it was a century ago. All the instruments of the woodwind family have been vastly improved; the natural horns and trumpets have given way to the improved valve horns and trumpets; the serpents and ophicleides have been entirely superseded by the trombones and tubas. It may be said that the modern orchestra comprises the best and most efficient instruments now known, and the test for admission into this select family is sonority and beauty of sound. Musical instruments are generally divided into four large groups, according to the manner in which the sound is produced, viz.: (1) stringed instruments, (2) wind instruments, (3) instruments of percussion, (4) keyed instruments. This latter group embraces the organ and pianoforte, the former being really a wind, the latter a stringed instrument. Both differ from the other instruments of those groups in the use of a keyboard.

STRINGED INSTRUMENTS. Stringed instruments are divided into two principal classes: (A) Those in which the tone is produced by drawing a bow made of horse-hair across the strings. (B) Those in which the tone is produced by plucking the string either with the fingers or a small instrument called *plectrum*. The instruments of class A have but few strings (generally four), and depend for the production of their complete range upon stopping, i.e. shortening the vibrating portion of the string by means of the fingers. To this class belong (1) the violin, (2) the viola, (3) the violoncello, (4) the double bass. (See the separate articles.) Some of the instruments of class B have few strings like those of class A; others have a separate string for each note. Those having few strings are: (1) the mandolin, (2) the guitar, (3) the banjo. Those having many separate strings: (1) the zither, (2) the harp. (See the separate articles.) Formerly there were in use instruments that were played with a bow, which also had additional strings to be plucked with the fingers. (See THEORBO.) Among the stringed instruments by far the most important are those constituting the viol family (class A). The present perfection of these instruments is the result of a slow evolution of possibly a thousand years. But so far we have no evidence whatever that any instruments of the viol family were known in antiquity. Because Arabic authors of the fourteenth century mention stringed instruments, it was supposed for some time that viols originated in the Orient. This has been disproved by Gerbert, who in the second volume of his *Musica Sacra* published a representation of a European stringed *lyra* of the ninth century very similar in shape to the later *giga*. Even earlier, however, the crowd (q.v.) was known in Wales. For several centuries viols were built in two shapes, either with a flat body like the violin or with a pear-shaped body like the mandolin. During the fifteenth and sixteenth centuries stringed instruments of all possible varieties of shapes were built. These, however, were all superseded in the course of the following two centuries, when the art of violin-making reached its height. After the violin had been perfected the same attention was also bestowed upon the instruments of lower pitch of this family, such as the bratsche, viola de gamba, viola d'amore, etc. (See VIOLIN; VIOLONCELLO.) A full account of how the viol family came to be the foundation of the modern orchestra will be found under ORCHESTRA.

WIND INSTRUMENTS. Under this heading are included all instruments on which the tone is produced by setting a column of air in motion. According to the material from which they are made, they are subdivided into: (A) Woodwind instruments, (B) brass instruments. Many of the wind class are transposing instruments, i.e. the tones actually produced upon them are *not* the same as those written for them. Let us take the clarinet family as an example. The compass of the clarinet in C is from e to c^3. It is possible to obtain notes below and above this range by building clarinets in different keys. Thus the clarinet in A produces the same series of tones a minor third lower, so that the lowest tone is c♯ and the highest a^3. The clarinet in E♭ produces the tones a minor third higher, so that its lowest tone is g and its highest e♭^{3}. Hence the music for any transposing instrument must be written in a key *above* or *below* the key of the composition by the same interval as the key of the instrument is *below* or *above* C. For instance, a piece is written in A♭ major and the composer desires to employ the E♭ clarinet. Since every tone sounds a minor third higher than the written note, it is necessary to write this particular clarinet part in a key lying a minor third below A♭, i.e. in F. See TRANSPOSING INSTRUMENTS.

A. *The Wood-wind.*—The instruments belonging to this class are generally made of wood, but ivory is also used, and quite recently flutes have been made of silver. The instruments of the wood-wind family are: (1) the flute; (2) the piccolo (a small flute with very shrill tones); (3) the oboe; (4) the English horn; (5) the clarinet; (6) the bassoon; (7) the double or contra bassoon; (8) the flageolet. (See the separate articles.) This last instrument was extensively employed by Gluck and Mozart, but is now obsolete. Of the wood-wind instruments the English horn and the clarinet are transposing instruments, as was also the flageolet. All the wood-wind instruments have a rich, mellow tone approaching that of the human voice more closely than any other instruments.

B. *The Brass.*—The members of this class consist of (1) the horn; (2) the cornet; (3) the trumpet; (4) the trombone; (5) the tuba; (6) the ophicleide; (7) the serpent. (See the separate articles.) The two last named are obsolete. With the exception of the trombone, all these instruments are transposing instruments. The tones produced by brass instruments are distinguished as *natural* and *harmonic* tones. The former are produced upon the open tube by regulating the force of the air-current by means of the lips; the successive tones produced are the harmonics or overtones of the fundamental. (See HARMONICS.) All tones produced by the aid of the valves are called harmonic tones. In the case of the trombone the length of the vibrating air-column is not regulated by valves, but by a slide. Formerly the horns and trumpets had no valves, and these instruments are to-day called *natural* horns and trumpets. To produce a complete scale on them it was necessary to insert the left hand in the opening. They have now been entirely superseded by the valve-horns and trumpets. The trumpets must have undergone considerable change since the days of Bach and Handel, for in the works of these masters we find passages written for trumpets which no one can execute to-day. All the brass instruments are built in many keys, so that it is easily possible to write four-part harmony for only one group of brass instruments. For instance, in the case of trombones there are four varieties: the alto, tenor, bass, and double-bass trombone. The latest additions to the family of brass instruments are the tubas, which Wagner had constructed especially for his *Ring der Nibelungen.* See TUBA.

INSTRUMENTS OF PERCUSSION. The instruments of percussion may be divided into two principal classes: (A) Those which have definite pitch; (B) those which have not. The former class comprises (1) the kettle-drums; (2) the glockenspiel; (3) the xylophone. The latter class includes: (1) the bass drum; (2) the small drums; (3) the tambourine; (4) the tamtam; (5) the cymbals; (6) the triangle; (7) the castanets. (See the separate articles.) The chief use of instruments of percussion is for marking the rhythm. Those instruments that are devoid of definite pitch are capable only of rhythmic figures; whereas the glockenspiel and xylophone can play melodic figures as well. Of all the instruments of percussion the kettle-drums are the most important and most generally used.

For description of the keyed instruments (*pianoforte* and *organ*), the reader is referred to the extensive special articles.

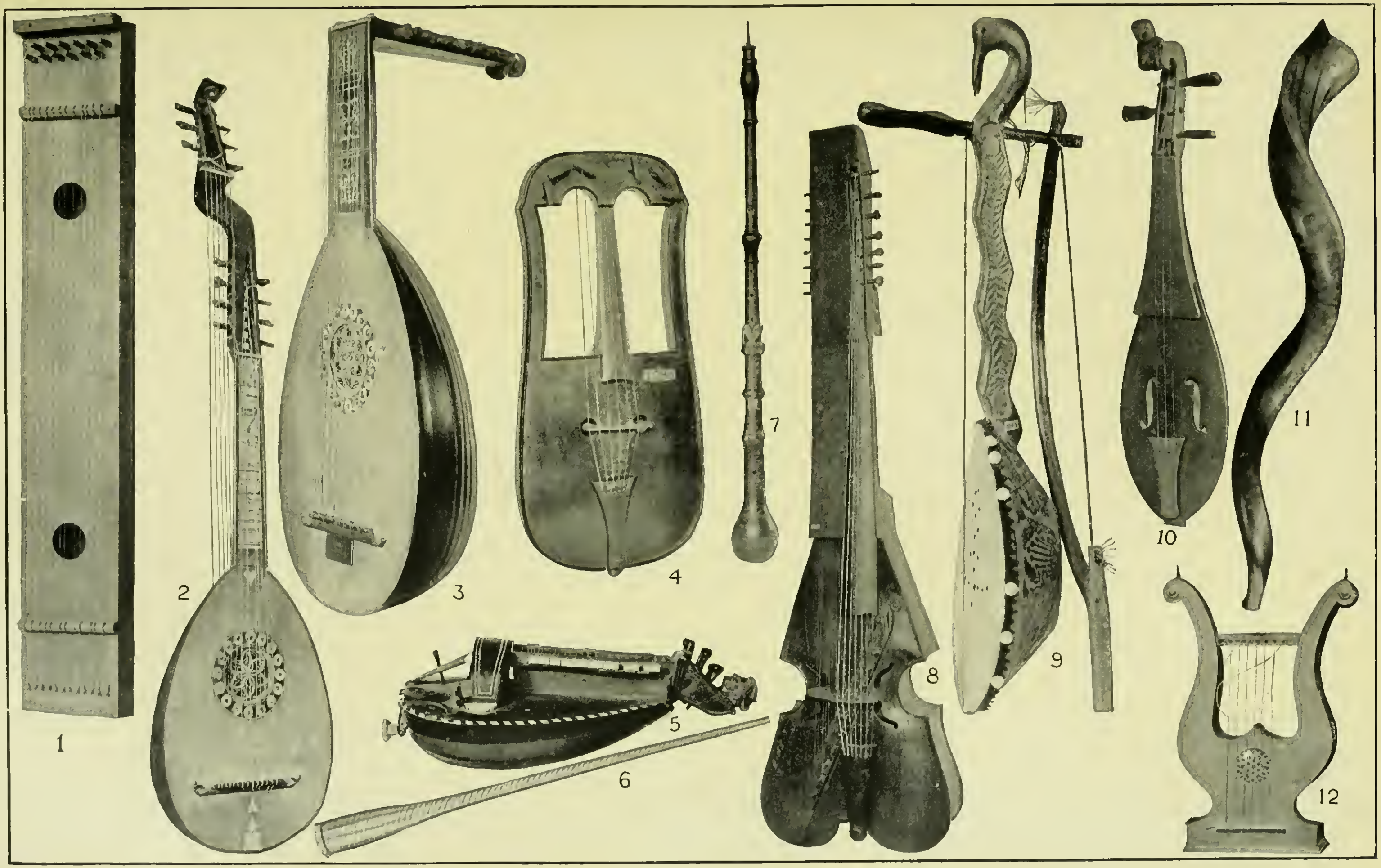
Under the above headings the instruments at present in use in the orchestra have been described in their general features and especially in their relation to other members of the same family. Besides the instruments mentioned, many others have been in use in former times. There are still others in actual use, but as they are not employed for music of a high character, they have not been discussed. Then there is still another class of instruments recently invented, which, however, have not yet come into general use, as the saxophone (q.v.). The following is a list of instruments of these classes: alpenhorn, bagpipe, basset-horn, bugle, cembal d'amore, chimes, clavichord, concertina, crowd, dulcimer, flügelhorn, glasschord, harpsichord, hurdy-gurdy, jews-harp, kazoo, krummhorn, lur, lute, lyre, ocarina, psaltery, sarrusophone, saxophone, shawm, spinet, theorbo, viol, virginal. Instruments of the nations of antiquity and of Oriental nations are treated in the special articles on the music of those nations.

Besides the instruments employed in musical performances, there are a few that are built solely for the purpose of acoustic experiments. These are (1) the monochord; (2) the siren; (3) the tuning-fork (qq.v.).

Among the most valuable works on the history of musical instruments may be mentioned: Wasielewski, *Geschichte der Instrumentalmusik im XVI. Jahrhundert* (Berlin, 1878); Comettant, *La musique, les musiciens et les instruments de musique chez les différents peuples du monde* (Paris, 1869); Vidal, *Les instruments à archet* (ib., 1878); Schletterer, *Die Ahnen moderner Musikinstrumente* (Leipzig, 1882); Hofmann, *Katechismus der Musikinstrumente* (ib., 1890); John Hawkins, *General History of the Science and Practice of Music* (originally published in five volumes in 1776, reprinted in two volumes, London, 1875). This latter work is particularly valuable for its many cuts of now obsolete instruments.

MUSICAL NOTATION. The art of expressing musical compositions in writing by means of certain conventional signs called notes. The oldest system of notation of which we have any knowledge is the *alphabetical notation* of the Greeks. The detailed descriptions of this system left to us enable us to decipher without much difficulty the few remnants of Greek music re-

MUSICAL INSTRUMENTS

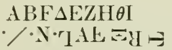


1. ÆOLIAN HARP
2. THEORBO
3. LUTE
4. CROWD or CRWTH
5. HURDY-GURDY
6. ALPENHORN
7. COR ANGLAIS
8. BARYTON
9. MONOCHORD
10. REBEC
11. SHOPHAR
12. LYRE

From the Crosby Brown Collection in the Metropolitan Museum of Art, New York

cently discovered. The Greeks employed uncial letters which appeared in a great variety of positions—inverted, sideways, divided in halves, etc. Thus no less than 120 different combinations were obtained.

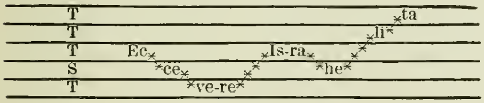
Example 1.



Long after the downfall of Greece this system of notation remained in use, especially in the writings of the theorists. During the sixth century A.D. Roman letters were first used. Boëthius employed the first fifteen letters of the alphabet. But these were later reduced to seven and applied to the degrees of the scale. These letters—as the Greek letters had also been—were placed in a straight line above the syllables of the words. Although in themselves sufficiently definite, the letters did not present to the eye the rising or falling of the melody, as does our modern notation. This need gave rise, in the eighth century, to a series of dots, hooks, curves, and peculiar figures which were placed above the syllables of the text at distances proportionate to the musical pitch of the note. These characters are known as *Neumes.* (See NEUMES.) From a combination of the signs of these Neumes and the alphabetical notation arose our modern system. But its progress was slow, and the complex system of *mensurable music* (q.v.) had first to outlive itself before the present simpler system was established.

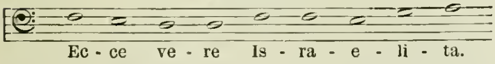
THE STAVE. The introduction of lines we owe to the Neumes. In the tenth century Hucbald took up the idea of using lines. He wrote the syllables between the lines, and at the beginning he indicated by the letters T and S whether the voice was to proceed by tones or semitones.

Example 2



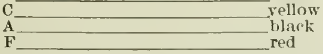
This, in modern notation, reads

Example 3



By increasing the number of lines Hucbald was enabled to write even four-part compositions in this manner. Soon after his time dots were used *on the lines,* leaving the spaces vacant, and the degree of the scale was indicated by a Greek letter placed at the beginning of each line. But the great number of lines necessary rendered the reading of this manner of notation difficult, and it was soon abandoned. Guido of Arezzo in the eleventh century added two black lines to the red and yellow lines of the Neumes, in such a manner that the upper black line above the yellow represented E, and the second black line, drawn between the yellow and red lines, A.

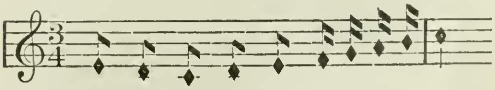
Example 4.



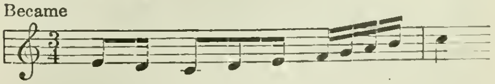
Whereas before his time only the spaces *or* the lines had been used, Guido made use of both lines *and* spaces. The advantages of this system were so obvious that this stave was soon adopted in every country of Europe. As long as music was homophonous, i.e. consisted of only a single melody, this stave answered all purposes. But the growth of polyphony soon rendered a greater number of lines and spaces an absolute necessity. No one seems to have thought of the simple idea of writing each voice on a separate stave. Instead the four lines were extended to six, eight, twelve, and even more. In the Paris Library there is a score, dating from the middle of the thirteenth century, in which all the voices are written on a single stave. The difficulty of reading scores written in this manner led musicians to adopt a uniform stave of nine lines arranged in two groups, each containing four black lines. The two groups were separated by a red line. In the fifteenth century we find three staves employed for different kinds of music. Plain chant melodies were written on a stave of four lines; all other vocal music on a stave of five lines; and a stave of six lines was used for all compositions written for the organ and virginal. After the invention of music-printing the five-line stave became the universal standard of all music, except the plain chant melodies, which to this day are written on a stave of four lines.

THE FORM OF THE NOTES. As long as music had no distinctive rhythm of its own and the musical accents were determined only by the word-accent, Guido's system of using simple dots answered all purposes. But it was not long before the need of notes having a fixed time-value made itself felt. Franco of Cologne, in the twelfth century, replaced the dots by notes of various shapes to indicate their relative duration. He also indicated the time-value of pauses or rests by a series of signs corresponding in duration to the different notes. A full account of this elaborate and difficult system will be found under MENSURABLE MUSIC. This system has become the foundation of our modern system of notation. The notes of larger value, the *large, long,* and *breve,* have disappeared, the *semibreve* having become our standard of value or *whole* note. The development of instrumental music during the eighteenth century brought with it a great advance in the technique of the instruments, and this led composers to write passages requiring more rapidity of execution than is possible to obtain from choral masses. Round notes were substituted for the square ones, because the former can be written more easily and rapidly. Another important innovation, and one which greatly facilitated the reading of scores, was the joining of all notes having hooks into groups readily recognized by the eye. Thus a passage which formerly was written

Example 5.



Became

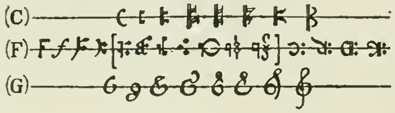


Whereas formerly the *semifusa* (corresponding to our sixteenth) was the note of smallest value, the increased rapidity rendered possible by instrumental technique led to a subdivision of sixteenths into thirty-seconds, and of these latter even into sixty-fourths. The signs denoting the rests in mensurable music have been adopted into the modern system without modification.

THE CLEFS. The oldest of the clefs is the F clef, which in its original form as a red line dates back to the tenth century. Almost as old is the C clef, which originally was a yellow line. These colored lines were used without a clef signature, as it was understood that every note upon the red line represented F, and every note upon the yellow line C. Later on the colored lines disappeared, black ones being substituted and the letter F or C placed at the beginning. (See NEUMES.) The modern forms of these clefs are the result of a series of modifications of the plain letters.

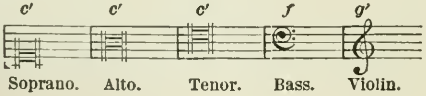
The G clef is more recent than the other two, but its present form is the result of similar changes of the letter G.

Example 6.



Originally the different clefs had no fixed position as they have to-day. In order to avoid the use of ledger-lines (which, in fact, were unknown), the position of the clefs was constantly shifted, so as to bring the range of every voice within the limits of the stave. In old manuscripts we find every clef, at various times, on every line of the stave. Even within the same melody the clef changes frequently. This arbitrary use of the clefs continued until the seventeenth century. The establishment of opera (q.v.) brought with it the introduction of many new instruments. To bring the range of all these instruments within the limits of the stave could not be accomplished any longer by the transposition of clefs. Previously some polyphonic writers of the sixteenth century had on very rare occasions resorted to the use of a single ledger-line above or below the stave. This idea was taken up by the operatic composers, and thus ledger-lines became a fixture in music. Now that there was no longer any need for the constant transposition of clefs, the positions of those that remained in use became definitely fixed. Each voice-part had its own clef, as also the violin:

Example 7.



In this form the classic masters have used the clefs. For the pianoforte the G and F clefs are used; the higher pitched orchestral instruments play with the G clef, those of lower pitch the F clef. The viola is the only one for which the alto clef (C) is retained. During the nineteenth century the C clefs have been superseded even in vocal music by the G clef.

TIME-SIGNATURES. Before the introduction of mensurable music there was no need of time signatures. The signatures used in mensurable music will be found in the special article on MENSURABLE MUSIC. When, in the seventeenth century, the bar was introduced, composers soon saw an opportunity for reducing the very complicated and cumbrous time-signatures of mensurable music. The underlying principle of rhythmic division into binary and ternary forms still remained the basis. But, whereas in the older system ternary division (perfect) was the principal consideration and binary division (imperfect) only secondary, the new system inverted these relations by recognizing only binary division as natural. Ternary division was retained, but was regarded only as a modification of the natural binary division and obtained by the use of a dot which increased the value of the note by one-half. Moreover, all notes were referred to the whole note (the semibreve of mensurable music) as the standard of value. Thus the whole note was divided into two half notes, each half note into two quarters, etc. The time-signatures of this new system were expressed by fractions, the denominators indicating the subdivision of the standard whole note, and the numerators the number of subdivided notes to be allotted to each measure. The only signs still retained from mensurable music are the semicircle for common time (four quarters in a measure) and the semicircle with a line (alla breve), where the line still has the meaning of reducing the notes to half their duration.

THE BAR. The earliest example of the use of vertical bars is found in Agricola's *Musica Instrumentalis*, which was published in 1528. The object of these bars, however, was only to keep the notes of the different voices one under the other, rather than to indicate rhythmic divisions. A few original drafts of older compositions give evidence that composers during actual composition did use bars to indicate the rhythm, although all the part-books up to the seventeenth century were printed without bars. The general use of bars we owe to the early composers of operas. Peri, in 1600, published the score of his *Eurydice* exactly as he had written it. In order to indicate clearly the connection between the different notes in the voices and accompanying instruments he drew vertical lines through the whole length of the stave. Caccini and Monteverde adopted this plan. The great facility of reading music printed in this way immediately led to its universal adoption. The new system of music, having established new signatures for time, allotted a certain number of beats to each bar, and in this way the bar became what it is to-day.

ACCIDENTALS. In spite of the strict laws governing plain chant and the use of the old Church modes, the human ear from the earliest times felt the need of a 'leading tone.' The tone of the scale that was subject to this modification was B. Thus at a very early time this letter was written in round (♭) and later square (♮) form to indicate whether the lower or higher tone was to be sung. It is easy to see how from these two forms arose our flat and natural (♭♮). Toward the end of the thirteenth century the sign ♮ was carelessly written ♯, and being applied to other tones than B, denoted the higher of the tones on the same degree. Thus, F♯ denoted the modern F♯, but F♭ was the same as our F natural, just as B♭ was regarded as the *natural* tone and B♯ (our B) a chromatic alteration of B♭. As a key-signature the sign ♭ appears first in the Church modes, but denoted only a transposition of the original mode. (See MODES.) Even in the eighteenth century a ♭ was used as a sign of resolution for a note having a ♯ or ♮ (these two signs were identical); and vice versa a ♯ or ♮ served to resolve a ♭. The signs of the double sharp and double flat (×, ♭♭) cannot be traced further back than the beginning of the eighteenth century. The sign × arose from writing the older ♯ in this position 𝄪. Before the beginning of the seventeenth century accidental sharps, flats, or signs of resolution appeared very seldom in writing. The singer was supposed to introduce the necessary chromatic alterations during the actual performance. As long as the Church modes reigned supreme no use was made of regular key-signatures. A flat or sharp placed at the beginning of a piece denoted only transposition. But as soon as the modern major and minor scales displaced the modes the necessity of key-signatures arose, in order to avoid the great number of accidentals.

EXPRESSION MARKS. Toward the end of the eighth century we find in one old manuscript written in *neumes* small letters interspersed with the characters of the *neumes*. These letters refer to the expression. We find a small *f* (*fragor*), *b t* or *t* (*bene teneatur* or *teneatur*), *c* (*celeriter*), etc. This manuscript is the famous Antiphonary of Saint Gall. The works of the great polyphonic masters of the fifteenth and sixteenth centuries are utterly devoid of any marks of expression, nor are any evidences of expression marks to be found in works written between the eighth and fifteenth centuries. There really was no pressing need for such marks, for all music was vocal, and the text gave a sufficient clew to the singers, who were all thoroughly trained musicians. But the development of instrumental music gave rise to various marks of expression. Hand in hand with the development of instrumental music went the perfection of the musical instruments. Many new effects were discovered, and to express these composers were obliged to use words. Monteverde in his opera *Orfeo* (1608) demands that the trumpets play with mutes, and this is indicated in the score by the words *con sordini*. The same composer introduced a number of new effects in his *Tancredi e Clorinda* (1624), among which were the *tremolo* and the *pizzicato* for strings. Such effects were called for by the actual words placed in the score. These are the earliest instances of expression-marks. Operatic composers immediately followed the practice established by Monteverde. Among the earliest of purely instrumental masters who employed words to help the performers was Frescobaldi (1583-1644). He was particularly careful to indicate the tempo. One of his favorite marks is *adagio*. Soon the words *allegro, largo, grave, moderato* came into general use. In the course of the eighteenth century nearly all the important marks of expression and time were in use. The nineteenth century substituted convenient signs for some of the most frequently recurring marks, such as *crescendo* <, *diminuendo* >, *staccato* . . . . , *legato* ⌒, *sforzando* ∧ etc., and increased the vocabulary of musical expression considerably. Some of the German masters of the last century, notably Schumann and Wagner, attempted to substitute a German terminology for the Italian. But the Italian terms are more definite, because two centuries of constant use have familiarized them to musicians of every nationality.

Another system of musical notation used formerly, especially for the lute, is discussed under TABLATURE. For the new system of designating chords by figures, used in theoretical treatises, see NUMERICAL NOTATION. A complete history of musical notation was written by Riemann: *Studien zur Geschichte der Notenschrift* (Leipzig, 1878); an abridgment of this is the same author's *Die Entwicklung unserer Notenschrift* (ib., 1881); Riemann, *Geschichte der Musiktheorie im IX.-XIX. Jahrhundert* (ib., 1898).

MUSICAL SAND. There are a large number of beaches, oftentimes, however, of very small extent, whose sand has the peculiar property of giving out a distinct musical tone when stepped upon. The musical note appears to depend upon the fact that the grains of sand are of such very uniform size that as they slip past each other under pressure the vibrations of the particles respectively reënforce each other so that sounds which would otherwise be inaudible become distinct, and the crunching noise which is heard when the foot presses down upon snow or ordinary sand becomes a clear musical note.

MUSICAL SOCIETY OF LONDON. A famous English musical society organized at London in 1683. At this period the study of choral music in England had assumed dimensions and a degree of artistic importance far greater than obtained in any other country. The success which had attended the work of 'The Corporation of the Sons of Clergy,' established in 1655 and incorporated by charter of Charles II., in 1678, led to the founding of the Musical Society, the principal function of which organization was the celebration of Saint Cecilia's Day. Among the poets who wrote odes for the society were Dryden and Congreve, and among the composers Purcell and Blow. At the last regular Cecilian festival held in London in 1703 the chorus numbered about thirty boys and as many men, and the orchestra about twenty-five persons. The society still occupies an important position in English musical life.

MUSIC BOX. A case containing mechanism constructed in such a manner that music can be produced automatically. Machines for making mechanical music have been known since the invention of clocks; but real music boxes were not introduced till after 1750. They have been greatly improved since then, and some modern musical boxes can play over 100 tunes. The mechanism is similar to that of the barrel-organ. The principal parts are the comb, the cylinder, and the regulator. Bells, drums, and castanets are frequently added to produce musical effects, and there are occasionally combinations of reeds and pipes. The musical boxes of Prague, Sainte Lusanne in France, and Geneva, Switzerland, are especially famous.

MUSIC PRINTING. See PRINTING.

MUSIC RECORDER. See MELOGRAPH.

MU'SIMON. See MOUFLON.

MUSIN, mụ'zăN', OVIDE (1854—). A Belgian violinist, born at Nandrin, near Liège. He studied at the Conservatory of that city under Heynberg and Léonard, followed the latter to the Paris Conservatory, where, in 1868, he won a gold medal, and taught for a year before leaving on his European and American concert tours that ultimately led him round the world. In 1898 he became violin professor at the Liège Conservatory, but continued to spend much time in the United States.

MUSK, or **MUSK DEER** (OF., Fr. *musc*, from Lat. *muscus*, from Gk. μόσχος, *moschos*, from Ar., Pers. *musk*, musk, from Skt. *muṣka*, testicle, mouse, from *muṣ*, to steal). An aberrant deer of the subfamily Moschinæ, which differs from ordinary deer in the lack of antlers; in the possession by the male of long upper canines, which project downward outside the lips; and in certain anatomical features. Hence there has been much discussion whether the animal should be included in the Cervidæ. There is only one species, *Moschus moschiferus*, of the high Himalayas. Tibet, and Eastern Siberia—a small animal, which stands about 20 inches high and has a clumsy form. Its favorite haunts are the tops of pine-covered mountains, but its summer range extends far above the region of pines. Its habits are nocturnal and solitary, and it is extremely timid. It is much pursued by hunters on account of its odoriferous secretion, which has been known in Europe since the eighth century, and is much valued as a perfume.

Musk. This secretion is produced in a glandular pouch situated on the hinder part of the abdomen of the males, and its natural use seems to be that of increasing sexual attractiveness. The musk-bag, or 'pod,' is formed by an infolding of a portion of the skin of the belly, within which a number of membranes are contained, and between these membranes are glands by which the musk is secreted. When newly taken from the animal, musk is soft and almost resembles an ointment; it is reddish-brown, and has an excessively powerful odor. Very little of it reaches Europe unadulterated. Musk is usually imported either in the form of 'grain-musk,' that is, the musk which has been collected chiefly from stones upon which it has been deposited by the animal, in which state it is a coarse powder of a dark-brown color; or in the 'pod,' dried with the musk inside. Of both kinds the annual importations are about 15,000 ounces per annum, chiefly from China and India. Small quantities are used in medicine, but the greater portion is employed by the perfumers. The kinds generally known in trade are the Tonquin or Chinese, and the Carbardine, Kabardine, or Siberian, which is inferior. Genuine musk has the valuable property of adding to the permanency of other odors. On account of its properties as a stimulant and antispasmodic, it is also used to some extent in medicine. See Perfumery.

Bibliography. Lydekker, *Deer of All Lands* (London, 1898); Flower, a monograph in *Proceedings of the Zoölogical Society of London*, 1875. See Plate of Fallow Deer, Musk, etc.

MUSKAT, mŭs-kăt′. A town of Arabia. See Muscat.

MUSK DUCK. (1) A very large Australian sea-duck (*Biziura lobata*), which has a musky odor. The male is decidedly bigger than the female and has a lobe of skin depending from its chin. (2) The Muscovy duck.

MUSKEGON, mŭs-kē′gŏn. A city and the county-seat of Muskegon County, Mich., 40 miles northwest of Grand Rapids; on Muskegon Lake, which is connected with Lake Michigan by a channel 200 feet wide and of ample depth for large vessels, and on three branches of the Pere Marquette, the Grand Rapids and Indiana, and the Toledo, Saginaw and Muskegon railroads (Map: Michigan, G 5). Through the liberality of one of its citizens the city enjoys numerous gifts—a manual training school, a public library, a gymnasium, a square, which is the site of a handsome soldiers' monument and of several bronze statues, and a hospital—for the maintenance of which also the donor has made ample provision. Muskegon has one of the finest harbors on Lake Michigan, open the entire year, which is in daily steamboat communication with Chicago, Milwaukee, and other lake ports. It carries on a large trade in lumber, fruit, celery, and other garden truck, and in the principal manufactures of the place, which include flour, paper, knit goods, furniture, refrigerators, curtain rollers, pianos, chemical engines, electric cranes, beer, and iron and tinplate products. The government is administered, under a charter of 1897, by a mayor, annually elected, a unicameral council, and subordinate municipal officers, chosen by the people. The city owns and operates the water-works. Though a trading post was here established in 1812, Muskegon was not permanently settled until 1834. In 1861 it was incorporated as a village, and eight years later was chartered as a city. Population, in 1890, 22,702; in 1900, 20,818.

MUSKELLUNGE, mŭs′ke-lŭng. A common variant of maskinonge (q.v.).

MUSKET. See Small Arms.

MUSKHOGEAN (mŭs-kō′gē-*a*n) **STOCK.** A North American Indian stock which derives its name from Muscogee, the principal tribe of the Creek confederacy. (See Creeks.) This is one of the most important linguistic stocks of the United States. It formerly occupied the greater portion of the territory of the Gulf States east of the Mississippi, and comprised the Creek, Choctaw-Chickasaw, Seminole, Apalachee, and a number of smaller tribes and bands, speaking perhaps five distinct languages, with several minor dialects. The difference was greatest between the Muscogee and the Choctaw proper, of which the Chickasaw was a dialectic form. The Seminole is a mixed dialect, based chiefly upon Hichitee, the prevailing language of the 'Lower Creeks,' formerly residing on the Chattahoochee River. The old Mobilian trade language (q.v.) was based upon Choctaw.

According to their traditions the Muskhogean tribes came from the West and Northwest, and those who formerly resided nearest the Mississippi, as the Choctaw and Chickasaw, have a clear tradition of having crossed that stream to enter their later territory. The migration must have occurred at a very early period, and they appear to have found the country occupied by other tribes whom they conquered and absorbed. Their authentic history begins with the first landing of the Spaniards on the Gulf coast under Narvaez in 1527. Thirteen years later De Soto traversed their country from east to west, finding the various tribes in practically the same positions which they occupied up to the period of their final removal to the Indian Territory. For three centuries their history is closely interwoven with that of colonization and conquest by the Spaniards, French, and English in the Southern States. Each tribe or village made such alliances as suited its purpose, with the exception of the Chickasaw, who, like the Iroquois in the North, remained the steady allies of the English, and by their command of the waterway of the Mississippi, were able to check the advance of French colonization by cutting off communication between Louisiana and the Illinois settlements. The Apalachee of Florida were Christianized at an early period by the Spanish Franciscans, but the entire tribe was exterminated by the English and their Indian allies about 1702, and the country left an uninhabited wilderness until it was gradually occupied by vagrant bands from the Creek confederacy, later known as Seminole, or 'runaways.' The Yamasi of South Carolina were driven from their homes in 1715 as a result of a war with the English and retired to Florida. The Muskhogean tribes played little part in the French and Indian War, but the Creeks took a particularly active part with the English against the Americans in the Revolution. This warlike confederacy again rose against the neighboring American settlements in the War of 1812, and by the opening massacre at Fort Mims and the desperate encounters at Talladega and Horseshoe Bend made the Creek War one of the bloodiest pages in American history. The two Seminole wars, which cost the Government years of effort and over $40,000,000, further illustrated the fighting temper of the Creek tribes. By these wars and successive treaty sales the Muskhogean tribes were rapidly dispossessed until by the year 1835 practically the whole body had been removed to the west of the Mississippi. Here the four principal tribes, the Creek, Choctaw, Chickasaw, and Seminole, reëstablished themselves as 'nations' under organized governmental forms in the Indian Territory, where they now reside, with a combined population of pure and mixed blood, exclusive of adopted aliens, of perhaps 33,000 persons, besides some 2000 more in detached bands in Florida, Mississippi, Louisiana, and Texas.

All the Muskhogean tribes were sedentary and agricultural, residing in compact and regular towns and villages, frequently palisaded, and always with a central 'town house' for councils and other public ceremonies, fronting upon a plaza or public square for outdoor gatherings. Their social organization was complex and exact, the rank and duty of each clan being specifically fixed in the tribe. They were a virile race and have maintained their population and tribal organization against all the wasting effect of contact with white civilization. Much study has been given to their language, particularly the Muscogee and Choctaw, of which there is a considerable body of native literature. The best summaries of their characteristics and history are: Adair, *History of the American Indians* (London, 1775); Hawkins, *Sketch of the Creek Country;* and Gatschet, *Migration Legend of the Creek Indians* (Philadelphia, 1884-88).

MUSK HYACINTH. A bulbous plant. See GRAPE HYACINTH.

MUSKINGUM, mŭs-kĭn′gŭm. The principal river of eastern Ohio. It is formed at Coshocton by the junction of the Walhonding and Tuscarawas rivers, and flows southeastward 112 miles through a rich agricultural region, entering the Ohio River at Marietta (Map: Ohio, G 6). The Ohio and Erie Canal follows its course as far as Zanesville, and slackwater navigation has been secured to Dresden, 92 miles from the mouth of the river.

MUSK MALLOW. A tropical plant. See MALLOW; HIBISCUS.

MUSKMELON (so called from its peculiar aromatic flavor), *Cucumis Melo.* An annual herbaceous vine of the natural order Cucurbitaceæ, a native of the warmer parts of Asia and now cultivated in both hemispheres for the sake of its rounded or ovate fruit, which, in its numerous varieties, varies from a few inches to more than a foot in diameter. Some varieties are distinguished by a thick, warty rind, some by a rind cracked in a net-like manner, some by ribs and furrows, and some by a perfectly smooth and thin rind. The flesh may be white, red, green, yellow, or of intermediate colors. There are also varieties that ripen early and late, and one group of varieties little grown in the United States, which keep well into the winter. They require a warm, quick soil. In field culture they are planted—6 to 10 seeds—in hills 4 to 6 feet apart either way. To hasten growth and on poor soils two or three shovelfuls of well-rotted manure are placed under each hill. In the North, commercial growers start the plants under glass, preferably in a hot bed, and transplant them to the open field when the weather becomes warm enough. The seedlings are transplanted with difficulty and are therefore usually grown on inverted sods or in pots. Some subspecies of *Cucumis melo* are: Var. *saccharinus* or pineapple melon, a sweet-fleshed variety; var. *flexosus* or snake melon, 2 to 3 feet long and 1 to 3 inches in diameter, sometimes grown for preserves, but more often as an oddity; var. *chito*, also called orange melon, vegetable orange, garden lemon, vine peach, etc., and used for pickles and preserves; var. *inodorus*, a long keeper of poor quality; var. *Dudaim*, or pomegranate, dudaim, or Queen Anne's pocket melon, a highly perfumed, but inedible sort. See Plate of CUCUMBER ALLIES.

The striped beetle and flea beetle are serious pests of muskmelons. Spraying with Paris green or dusting with tobacco dust, air-slaked lime, or road dust when the plants are moist, helps to keep the insects under control. Land plaster mixed with kerosene or turpentine is used for the same purpose. The downy mildew and leaf spot diseases which attack the plant are held in check by applications of Bordeaux mixture. Muskmelons are commonly called cantaloupes in the United States. See FUNGICIDE.

MUSKOKA, mŭs-kō′kȧ. A lake region of Ontario, Canada, bounded on the north and northeast by Lake Nipissing and the Ottawa River, on the south by Lake Simcoe, and on the west by Georgian Bay (Map: Ontario, D 3). The region covers an area of about 10,000 square miles, 800 feet above the sea and 200 feet above Lake Huron. Besides a lake, river, and county of the same name, it includes extensive forests, several rivers, and from 800 to 1000 lakes and smaller sheets of water. Fine waterfalls also occur, of which the most important are the Bridal Veil Falls on the Shadow River, and the High

Falls and the South Falls with a descent of 130 feet, on the Muskoka, near Bracebridge (population, in 1891, 1419; in 1901, 2479), the county capital. The chief lakes, Muskoka, 20 miles long by 2 to 8 miles broad, Rosseau, 12 miles long and 1 to 6 miles wide, and Joseph, are connected and have regular steamer navigation service in summer, in connection with the Grand Trunk, the Canadian Atlantic, and the Canadian Pacific railways, which traverse the region. The forests abound in game, and the lakes with fish, and the district has become popular for its hunting, angling, boating, and bathing.

MUSK OX. The musk ox (*Ovibos moschatus*), although approaching cattle in size, is really quite as closely allied to the sheep. It undoubtedly belongs in the family Bovidæ and is perhaps entitled to have a subfamily division to itself. The genus contains only the single species, at present confined to Arctic America, but formerly ranging over the Northern United States as far south as Kentucky and over Northern Asia and Europe also, as is shown by the bones found in the Pleistocene deposits of those regions. Its southern limit is gradually retreating northward, and there can be little doubt that the number of musk oxen is steadily declining. The name 'musk ox' or 'musk sheep' refers to a peculiar musky odor, the origin of which seems to be in doubt; apparently, however, there is no special gland as in the musk deer and other musky mammals. The legs are short and stout, so that the animal is somewhat lower than a small ox, which it otherwise resembles in size and shape. The hair is amber brown, woolly and long; thick, matted and curly on the shoulders, giving the appearance there of a hump; elsewhere it is straight and hangs down so as to conceal the short tail and upper half of the legs. The wool has been spun into fabrics said to be extremely soft. The hoofs are remarkable in being asymmetrical, the outer half being rounded while the inner is pointed; the sole of the foot is hairy. The head is inclined to be massive, especially in old males, where the horns have extremely broad bases. The latter are elegantly curved, first obliquely downward and backward by the side of the head and then upward and forward. The ears are so small as to be concealed by the hair, and the muffle is hairy as in sheep and goats. The flesh is coarse grained, but of variable quality, some individuals being tender and of good flavor, while others are tough and so musky as to be uneatable. Curiously enough, the difference in flavor is apparently not a matter of age or sex. Musk oxen are gregarious, going in flocks of 20 or 30, or rarely as many as 80 or 100, and are said to be very sheep-like in their habits. Although the legs are so short, they run with speed, and can climb steep slopes and clamber over rocks with remarkable agility. The young are produced, one at a time, at the end of May or early in June, and the rutting season is in September. The food of the musk ox is grass, moss, lichens, and tender shoots of willow and pine. They are themselves an important item in the larder of the Eskimos and of Arctic explorers. The writings of these explorers contain the best accounts of the animal, whose young have now and then been brought alive to Europe, and have survived for a time in zoölogical gardens. See Plate of WILD SHEEP AND MUSK OX.

MUSK PLANT, MUSK ROOT, MUSK TREE, MUSK WOOD. Various plants possessed of a musky odor. Among these are the common musk plant (*Mimulus moschatus*); the musk tree (*Olearia argophylla*) of Tasmania; the musk okra (*Hibiscus moscheutos*); the musk tree of Jamaica (*Trichilia moschata*); and the West Indian musk wood (*Guarea grandifolia*), used in perfumery. The drug called musk root or Sambul, brought from Asia principally through Russia and Persia, is the starchy root of *Euryangium Sumbul*, which has a pure musky odor, and is used as a substitute for musk.

MUSKRAT (so called from its musky odor), or MUSQUASH. The muskrat (*Fiber zibethicus*) is one of the most widely distributed and best known of North American quadrupeds, and it is peculiar to this continent. It makes its home in the banks or water of streams, ponds, and lakes. It is the largest known species of the subfamily Arvicolinæ (see VOLE) of the family Muridæ, and is peculiarly adapted to an aquatic life, although there are other species of the subfamily which are also amphibious. Its body is about 12 inches in length, and its tail about 8 inches. The body is rather stout and thickset, the head is rounded, and the ears are small and close. The front feet are rather small, with four digits and a rudimentary thumb, while the hind feet are stout, with five partially webbed toes, and so attached to the leg that they are well fitted for swimming, yet the sculling movement of the much compressed tail is the principal means of progress in the water. As with other aquatic mammals, the pelage consists of an undercoat of dense, soft fur and an outer coat, on the back and sides, chiefly of long, shining, smooth hairs. So much air is held by these outer hairs that in ordinary excursions the under fur is hardly wetted. The color above is dark umber brown, darkest on the middle of the back and on the tail, while beneath the prevailing shade is gray.

The musky odor from which the animal gets its name is due to the secretion of a large gland in the inguinal region, which is present in both sexes. The muskrat is omnivorous, eating roots (especially of the pond lily), fruits, vegetables, insects, worms, mollusks, etc., but it is especially fond of apples, in search of which it often wanders far from its home, and thus finds its way occasionally into barns and cellars. In some localities fresh-water mussels are a favorite article of food, and large heaps of the empty shells are sometimes found near muskrat burrows, due to their preference for dining day after day in the same place. Although so widely distributed and abundant, the muskrat is not often seen, as it is mainly nocturnal in its habits, and during the day remains in its burrow or house. The home of this animal is either built of sticks, mud, and grass, and forms a heap the size and appearance of a small haycock, or else is dug out of the bank of a stream or pond and then forms a burrow of indefinite length, the entrance to which is under water. The character of the home seems to depend upon the nature of the country; where there is an extensive swamp, or stretch of shallow water, so that the houses will not be ordinarily exposed to wandering enemies, muskrats seem to prefer these homes; but where they live in or about a narrow stream, with little swamp, the burrow in the bank is the more usual shelter. The houses are always entered from water deep enough so that the passageway shall not freeze up in winter.

The flesh of the muskrat is good eating, and was formerly much used by the Indians. The fur is used quite extensively, so that the skins are an article of commerce. For this reason, muskrats are extensively trapped and hundreds of thousands are killed annually. Their numbers nevertheless do not decrease, partly because their natural enemies are fewer, but chiefly because of the fact that the making of slackwater spaces by damming rivers, and the digging of canals (whose banks they seriously damage), have greatly extended waters suitable for them in various parts of the country. Trapping is done, chiefly in the winter, by setting small steel traps at the entrance to their houses or burrows or in runways where they come ashore.

The name muskrat is applied to a number of other more or less rat-like animals, on account of their strong odor. In Europe it is frequently given to the desman (q.v.), while in India it is associated with a shrew (*Crocidura cærulea*) which has well-developed musk glands on the belly and flanks. In South Africa the genet (*Genetta felina*), a viverrine, carnivorous mammal, is sometimes so called.

Consult the works of Audubon, Richardson, Godman, Kennicott, and other early writers; and of C. C. Abbott, H. D. Thoreau, J. Burroughs, D. L. Sharp, R. Robinson, A. L. Adams, W. Cram, J. A. Allen, E. S. Mearns, and other recent naturalists; especially Merriam, *Mammals of the Adirondacks* (New York, 1895); Herrick, *Mammals of Minnesota* (Minneapolis, 1892); Butler, "Observations on the Muskrat," in *American Naturalist*, vol. xv. (Philadelphia, 1885); Cram and Stone, *American Animals* (New York, 1902).

See Plate of BEAVER, COYPU, AND MUSKRAT.

MUSK SHEEP. A musk ox (q.v.).

MUSK SHREW. One of a large group of Old World shrews, of which about eighty species of the genus Crocidura are known. They are noted for their musky odor, range from the Mediterranean to Northern India, and are of terrestrial habits. One of these shrews (*Crocidura cærulea*) is the largest of its race (see SHREW), and as large as a rat. It is gray, and is known to Anglo-Indians as the 'muskrat.' It enters houses and at night runs about, catching insect vermin; but counterbalances this beneficial service by leaving behind a musky odor, sometimes unpleasantly strong.

MUSK TORTOISE, MUSK TURTLE, or STINKPOT. One of the mud or 'box' turtles (*Cinosternum odoratum*) of the eastern half of the United States, well known for its strong, musky odor, which exudes from glands in the arm-pits. It has a disproportionately large head, a long and slender neck, with two yellow stripes on each side, and a dusky shell, clouded and sometimes spotted. It is edible.

MUSKWAKI, mŭsk-wä′kė. An Algonquian tribe. See Fox.

MUSLIN (Fr. *mousseline*, from It. *mussolino*, muslin, made of muslin, from *mussolo*, muslin, from ML. *Mossula*, from Syr. *Mosul*, a city of Mesopotamia on the Tigris, whence the fabric originally came). A cotton fabric of Oriental origin. No such trade now exists in the Orient; and for muslins of the common kinds at least the Indian market depends upon the manufactures of England and France. Muslin is much less compact in its texture than calico—indeed, it more nearly resembles gauze in appearance; but it is woven plain, without any twisting of the filling threads with those of the warp. The manufacture of muslins is very extensive, especially printed muslins, in which the patterns are produced by the same processes as in calico-printing. The term muslin is also applied to a coarser and heavier, but plainly woven cotton cloth, suitable for sheets and pillow-cases. See WEAVING.

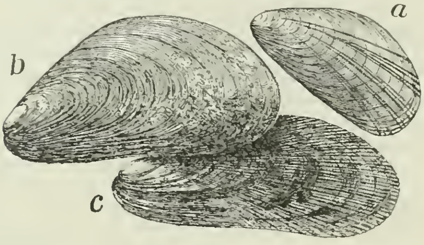
MUS′PRATT, JAMES SHERIDAN (1821-71). An eminent Irish chemist. He studied under Liebig, at Giessen, 1843-45, and there took the degree of Doctor of Philosophy, with a thesis tracing the resemblance between the carbonates and sulphites. In 1847 he produced a number of interesting organic substances from the sulphocyanates of ethyl and methyl. On his return to England in 1848 he established and became superintendent of a college of chemistry at Liverpool. From 1854 to 1860 he was engaged on his well-known dictionary of chemistry. The latest German edition of this important work may be found mentioned in the bibliographic section of the article CHEMISTRY. His *Outlines of Quantitative Analysis for Students* has had a considerable circulation.

MUS′QUASH. The name among the Indians of the Canadian Northwest for the muskrat (q.v.). 'Talking musquash' is a phrase in the Hudson Bay region for the gossip of trappers or fur traders about peltries, of which the fur of the muskrat forms a constant and important item.

MUSSAFIA, mụs-sä′fē-ȧ, ADOLF (1835—). An Austrian Romance philologist, born at Spalato. He studied medicine, but in 1855 became instructor of Italian at the University of Vienna, and in 1860 professor of Romance philology. He contributed valuable papers on Italian dialects to the proceedings of the Vienna Academy, and wrote: *Altfranzösische Gedichte aus venezianischen Handschriften* (1864); an edition of Fra Paolino's *De Regimine Rectoris* (1868); *Handschriftliche Studien* (1862-70); *Ueber die spanische Version der Historia Troiana* (1871); *Die catalanische Version der sieben weisen Meister* (1876); and studies of the legends of the Madonna (1884-91).

MUSSEL (AS. *mūxle*, *mucxle*, from Lat. *musculus*, small fish, sea-mussel, diminutive of *mus*, mouse). The word mussel is one of those popular names of such uncertain limits that to attempt to define it is a difficult matter. At the present time it is applied to two totally distinct groups of bivalved mollusks, one marine and the other fresh-water. The first group includes the shell-fish of the family Mytilidæ, especially the genera Mytilus, Modiola, and Modiolaria. This family is characterized by the presence of a well-developed byssus, two adductor muscles, a fringed vestige of a siphon, and an equivalve but inequilateral shell, with a thick epidermis, but with a weak and usually toothless hinge. The 'common' mussel (*Mytilus edulis*) of all northern coasts is in the Old World much raised for food, but its greatest importance in the United States lies in its usefulness as bait for fishermen and as manure for farmers near the coast.

It is gregarious and occurs in masses, closely crowded together, adhering to rocks, sand, and each other, by the very tough byssus, the whole 'beds' being thus practically spun together. These beds are generally in shallow water, less than thirty fathoms, and are often exposed at low tide. The shell is oblong with a terminal umbone, and generally about three inches long by an inch and a half wide; but under favorable conditions they may become six inches or even more in length. The outside of the shell is black, but inside it is pearly blue. When young, mussels move about, but they soon anchor themselves by the byssus, and unless artificially disturbed will remain fixed throughout life. So strong are the byssus-threads that these mollusks have been utilized as an aid in the strengthening of breakwaters, the young mussels being planted on the rocks in myriads and thus assisting in uniting the separate pieces into a rigid whole. The horse-mussels (q.v.) belong to the genus Modiola, which does not have the umbone terminal. They are more elongated than Mytilus and some species reach a much larger size. See Colored Plate of CLAMS AND MUSSELS.



AMERICAN MARINE MUSSELS.

a, common edible mussel (*Mytilus edulis*); *b*, horse or meadow mussel (*Modiola modiolus*); *c*, ribbed mussel (*Modiola plicatula*).

The other group to which the name mussel is given is the family Unionidæ, which are fresh-water mollusks of very wide distribution. The family is characterized by the possession of two adductor muscles and regular shells, with thick epidermis and thin nacreous layer, prominent external ligament, and a variable hinge. Upward of a thousand species have been named, a very large proportion of which occur in the United States, where the family is very abundant and widely distributed. It is still an open question as to what constitutes a valid species or even a genus in this family, though several genera, as Unio, Anodon, and Margaritana, are recognized. These fresh-water mussels occur in lakes, ponds, and streams, generally in large numbers together, and are sometimes eight inches or more in length, by four in breadth, but they are usually smaller and narrower. They are sometimes used for food, but are tough and not very palatable. Their chief importance lies in the fact that they frequently produce pearls, and are indeed the only basis of the fresh-water pearl industry. As high as $25,000 has been paid for a single mussel-pearl. (See PEARL). All of the Unionidæ have a remarkable life-history, for the eggs when laid find their way into the mother's gills, where they remain until the young are hatched. Although these young have a bivalve shell, they are totally different from the adults and have a very simple structure. At this stage of development they are called 'glochidia' larvæ. After leaving the maternal gills they attach themselves to the skin of a fish, where they give rise to an excrescence which gradually swells until it is a capsule big enough to see with the naked eye. These capsules are almost black and are usually seen on or near the fins of the host fish; they are often very numerous on a single fish. Within the capsule the glochidium lives until it finally assumes the adult form, when it breaks through the outer wall of the capsule and settles to the bottom, as a miniature mussel. The distribution of the species is therefore mainly dependent on the activity of the fishes which serve as hosts.

Fossil mussels are found in most geological formations from those of Ordovician age to those of recent time. They comprise the superfamily Mytilacea, containing the families Modiolopsidæ, Mytilidæ, and Dreissensiidæ. The first, now entirely extinct, are essentially ancestral forms of the Mytilidæ, which range through Devonian to recent formations. The Paleozoic species of this family belong mostly to the genus Modiola, which began in Devonian, was abundant in Jurassic and Tertiary time, and still persists as a common shell of the littoral zone of all seas. Mytilus began in the Triassic. Lithophagus or Lithodomus, the mussel which bores cavities in limestone rock, has been recognized in Mesozoic and Tertiary formations. The Dreissensiidæ are of later origin, appearing first in the Tertiary. They are essentially fresh-water and estuarine mussels, and have probably evolved from Mytilus or a closely allied genus of the littoral zone in late Mesozoic or early Tertiary time. See Plate of ABALONE, ETC., and illustration under MOLLUSK.

MUSSELBURGH, mŭs'sel-bŭr-ō̇. A small seaport town and Parliamentary burgh in the county of Edinburgh, Scotland, at the mouth of the Esk, 3½ miles north by east of Dalkeith (Map: Scotland, F 4). Tanning, leather-dressing, and the manufacture of sail-cloths, nets, and salt are carried on. The harbor at Fisherrow is frequented by coasting craft, and by small vessels from Holland and the Baltic. There are famous golf-links here. In the vicinity are interesting antiquities. Population, in 1891, 8888; in 1901, 11,704.

MUSSEL-DIGGER. A popular name for the California gray whale.

MUSSEL SCALE. A diaspine scale insect of the genus Mytilaspis, all of the species of which bear scales shaped like a mussel shell or the shell of an oyster. Several species are very injurious to vegetation. The so-called 'oyster-shell bark-louse' of the apple (*Mytilaspis pomorum*) is a cosmopolitan enemy of apples and pears; and the long scale and the purple scale of the orange (q.v.) are pernicious examples.

MUSSET, mụ'sȧ', ALFRED DE (1810-57). A noted French poet, dramatist, and novelist, born in Paris, November 11, 1810. His father was a man of letters, and Alfred grew up in a literary atmosphere, was graduated with honors at the Collège Henri Quatre, and published at twenty his first verses, *Contes d'Espagne et d'Italie* (1830). This, with *Poésies diverses* (1831), and *Le spectacle dans un fauteuil* (1832), established his fame. The latter contained a poem, *Namouna*, and two short plays in a manner peculiarly his own, *La coupe et les lèvres* and *A quoi rêvent les jeunes filles.* He had already produced on the stage a comedy, *La nuit vénitienne* (1830), a failure. In 1833 he followed the dramatic vein in two tragi-comedies, *André del Sarto* and *Les caprices de Marianne,* possibly his best. *Rolla,* too, belongs to this year, and was once thought the French *Childe Harold,* though now less admired. This sudden flowering of Musset's genius was interrupted by a reckless passion for George Sand (q.v.), whom he first met in the summer of 1833, and accompanied in 1834 to Italy as her 'secretary.' He suffered acutely in this new relation from disillusionment and self-deception. He "was a child all his life and a spoiled child," never more so than in the inevitable estrangement (1835) that cost George Sand few pangs, but marks a cardinal point in Musset's career. He returned sick, experienced another unhappy love and a series of sordid entanglements, and worked intensely and admirably, at intervals interspersed with periods of depression. Through the patronage of the Duc d'Orléans he received a position as librarian in 1838.

Musset's work after the separation from George Sand (*Les nuits, Ode à la Malibran, Lettre à Lamartine, Espoir en Dieu*) shows at its best a sad, yet in the main sober, resignation. But during this period he was more occupied with drama and with prose fiction. Of the *Comédies et proverbes, Fantasio* and *On ne badine pas avec l'amour* belong to 1834, *Le chandelier* to 1835, *Il ne faut jurer de rien* to 1836. *Lorenzaccio,* an historical drama (1834), had no success. These, as Lemaître points out in his preface to Jouaust's *Théâtre d'Alfred de Musset,* show the most genuine and original dramatic talent of all the Romantic School. Tragedy mingles here with comedy, not as with Hugo by juxtaposition, but by interpenetration, for Musset had too true a taste to yield to the extravagances of Dumas or Hugo. In an essay *La tragédie* (1838) he refuses allegiance alike to French romantic or classic principles, but he combines the outward appearance of restraint with the new liberty to associate the weird and terrible in human life with its higher comic aspects. Thus he succeeded in presenting complex characters better than any of his contemporaries or predecessors in French drama. His wit in dialogue had not been equaled since Beaumarchais. None of these plays was acted in France before 1848, and their influence is hardly noticeable before 1865, but they contain the quintessence of romantic imaginative art. They show most and best the unchecked freedom of fancy that joined with the spirit of realistic comedy in Ponsard, Dumas, and Augier to produce the modern French drama. Musset's prose fiction begins with *Les confessions d'un jeune homme du siècle* (1836), which in spirit at least is autobiographic. This was followed by nine *Contes* (1837-44), of which *Croisilles* is best, and a tenth, *La mouche* (1851), one of the last flickerings of his genius. These are interesting chiefly in exhibiting the progress of ethical disintegration. *Margot* and *Le merle blanc* have autobiographic elements. So perhaps has *Mimi Pinson,* a 'profil de grisette' (1845). In this story Musset anticipates by some six years a type of the French working girl portrayed by Henri Murger (q.v.). Mimi has few clothes, but she looks as tidy as she can, and has the pretty manners, the recklessness as to the future, and the easy morality of the *grisette.* Musset's critical essays are also worthy of remark, especially the witty *Lettres de Dupuis et Cotonet,* satirizing modern marriage, journalists, novelists, and, above all, the critics of thoroughbred Romanticism. Musset's closing years were marked by dejection and by comparative inactivity. In 1841 he flung at the Germans his fiery war song, *Le Rhin allemand.* In 1845 appeared *Il faut qu'une porte soit ouverte ou fermée,* a *proverbe.* In 1847 *Un caprice* (1837), a little tragedy with a chorus to utter platitudes in Greek style, was performed at the Théâtre Français. Between 1848 and 1851 *Bettine* was played, and *Carmosine* was written, but they are scarcely worthy of their author.

Musset died of an affection of the heart, May 2, 1857. His works were published in ten volumes in 1865.

Consult: Sainte-Beuve, *Portraits contemporains,* vol. ii., and also his *Causeries du lundi,* vols. i., xiii.; George Sand, *Elle et lui* (Paris, 1859); Paul de Musset, *Lui et elle* (ib., 1860); id., *Biographie d'Alfred de Musset* (ib., 1877); Jaubert, *Souvenirs* (ib., 1881); Faguet, *Etudes littéraires sur le XIXème siècle* (ib., 1887); Lemaître, *Introduction au théâtre de Musset* (ib., 1885-89); Palgrave, *Oxford Essays* (Oxford, 1855); Lindau, *Alfred de Musset* (Berlin, 1870); Spoelbergh de Lovenjoul, *Etude critique et bibliographique sur les œuvres d'Alfred de Musset* (Paris, 1867); Barine, *Alfred de Musset* (ib., 1893).

MUS′SEY, Reuben Dimond (1780-1866). An American surgeon, born at Pelham, N. H. He graduated at Dartmouth in 1803, and received the degree of M.D. from the University of Pennsylvania in 1809. He held medical professorships at Dartmouth, Cincinnati, and Miami Medical College, and gained a high reputation as a bold and skillful operator. He was the first to tie both carotid arteries, and the first to remove completely the shoulder blade (1837); and was unusually successful in lithotomy and operations for strangulated hernia. He wrote *Health: Its Friends and Its Foes* (1862).

MUS′SULMAN. See Moslem.

MUSTAGH (mo͞o-stäg′) **MOUNTAINS.** A mountain range in Kashmir. See Karakorum.

MUSTANG. See Horse, and Plate of Equidæ.

MUSTAPHA, mo͞o′stȧ-fä. The name of four Ottoman sultans. The first (1591-1639), a son of Mohammed III., succeeded Achmet I. in 1617, was deposed after three months, came to the throne again in 1622, and was again deposed (1623). He was feeble-minded.—Mustapha II. (1664-1704) came to the throne in 1695, and at the Peace of Carlowitz signed away the Morea, the Ukraine, Hungary between the Danube and Theiss, and Azov. He was deposed by a rising of the Janizaries in 1703.—Mustapha III. (1717-74) ruled from 1757 until his death. He quarreled with Russia and Poland and involved the country in war which lasted through his reign. His internal reforms were no more successful than his foreign policy.—Mustapha IV. (1779-1808) was made Sultan by the Janizaries, who rebelled against Selim III. in 1807, and was deposed and killed in the next year.

MUSTAPHA, Kara, kä′rȧ. A Turkish grand vizier. See Kara Mustapha.

MUSTARD (OF. *moustarde*, Fr. *moutarde*, from OF. *moust*, from Lat. *mustum*, must, neu. of *mustus*, fresh), *Brassica*. A genus of plants of the natural order Cruciferæ, having yellow flowers, and linear or oblong pods, which terminate in a sword-shaped, compressed, or four-cornered beak, and contain one row of seeds. The black mustard (*Brassica nigra*) is an annual, which grows wild in fields and by waysides in the middle and south of Europe. Its pods are bluntly four-angled, smooth, erect, and lie close to the stem, their valves one-nerved; the leaves are smooth, the lower ones lyrate, the upper linear-lanceolate; the seeds are brownish black. White mustard (*Brassica alba*), also a native of most parts of Europe, is an annual having divergent pods covered with stiff hairs, the valves five-nerved, the seeds yellowish, the leaves pinnatifid. Both these species are cultivated in Europe and to a limited extent in America, for their seeds, which are ground into powder to make the well-known condiment called mustard. The mustard of commerce is frequently mixed with flour and commonly colored with turmeric. The powder of the seeds is also much used in medicine as a rubefacient. Mustard seeds depend for their pungency on a principle which, when water is added to black mustard, forms volatile oil of mustard. There is also in the seeds a bland fixed oil, oil of mustard, which is obtained from them by expression, and constitutes about 28 per cent. of their weight. White mustard is often sown in gardens and forced in hot-houses for use as a salad. It is also sometimes sown as a green manure crop and for feeding sheep, when turnip or rape has failed. Wild mustard, or charlock (*Brassica arvensis*, or *Sinapistrum* of some botanists), which is distinguished by turgid and knotty pods with many angles and longer than the two-edged beak, is a troublesome annual weed in both Europe and America. It is controlled by spraying with a 2 per cent. solution of copper sulphate or 12 to 15 per cent. iron sulphate at the rate of 50 to 70 gallons per acre. (See HERBICIDE.) Indian mustard (*Brassica ramosa*) is extensively cultivated in India for its seeds, which are used as a condiment, as are those of *Brassica dichotoma* and *Brassica glauca* (regarded by some botanists as forms of *Brassica arvensis*), also cultivated in India. Other species are *Brassica japonica*, used to a considerable extent in the United States for greens; a turnip-rooted Chinese form (*Brassica napiformis*), and Chinese mustard (*Brassica juncea*). See illustration of CABBAGE ALLIES.

MUSTARD FAMILY. A natural order of plants. See CRUCIFERÆ.

MUSTARD OIL, or OIL OF MUSTARD, chemically known as *allyl iso-sulphocyanate*, C_3H_5NCS. A volatile oil obtained from black mustard, the seeds of the Brassica nigra, growing in Asia and in Southern Europe. The seeds contain a bland fixed oil which may be removed by expression, but they do not contain the volatile oil ready-formed. The latter is produced by the action of a soluble ferment (myrosin) upon the potassium salt of myronic acid (a glucoside), in the presence of water. Both myrosin and potassium myronate are contained in black mustard seeds. If, therefore, after the fixed oil has been removed, the crushed seeds are treated with water and distilled, the volatile oil is obtained, in much the same way as the volatile oil of almonds is obtained from bitter almonds. (See ALMONDS, VOLATILE OIL OF.) Mustard oil is a very volatile colorless liquid, having a painfully pungent odor and an acrid taste; when applied to the skin it speedily raises blisters; it is insoluble in water, and, if pure, boils at 151° C. Its formation from potassium myronate takes place according to the following chemical equation:

$$\underset{\substack{\text{Potassium}\\\text{myronate}}}{KC_{10}H_{18}NS_2O_{10}} = \underset{\substack{\text{Mustard}\\\text{oil}}}{C_3H_5NCS} + \underset{\text{Glucose}}{C_6H_{12}O_6} + \underset{\substack{\text{Acid}\\\text{potassium}\\\text{sulphate}}}{KHSO_4}$$

The pungency of ordinary mustard as a condiment is due to the formation of the volatile oil on addition of water. The allyl iso-sulphocyanate prepared by an artificial process in the chemical laboratory, is identical with the volatile oil obtained from mustard seeds.

The term *mustard oils* is often applied to organic iso-sulphocyanates in general.

MUSTEL'IDÆ (Neo-Lat. nom. pl., from Lat. *mustela*, weasel, from *mus*, mouse). The family of small carnivores, represented by the weasel, and embracing the more highly valued fur-bearing animals. They are related to the arctoid Carnivora, especially the bears, and the family includes three groups, as follows: (1) Melinæ (the Old World badgers); (2) Mustelinæ (grison, marten, sable, wolverine, polecat, weasels, ratel, American badger, and skunks); (3) Lutrinæ (otters). Consult authorities cited under CARNIVORA, especially Beddard and Coues. See FUR-BEARING ANIMALS.

MUSTER (from OF. *mostre*, *monstre*, Fr. *montre*, show, from Lat. *monstrare*, to show, from *monstrum*, portent, monster, from *monere*, to warn). When used in its military sense, this term applies particularly to the assembling of troops for the verification of membership. In the United States the troops are mustered for pay on the last day of each month, each stated muster being preceded by a minute inspection. In the British Army there is a special muster parade once each year, when every individual of each command must respond in person to the regimental muster roll. In the navy the crews are frequently assembled or mustered for the purpose of ascertaining if all are on board or for drill or instruction or reading general orders. Once a month (on the first Sunday occurring in the month) the officers and crew of the vessels of the United States Navy are called to 'general muster.' The presence of the officers is ascertained by inspection; but the names of the crew are called by the paymaster or his clerk, and each man in turn, except petty officers, as his name is reached, passes across the deck, before the captain. It was formerly the custom to muster the crew aft and read the *Articles for the Better Government of the Navy*, and then call the muster roll of the crew. The two performances now take place on different Sundays.

MÛT, mo͞ot. An Egyptian goddess, the wife of Ammon (q.v.) of Thebes, and the mother of Chons (q.v.). Her name signifies 'mother,' and in the inscriptions she is entitled 'the lady of heaven, the queen of the earth.' The chief temple of the goddess was at Karnak; it was connected with the great Temple of Ammon by a long avenue of sphinxes, and was partly surrounded by the sacred lake Asher. From the latter circumstance Mût is often called 'the lady of Asher.' She is frequently represented as a lion-headed goddess wearing upon her head the solar disk, but in mural decorations she is more commonly depicted in human form wearing the vulture head-dress and other symbols of a queen of Egypt. Consult: Wiedemann, *Religion of the Ancient Egyptians* (New York, 1897); Benson and Gourlay, *The Temple of Mût in Asher* (London, 1898).

MUTANABBI, moo͞′tá-nä′bė (Ar. *Abu al-Ṭayyib Aḥmad ibn al-Ḥusain al-Mutanabbi* (905-965). One of the most noted of the Arabic poets of the period of decline. He was born in Syria, the son of a water-carrier, and spent several years in the desert *al-Samāwa* (Mesopotamia). He was not a fervid Moslem, and at one time even put himself forward as a prophet (whence his name, *Mutanabbi*, 'the one claiming to be a prophet'). He was taken prisoner by Lulu, the Ikhshid Emir of Emesa. After being set at liberty he lived in great poverty and neglect, but in 948 became attached to the Court of Saif al-Dawlah at Aleppo, whom he accompanied on his raids, and whose praises he sang. He left Saif al-Dawlah in 957, going over to his enemy the Ikhshid Kafur of Egypt. In 961 he went to Bagdad, and at last to Shiraz, where the Bujide Adud al-Dawlah became his patron. He was murdered in 965 on the road from Shiraz to Kufah. His *Diwān*, containing 289 poems, has been very widely read in the East, where he is considered the last great Arabic poet, perhaps because of his intense national feeling. No less than forty commentaries have been written on his *Diwān*. Mutanabbi is the type of the Court singer, his theme the battle and the heroic deeds of his patrons. His songs lack the fire of the earlier Bedouin poetry and are artificial, but their technical excellence cannot be denied. They have been edited by Dieterici, with the commentary of *al-Wāḥidī* (Berlin, 1861), and published at Bulak (1860) and Cairo (1870 and 1890) with that of *al-'Ukbarī*. Other editions are: Calcutta (1815), Beirut (1860), Bombay (1892). The *Diwān* has been completely translated by Hammer-Purgstall, *Motenebbi der grösste arabische Dichter* (Vienna, 1824); extracts may be found in Rückert's *Hamasa* (Stuttgart, 1846), and in Ouseley, *The Oriental Collection*, vol. i. (London, 1797). Consult: Bohlen, *Commentatio de Mutanabbio*, (Bonn, 1824); Dieterici, *Mutanabbi und Seifuddaula* (Leipzig, 1847).

MUTATION. See UMLAUT.

MUTATION THEORY (Lat. *mutatio*, change, from *mutare*, to change, for *movitare*, frequentative of *movere*, to move, Skt. *mīv*, to push). The hypothesis that evolution (q.v.) takes place by means of sudden changes rather than through slow and almost imperceptible transformations. This idea, though not new, has been called into great prominence by the publication in 1901 of *Die Mutationstheorie* by Prof. Hugo DeVries, professor of botany at Amsterdam. Darwin himself, especially in his earlier works, recognized that 'single variations' or sports are to be reckoned with as well as natural selection. Through the influence of Wallace and others, natural selection had come to be the ruling theory, and it is only in recent years that the significance of sports in evolution has had much place. However, as long ago as 1864 Kölliker made an appeal for heterogenesis (which is identical with the mutation of De Vries) as a factor in the evolution of species. Professor Scott of Princeton has published similar views, using the word mutation. Still other writers have referred to the sudden origin of species as saltatory evolution. But De Vries is the first author who has performed experiments and worked out a theory to fit the facts which they have yielded.

Before taking up the experiments it may be said that mutation involves no necessary abandonment of natural selection, except in so far as it may have been held to account for the actual origination of new characters. Darwin recognized that natural selection improves but cannot originate anything new; mutation, on the other hand, is a means for the development of new characters, and even a new assemblage of characters, i.e. a new species. It should be stated, however, that DeVries gives but little place to natural selection, even as a means of improving something already present. His experiments show that there is a definite and rather narrow limit to individual variation, and the full advantage of artificial selection along any given line can usually be obtained within a few generations, as in the parsnip or carrot. He claims also that natural selection never fixes a character, but that reversion to the original may occur after many generations. Mutation, on the other hand, is believed to bring into existence something wholly new, without any transitions or connecting links. The new form, i.e. the mutant, remains fixed from the outset, and if it is fit, it will remain as a new species.

In 1886 De Vries observed a colony of evening primrose (*Œnothera Lamarckiana*) in which were two forms differing strikingly from the common type. Feeling that these aberrant forms doubtless came from the same parentage as the more common forms, he made artificial cultures to see if further aberrant forms would develop. He found such to be the case to an astonishing degree. Out of 50,000 seedlings of *Œnothera Lamarckiana* in the various years of study, 800, or about 1.5 per cent., were mutants, while 98.5 per cent. came true to seed. More than one-fourth of the 800 mutants were of one type, which De Vries named *Œnothera lata*, i.e. this form appeared anew in cultures more than 200 times. A form which he called *Œnothera gigas* appeared but once. When cultures are made from these new forms they are found to come true to seed except for occasional mutations; nor was any tendency to reversion observed. To these new forms, as to the two aberrant types observed in 1886, De Vries has given names which imply that these forms are actually new species. They have, he says, all the characteristics of species, differing not in one, but in several characters, and remaining constant in all cultures. He shows that they are as much entitled to be considered separate species as are the various members of the natural group to which the parent *Œnothera Lamarckiana* belongs. Indeed, it is possible to identify most of the new species even while yet seedlings. There are no transitions between parent and offspring, or between one new species and another. There is no slow and gradual fixation of characters by natural selection, but the new species is complete from the outset. Most of these new forms would doubtless disappear in a natural state, for they would be obliged to engage in a keen struggle with species already present, or would gradually suffer the loss of their specific characters through hybridization. However, some new species, especially if stronger than the parent form, might survive and extend their area; the two aberrant types first observed in a field in 1886 are still to be seen there and in greater numbers. Thus it may be said that De Vries has seen the birth of new species, a phenomenon which all evolutionists have wished to see.

It is of interest to observe that independently and almost simultaneously with De Vries, Korschinsky has brought together a vast mass of data under the title "Heterogenesis and Evolution." From the records of gardeners and horticulturists he has concluded that most cultivated 'varieties' of plants have arisen suddenly as sports, i.e. through heterogenesis or mutation.

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MUTAZ'ILITES (Ar. *Mu'tazilah*, from *'azala*, to separate). A Mohammedan sect founded by Wasil ibn Ata (c.745) and his disciple Abu al-Hudhail al-Allaf (died c.845). They had rationalistic tendencies, illustrated, e.g. by the teaching of Abu al-Hudhail, that man knows right and wrong by reason, independent of supernatural revelation. Later teachers developed several subdivisions of the sect. See MOHAMMEDAN SECTS.

MUTE (from Lat. *mutus*, dumb; connected with Skt. *mūka*, dumb). A small instrument used to modify the sound of any of the string instruments. It is made of hard wood, ivory, or brass, and is attached to the bridge by means of a slit, a leg of it being interjected between every two strings. The use of the mute both softens the tone and imparts to it a peculiar muffled and tremulous quality, which is sometimes very effective. It is much used in dramatic music to give color in dream-like or mystic stituations. Its application is indicated by the letters *c. s.*, or *con sordini*, and its discontinuance by *s. s.*, or *senza sordini*. Mutes for brass instruments are wooden cones with a hole bored through them so as to allow the passage of the air. They are inserted into the bell of the instrument. But, as their insertion affects the pitch of the instrument, these mutes must be used with the utmost care. Recently attempts have been made to construct complicated mutes for brass instruments that shall not affect the pitch. In the case of horns and trumpets the left hand is used as a mute. Mutes are also used for drums. On snare-drums a piece of cloth or felt is inserted on the lower side between the membrane and the snares. Kettle-drums are covered with a cloth or the membrane is lightly touched with the left hand. On the piano the soft pedal is frequently called mute.

MUTES. A term applied in phonetics (q.v.) to articulate sounds, also called occlusives, produced by a momentary closure, followed by a reopening of some portion of the oral passage. The mutes are either voiced (sonant, breathed) if the breath-stream makes the glottal chords vibrate, or unvoiced (surd, unbreathed) if the glottal chords are at rest, as *b, p*: *d, t*: *jh, ch*. With respect to the point of occlusion mutes are classified as gutturals, *k, kh, g, gh*; palatals, *c, ch, j, jh*; cerebrals (linguals, cacuminals), *ṭ, ṭh, ḍ, ḍh*; dentals, *t, th, d, dh*; and labials, *p, ph, b, bh*. The essential physiological condition for the mutes lies not in the closure, but in the reopening of the oral passage, while their quality is determined by the presence or absence of breath, and by the point of the occlusion.

MU'TIA'NUS, CONRADUS RUFUS (1471-1526). A German humanist, whose name in the vernacular was Konrad Mut. He was born at Homberg; studied under Hegius at Deventer, then at Erfurt, and for six or seven years in Italy. Thence he brought to Germany the idea of a humanistic association or academy, and by his letters from Gotha became the centre of the *Mutianische Bund*, which included Justus Jonas and Camerarius. Although he did not make common cause with Luther, Mutianus and his followers boldly attacked the abuses of the Church, and it seems certain that the *Epistolæ Obscurorum Virorum* owed their authorship to this circle. Consult Gillert, *Der Briefwechsel des Konrad Mutianus* (Halle, 1890).

MUTINY (from OF., Fr. *mutin*, mutinous, from *meute*, sedition, from ML. *mota*, revolt, *muta*, change, from Lat. *mutare*, to change). Mutiny at military law is unlawful opposition or resistance to lawful military authority with intent to subvert the same or to nullify or to neutralize it for the time. (Winthrop, *Military Law*, p. 892.) The acts constituting mutiny are exciting, causing, or joining in any mutiny or sedition in any troop, battery, company, party, post detachment, or guard, and are punishable with death or such other punishment as a court-martial may direct. (Twenty-second Article of War.) The punishment of death or such other punishment as a court-martial may adjudge may be inflicted on any person in the naval service who commits any of the acts which constitute mutiny. (Revised Statutes, Sec. 1624.) In England an annual act of Parliament passes to punish mutiny in the army and navy. (See MUTINY ACT.) Under the British articles "every one commits felony, and is liable upon conviction thereof to penal servitude for life as a maximum punishment, the maximum alternative term of imprisonment being three years, who maliciously and advisedly endeavors (a) to seduce any person serving in His Majesty's forces by sea or land from his duty and allegiance to His Majesty; or (b) to incite or stir up any such person to commit any act of mutiny, or to make or endeavor to make any mutinous assembly, or to commit any traitorous or mutinous practice whatever."

While mutiny is, in general, a concerted proceeding, a single officer or soldier may commit the offense. It is an offense punishable with death for a soldier or officer being present at a mutiny not to use his utmost endeavor to suppress it, or having come to the knowledge of a mutiny (or intended mutiny), not to give information of it to his commanding officer. (British and American Articles of War.)

Acts not characterized by an intent to subvert lawful authority, while they do not come within the legal definition of mutiny, may be regarded and punished as conduct tending to mutiny, but clear of the completion or commission of the offense. The law makes a distinction between mutiny and mutinous conduct, the latter being charged, and tried by court-martial, not under the mutiny articles, but as conduct to the prejudice of good order and military discipline.

Mutiny at Maritime Law is committed when there is a usurpation of the authority and command of a ship and an overthrow of that of the master or commanding officer. Any conspiracy to accomplish such an object, or to resist a lawful command of the master for such purpose; any endeavor to stir up others of the crew to such resistance, is an endeavor to commit a revolt within the meaning of the statute of 1790. (1, Stat. L., 113; *Abbott's National Digest*, 3. Mutiny.) The offense of making a revolt or mutiny on a ship is no longer punishable as a capital offense. (Act of March 3, 1835.)

For United States law on the subject of mutiny, see Revised Statutes, Sec. 1324, Arts. 22 and 23; Sec. 1624, Arts. 4 and 8; Secs. 4956, 5359, 5360.

MUTINY ACT. An act of the British Parliament passed from year to year, investing the Crown with powers to regulate the government of the army and navy, and to frame the articles of war. By the Bill of Rights, the maintenance of a standing army in time of peace, unless by consent of Parliament, was declared illegal, and from that time the number of troops to be maintained, and the cost of the different branches of the service, have been regulated by an annual vote. But Parliament possesses a further and very important source of control over the army. Soldiers, in time of war or rebellion, being subject to martial law, may be punished for mutiny or desertion; but the occurrence of a mutiny in a Scotch regiment soon after the Revolution of 1688, raised the question whether military discipline could be maintained in time of peace; and it was decided by the courts of law, that, in the absence of any statute to enforce discipline and punish military offenses, a soldier was only amenable to the common law of the country. The authority of the legislature thus became indispensable to the maintenance of military discipline, and Parliament, since 1689, at the beginning of every session, conferred this and other powers in an act called the Mutiny Act, limited in its duration to a year. In July, 1879, the Mutiny Act and the Articles of War were consolidated with a few changes into a complete military code called the Army Act, passed annually as before.

MUTSUHITO, mụt′sụ-hē′tō̇ or mụ-t′-sē′tō̇ (1852—). The name of the present Emperor of Japan, but little used and unknown to the vast majority of his subjects. The common people call him *Tenshi Sama*, 'August Son of Heaven,' and educated folks say *Shu-jo*, 'Supreme Master.' He succeeded to the throne February 3, 1867. Still a youth, he exercised little control during the earlier part of his reign, while Japan was being transformed into a modern nation, and opinions differ as to his activity in later years. He accepted the part of a constitutional ruler, and his influence on the Government became less apparent than that of the least self-assertive European monarch. No hostile criticism has been directed against him and his character has been considered blameless. His history is merged in the history of the Empire. He married the daughter of a noble on February 9, 1869.

MUTTON-BIRD. See Shearwater.

MUTTON-FISH. (1) A fish of the large, widespread group of eel-pouts, the eel-pout or mother-of-eels (*Zoarces anguillaris*) of the North Atlantic coasts. It feeds upon shellfish, may be caught with a hook in the bays north of Cape Cod, and reaches a weight of six to seven pounds. It spawns in late summer and produces a few large eggs. (2) One of the snappers (*Neomenis analis*) of the West Indies. (3) One of the mojarras (*Gerres olisthostomus*), also called 'Irish pompano.'

MUT′TRA. The capital of a district in the United Provinces, British India, 23 miles northeast of Bhartpur, on the right bank of the Jumna (Map: India, C 3). The city extends in crescent form for about 1½ miles along the right bank of the river, to which access is facilitated from a paved street by numerous ghats and chatburahs, ornamented with pavilions and temples. The devotional ablutionary exercises of the mixed crowds morning and evening constitute one of the characteristic sights of the city. Ravines intersect the town, and the streets are narrow, dark, and steep. The Hardinge, or Holi entrance gate, is a notable monument, and the houses of some of the wealthier native class are adorned with fine sculptures. There are numerous mosques and temples, of which the Jumma Musjid, dating from 1660, is the chief. Among interesting remains are the ruins of Akbar's fort, centrally situated on the river bank, and the observatory built by the celebrated astronomer Jey Singh, who became Prince of Amber in 1693, still containing several astronomical instruments. Modern features are the museum, botanical gardens, the European churches, and the extensive military cantonments to the south of the city. As early as the fourth century, Muttra is mentioned as a centre of Buddhism. As the reputed birthplace of Krishna and his brother Balarama, it is annually visited by thousands of pilgrims on the occasions of its religious festivals. The river abounds with turtles, and the streets swarm with monkeys, peacocks, paroquets, and sacred bulls, which are permitted to roam at large, protected and fed by the people. Muttra anciently was of great importance, and its splendor and wealth made it an object of attack to the first Afghan invaders; Mahmud of Ghazni in 1017 plundered and burned the city and carried off idols of gold, silver, and precious stones, valued at $1,500,000. In 1500, 1636, 1669, and 1756, it again suffered capture and spoliation. Since the British occupation in 1803, it has regained some of its former importance. During the Indian Mutiny of 1857, the Sepoys here murdered their British officers and joined the insurgents at Delhi. Population, in 1891, 61,195; in 1901, 60,042.

MUTUALISM (from *mutual*, from OF. *mutu*, from Lat. *mutuus*, reciprocal, from *mutare*, to change). That type of symbiosis (q.v.) in which each symbiont is believed to gain by the presence of the other. It has not been absolutely proved that a case of complete mutualism exists, though in the root tubercles (q.v.) of the Leguminosæ the evidence for mutualism is very strong.

MU′TULE (Lat. *mutulus*, mutule, modillion). A rectangular block under the corona of the cornice of the Doric order. One is regularly placed over each triglyph and metope. On each mutule are worked three rows of six *guttæ* or drops. They probably represent the heads of the nails by which the wooden block was fastened in the primitive brick and wood style from which the Doric order developed. See ENTABLATURE.

MUTUUM (Lat., loan). A loan of any article or commodity for consumption by the borrower, who agrees to return the articles in *kind.* The term and the rules governing such contracts originated in the Roman law, and were adopted into the English and Scotch law at an early period and became a part of the common law. It is not a true bailment, as the article itself is not to be returned, and it does not create a debt, as no money payment is to be made. The title to the commodity lent passes to the borrower, and, therefore, it seems like a contradiction in terms to employ the terminology of bailments to such contracts. It has been held in a few States that the delivery of grain to a miller for grinding is a contract of *mutuum,* and that the miller is only bound to return flour of the same quality that the grain delivered would have produced. The important effect of this doctrine on such a state of facts would be that the miller would still be bound to deliver the flour if the grain were destroyed. Consult Story, *Bailments; id., Fungibles.*

MUYSCA, mu̥-ē'skȧ. A confederacy of South American Indians. See CHIBCHA.

MUZAFFAR-ED-DIN, mōō-zä'fēr-ĕd-dēn' (1853—). Shah of Persia, the second son of Nasr-ed-Din (q.v.). He was born at Teheran, March 25, 1853. He was appointed Governor of the Province of Azerbaijan, but was recalled for failing to suppress an uprising of the Kurds. Already declared heir apparent during his father's lifetime, Muzaffar-ed-Din became Shah June 8, 1896, after Nasr-ed-Din's assassination by a Babi (see BABISM) on May 1. In early life an almost fanatical Mohammedan, he showed great tolerance as Shah, particularly in his repression of an outbreak against the Christian Armenians at Kazoni in 1899. He further relieved his subjects at his accession of the taxes on meat and bread, and likewise abolished the system of purchase of civil and military positions. Of this change from his earlier character the European influence, especially that of the French, under which he came in Teheran, is the main cause. He twice visited Europe, first at the time of the Paris Exposition in 1900, when an unsuccessful attempt to assassinate him was made by an anarchist named Salson, and again in 1902.

MUZAFFARPUR, mŭz'äf-ēr-pōōr'. The capital of a district in Bengal, British India, on the right bank of the Little Gandak River, 37 miles northeast of Patna (Map: India, E 3). It is a well-built town with a numerously attended high school and a German mission. Saltpetre is largely mined in the district, and there is a considerable trade, especially in indigo and saltpetre. Population, in 1897, 49,192; in 1901, 45,617.

MUŽÁKOVÁ, mu̥'zhä-kô'vä, JOHANA (1830—). A Bohemian novelist, known by her pseudonym, Karolina Světla. She was born at Prague and her name was Rott before she married Professor Mužák. After 1858, when her first novel, *Double Awakening,* was published, she produced more than fifty works of fiction, such as: *Láska k básnikovi* ("Poet's Love," 1860); *Prvni Česka* (1861); *Vesnicky roman* ("Village Romance," 1869); *Frantina* (1870); *Kriz a potoka* ("The Cross Beside the Stream," 1871); and *Barbara* (1873), besides essays, memoirs, and songs.

MUZIANO, mōō'tsē-ä'nō, GIROLAMO (1528-92). An Italian painter of the Mannerist School. He was born at Aquafredda, near Brescia, whence he was also called Bressano. His first master was the painter Girolamo Romanino, and he afterwards studied in Venice under Titian. Proceeding to Rome, he adopted the manner of Michelangelo, whose favor he gained by his first painting of importance, "The Resurrection of Lazarus," now in the Quirinal Palace. He is best known for his improvement of mosaics and the foundation of the Academy of Saint Luke, which was largely due to his efforts and endowment. He was also celebrated among contemporaries for his landscapes. Most of his pictures are in the palaces and churches of Rome. Among the best are: "Descent from the Cross," Borghese Gallery; "Christ Giving the Keys to Peter," his masterpiece; and a "Flagellation," in the Vatican. His principal surviving frescoes are in the Vatican and at Foligno. Though an imitator of Michelangelo, he preserved the excellencies of Venetian coloring. He died in Rome, April 27, 1592.

MY'ALI'NA (Neo-Lat., diminutive of Lat. *mya,* from Gk. μύαξ, *myax,* sea-mussel, from μῦς, *mys,* muscle, mussel, mouse). A fossil pelecypod somewhat resembling in shape a mussel (Mytilus), that is very common in the Carboniferous and Permian rocks, and hence an index fossil of those periods. The genus is of interest also as possibly representing an intermediate stage between the Aviculidæ and Mytilidæ, with both of which families it has characters in common.

MYC'ALE (Lat., from Gk. Μυκάλη, *Mykalē*). The ancient name of a mountain, now called Samsun, in the south of Ionia in Asia Minor. It terminates in the promontory of Cape Santa Maria, opposite the island of Samos. To the shore of this promontory the fleet and army of Xerxes withdrew in B.C. 479 on the news of the approach of a Greek fleet. The Greeks under the Spartan King Leotychides and the Athenian Xanthippus, father of Pericles, followed them, landed, and after a severe struggle stormed the Persian camp and burned the ships.

MYCE'LIUM (Neo-Lat., from Gk. μύκης, *mykēs,* fungus + ἧλος, *hēlos,* nail, wart). A collection of fungal filaments (hyphæ) making up the plant body. See FUNGI.

MYCE'NÆ (Lat., from Gk. Μυκῆναι, *Mykēnai*). An ancient city of Greece, situated on a steep hill in the northeastern corner of the Argolic Plain, commanding the passes toward Corinth. It was said to have been founded by Perseus and to have been ruled by his descendants until they were superseded by Pelops. It is celebrated in legend as the capital of Agamemnon. Here was laid the scene of the terrible story of the house of Atreus, and here was stored the wealth of Agamemnon. After the epic period, the city seems to have been completely overshadowed by the power of Argos, but it still preserved a quasi-independence, for during the Persian wars, when Argos was friendly to Persia, we hear of eighty Mycenæans at Thermopylæ, and along with Tiryns it sent two hundred men to Platæa. Later Mycenæ joined the Spartan league, but when the Spartans were occupied by the revolt of the Helots, in B.C. 463, the Argives besieged the city and expelled the inhabitants. From that time the place was the seat of a small village community, who in the time of Pausanias showed visitors the graves of Agamemnon and his household. The destruction of the city by the Argives did not greatly injure the massive Cyclopean wall; and this fortification, with the 'Lion Gate,' so called from the reliefs on the triangular slab over the lintel, and the domed tomb outside, commonly called the 'Treasury of Atreus,' had attracted the attention of archæologists long before Heinrich Schliemann in 1876 began his excavations. These opened an entirely new field in Greek archæology by the discovery just inside the Lion Gate of a carefully inclosed circle, within which at a considerable depth were five graves, hewn in the rock, and containing a number of bodies with an extraordinary mass of gold and silver ornaments, swords, and vases. Since that time the Greek Archæological Society has continued the excavations, for the most part through Dr. Tsountas, whose accurate and careful methods have proved highly successful. Besides the 'Treasury of Atreus,' eight other domed tombs and a very large number of smaller rock-cut chambers for burial have been opened. Within the wall a sixth grave was discovered near the others, the foundation walls of smaller houses were laid bare, while near the summit of the Acropolis were found the ruins of a palace showing great similarity to that at Tiryns. The discoveries at this site first brought into prominence that special period of Ægean civilization which preceded the historic Hellenic culture, and hence the name Mycenæan has been given to this age and civilization. Every year brings to light fresh material from this period, but until the recent discoveries in Crete no single site has yielded so large a variety of objects, or so complete a series of vases. For the general characteristics of Mycenæan art and for illustrations, see ARCHÆOLOGY. Consult: Schliemann, *Mycenæ* (London, 1878); Schuchhardt, *Schliemann's Excavations*, trans. by E. Sellers (London, 1891); Tsountas and Manatt, *The Mycenæan Age* (Boston, 1897); Ridgeway, *The Early Age of Greece*, vol. i. (Cambridge, 1901); Hall, *The Oldest Civilization of Greece* (Philadelphia, 1901).

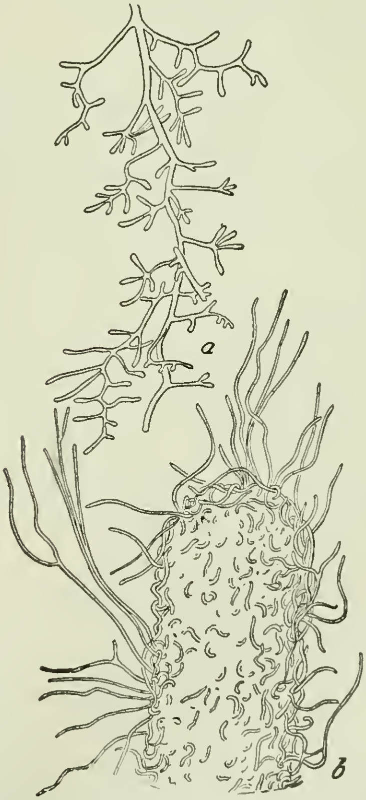
MY'CERI'NUS. An Egyptian king, the sixth of the Fourth Dynasty. His name, written by Herodotus as above, and by Diodorus, 'Mecherinus,' is, following the Egyptian form, 'Menkaura.' He built a pyramid southwest of Gizeh, the third in size and the first in point of preservation. In it in 1837 were found his stone sarcophagus (afterwards lost at sea) and fragments of his wooden coffin. Mycerinus was famed for his piety. He is the subject of one of the early poems of Matthew Arnold.

MY'CETOZO'A (Neo-Lat. nom. pl., from Gk. μύκης, *mykēs*, fungus + ζῷον, *zōon*, animal). A small class of terrestrial Protozoa (q.v.).

MYCO'NIUS, FRIEDRICH (1491-1546). A German theologian of the Reformation. He was born at Lichtenfels in Upper Franconia, of a family named Mekum, and assumed the Latinized name Myconius. At the age of nineteen he entered a Franciscan cloister at Annaberg, and in 1516 became a monk. In the following year Myconius embraced Luther's teachings, and about 1524, as pastor of a church at Gotha, became one of the leaders of the Reformation. He rendered especially valuable service in Thuringia and, after 1539, in Leipzig, by reviving the primitive custom of episcopal visits to the different churches. He attended several of the conferences of the Reformation period and in 1538 was sent on a mission to England. Myconius's *Historia Reformationis*, which contains much autobiographic matter, was published in 1710. Consult: Ledderhose, *Friedrich Myconius* (Gotha, 1854), and the biography by Meurer in his *Altväter der lutherischen Kirche* (Leipzig, 1864).

MYCONIUS, OSWALD (1488-1552). A Swiss reformer and friend of Zwingli. His real name was Oswald Geishüsler. He was born at Lucerne, studied and taught at Basel; then lived for three years (1516-19) at Zurich. After teaching at Lucerne and Einsiedeln he returned to Zurich. About 1532 Myconius became pastor at Basel, and was soon elected to succeed Œcolampadius as antistes of the district and professor of theology, a choice which met with Erasmus's disapproval. His great labor was the reform of the Swiss schools. In theology he mediated the views of Luther and Zwingli on the nature of the Lord's Supper, and finally came to a mystic interpretation of it. He wrote a *Life* of Zwingli (1532) and a commentary on Mark's Gospel (1538). Consult Hagenbach, *Oekolampad und Oswald Myconius, die Reformatoren Basels* (Elberfeld, 1859).

MY'CORRHI'ZA (Neo-Lat., from Gk. μύκης, *mykēs*, fungus + ῥίζα, *rhiza*, root). The whole structure formed by the intimate association of



MYCORRHIZA.

a. Root and rootlets of *Carpinus Betulus*, showing the coralloid character of mycorrhiza.

b. End of root of the beech (*Fagus sylvatica*), showing mat of fungus threads; more highly magnified than *a*.

certain fungi with the roots of higher plants. The fungi either grow inside the cells of the cortex (endotrophic mycorrhiza) or invest the young absorbing portions of the roots with a jacket of interwoven hyphæ (ectotrophic mycorrhiza, Fig. b.). Recent investigations have shown that mycorrhizal fungi are very widespread and that they are associated with perhaps more than half of the higher plants. They are particularly abundant in humus, and the conclusion has been reached that a large number of humus plants are very much benefited by their presence, and further, that some plants, such as the Indian pipe, certain orchids, and even the beech tree, are unable to complete their normal life cycle in sterilized soil. The relation between the fungus and the higher plants is not fully known, but it is believed that the fungus by its digestive powers secures and prepares certain foodstuffs, especially those containing nitrogen, for the roots. Whether or not the fungus gains benefit from the higher plants is not altogether clear, although it is probable that it lives in part as a parasite, getting certain carbohydrate foods. See Symbiosis.

MYELAT, mē′ȧ-lȧt (Bur., unoccupied country). A division of Burma, India, comprising sixteen of the Southern Shan States, the largest having an area of 1600 square miles, and the smallest 4 square miles. Total area, 3723 square miles. The region is sparsely populated, the few inhabitants being chiefly occupied in the cultivation of rice and sugar-cane.

MYELI′TIS (Neo-Lat., from Gk. μυελός, *myelos*, marrow). An inflammation of the substance of the spinal cord which may be limited to the white or the gray matter and involve the whole cord or isolated portions of it. When the white matter is inflamed with the meninges it is called 'cortical myelitis;' when the gray matter only is affected it is known as 'central myelitis.' The disease may extend transversely, or may proceed in an upward or downward direction. The causes are, in general, injuries of various kinds, exposure, and overexertion; the infectious diseases, such as measles, typhus fever, and smallpox; and caries or tumors of the spine or the cord itself. The symptoms depend upon the extent and location of the inflammatory process. A transverse myelitis, for instance, produces complete paralysis of all the voluntary muscles whose nerve fibres arise from nuclei below the seat of the lesion. In children the disease attacks the anterior horns of the gray matter (when it is called *poliomyelitis* or 'infantile spinal paralysis'), and results in rapid loss of power and atrophy of certain groups of muscles.

MY′ER, Albert James (1827-80). An American meteorologist, born at Newburg, N. Y. He graduated at Hobart College, and took his degree in medicine at the University of Buffalo in 1851. In 1854 he was appointed assistant surgeon in the United States Army, and was assigned to Texas, where he first developed his celebrated signal system of flags by day and torches by night, which afterwards came into general use. In 1860 he was commissioned major and made chief signal officer of the army. On the outbreak of the Civil War he was made signal officer on the staff of General Butler, and afterwards on that of General McClellan, and was successively brevetted lieutenant-colonel, colonel, and brigadier-general, his last promotion being for distinguished services in organizing, instructing, and commanding the signal corps of the army, and for especial service on October 5, 1864, at Allatoona, Ga., where his signal system enabled the apparently doomed garrison to summon assistance from the main army. On July 28, 1866, he was made colonel in the Regular Army and chief signal officer. In 1870 he commenced his work of observing and giving notice by telegraph of the approach and force of storms on the northern lakes and seacoast, at the military posts in the interior, and at other points in the States and Territories. He published *A Manual of Signals for the United States Army and Navy* (1868). A short time before his death he was promoted to the full rank of brigadier-general of the United States Army.

MYER, Fort. See Fort Myer.

MY′ERS, Frederic William Henry (1843-1901). An English poet and essayist, born February 6, 1843, at Keswick, where his father was incumbent of Saint John's Church. He was educated at Cheltenham, and at Trinity College, Cambridge, graduating with distinction, and gaining a fellowship in his college (1865). His taste for poetry was shown in his boyhood. He delighted in Homer, Æschylus, Lucretius, in fragments of Sappho, and in Pindar. Before quitting school he had learned all Vergil by heart. He was for many years inspector of schools. In 1882 he took an active part in founding the Society for Psychical Research, of which he became president. He died in Rome, January 17, 1901. The verse of Myers, which belongs mostly to an early period, comprises *Saint Paul* (1865); *Poems* (1870); and the *Renewal of Youth* (1882). In these collections are pieces of rare beauty, which give the author one of the first places among the lesser poets. Myers undoubtedly wrote some of the finest essays of his time in *Essays Modern and Classical* (1885), and in *Science and a Future Life* (1893). He also prepared for the English Men of Letters Series an admirable *Life* of Wordsworth (1880). His work in psychical research is represented by his contributions to the *Phantasms of the Living* (1886). After his death appeared a remarkable book on the evidences of immortality entitled *Human Personality and Its Survival of Bodily Death*, ed. by R. Hodgson and A. Johnson (London, 1903). Consult the London *Athenæum* for January 26, 1901.

MYERS, Peter Hamilton (1812-78). An American author, born at Herkimer, N. Y. He practiced law in Brooklyn, and wrote a number of novels dealing with the early settlers of New York State, among which are: *The First of the Knickerbockers: A Tale of 1673* (1848); *The Young Patroon, or Christmas in 1690* (1849); *The King of the Hurons* (1849), republished in England under the title *Blanche Montaigne* (1856); and *The Prisoner of the Border: A Tale of 1838* (1857).

MYERS, Philip Van Ness (1846—). An American educator and author, born at Tribes' Hill, N. Y. He graduated at Williams College in 1871, studied law for a year, and then went to South America on a scientific mission. After two years in Europe he returned to the United States and became president of Farmers' College, Ohio, in 1879. In 1890 he was appointed professor of history and political economy at the University of Cincinnati, where five years later he was chosen dean of the academic faculty. His publications include: *Life and Nature Under the Tropics* (1871); *Remains of Lost Empires* (1875); and *Rome: Its Rise and Fall* (1890).

MYIASIS, mī-yā′sĭs (Neo-Lat., from Gk. *μυῖα*, *myia*, fly). A medical term for the state of being infested with the larvæ of dipterous insects. A rather large number of flies may infest human beings in this way, and the disease has been divided according as the larvæ are found in the skin, in the ear, in the conjunctiva, in the intestines, in the mucous membranes, in the nose, or in wounds. The most common form is the presence of the larvæ of flesh-flies, or blow-flies, in open and neglected wounds. In certain portions of the United States, the screw-worm fly (*Lucilia macellaria*) deposits its eggs or larvæ not only in open sores upon the bodies of men and women, but many cases are on record where the eggs have been deposited in the nostrils of persons sleeping exposed in the daytime. These flies are especially apt to be attracted by an offensive catarrhal condition. Scores of maggots have been taken from the nasal passages of such individuals, and a complete destruction of the soft palate has been brought about in this way. The European flesh-fly known as *Sarcophila Wohlfarti* has been reared from larvæ found in numbers in the nasal cavities and in the ear of man. *Lucilia nobilis* of Europe has also been reared from the ear of a man, causing extensive discharges and much putrefaction. The bluebottle fly (*Calliphora vomitoria*) sometimes causes nasal myiasis, and the common flesh-fly (*Sarcophaga carnaria*) has been reared from larvæ found in the nasal passages. There are also cases of myiasis of the vagina. In all of these instances the flies are either Sarcophagidæ or Muscidæ, and the adults were attracted to putrid or septic wounds, or to an offensive or purulent discharge from the body, depositing their eggs or larvæ therein. Internal myiasis is nearly always caused by the larvæ or flies of the family Anthomyiidæ. These flies deposit their eggs in spoiled vegetables, which are afterwards eaten in the raw state, as in salads. The larvæ of several species have been passed while still alive, and frequently cause intestinal disturbances of a more or less serious character. *Homalomyia canicularis*, for example, has several times been reared in this way. In the family Sepsidæ, the common cheese maggot (larva of *Piophila casei*), taken into the stomach with old cheese, has been found alive in excreta, having passed through the entire alimentary canal. Cutaneous myiasis, aside from that of open wounds, is produced by several of the botflies of the family Œstridæ. (See BOT-FLY.) In tropical regions there are one or more species of the genus Dermatobia, which may lay their eggs upon the skin of human beings, the resulting maggot forming a pus-sac below the surface of the skin, and, if undisturbed, reaching its full growth in this situation. Such cases as this are not uncommon among the unclothed inhabitants of tropical countries, and persons while bathing occasionally become infested. The best known of these human bot-flies is *Dermatobia cyaneiventris*, common in South America.

MYLIT′TA. A word long believed to be the name of a Babylonian deity, on the authority of Herodotus, who describes the cult of Mylitta in Babylonia. As a matter of fact, Mylitta is a corruption of the Babylonian *belit* (lady), used as a title of the goddess, who is more properly known as Ishtar (q.v.). She originally represented the female portion of the twofold principles through which all creation burst into existence, and which, by their united active and passive powers, uphold it. Ishtar, however, developed other qualities besides those typical of procreation. She is a goddess of war, who, armed with sword, arrows, and spear, marches at the head of the Assyrian armies. Consult Jastrow, *Religion of Babylonia and Assyria* (Boston, 1898).

MY′LODON (Neo-Lat., from MGk. *μυλόδους*, *mylodous*, molar, from Gk. *μύλη*, *mylē*, mill, millstone + *οδούς*, *odous*, tooth). A gigantic extinct edentate mammal, allied to Megatherium and Megalonyx, found in the Pleistocene deposits of North and South America. See MEGATHERIUM.

MY′NA-BIRD, or **MINA-BIRD** (Hind. *mainā*, starling). A starling (*Sturnia religiosa*) of the East Indies, deep velvety black in color, with a white mark on the base of the quill-feathers of the wings, yellow bill and feet, and two large bright yellow wattles at the back of the head. It is very lively and intelligent, and possesses a power of imitating human speech excelled by none of the parrots. It has sometimes been trained to repeat sentences of considerable length. It is therefore in great request, and is often brought to Europe and America, while in India it is one of the most familiar and interesting of village birds, and is regarded by the Hindoos as sacred to Ram Deo.

MY NOVEL; or, VARIETIES IN ENGLISH LIFE. A novel by E. Bulwer-Lytton (1853). The story, told by P. Caxton, is partly of Hazeldean and partly of London. The principal hero is Harley L'Estrange, witty and brilliant, the friend of Squire Hazeldean. He at first fancies Helen Digby, who marries Leonard, the son of Colonel Egerton, by an early, secret marriage, and finally marries Viola, daughter of an Italian gentleman, who with his friends forms a secondary story. The plot is involved, but the novel is one of Bulwer's finest productions.

MYOCARDITIS (Neo-Lat., from *myocardium*, from Gk. *μῦς*, *mys*, muscle, mouse + *καρδια*, *kardia*, heart). An inflammatory affection of the wall of the heart. It is a term first used by Sobernheim in 1837. Myocarditis is considered as an inflammation due to infection. It is a disease secondary to typhoid fever, diphtheria, scarlet fever, cerebro-spinal meningitis, variola, erysipelas, malaria, rheumatism, influenza, or septicæmia. See HEART, DISEASES OF.

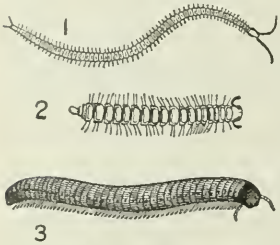
MYOMANCY. See SUPERSTITION.

MYOPIA (Neo-Lat., from Lat. *myops*, from Gk. *μύωψ*, short-sighted, from *μύειν*, *myein*, to close + *ὤψ*, *ōps*, eye). Short sight. A form of ametropia due to the fact that the antero-posterior axis of the eyeball is too long; and hence its refracting media are not proportionately diminished in power. Parallel rays of light, therefore, are not brought to a focus on the retina, but in front of it, forming circles of diffusion on the retina. See SIGHT, DEFECTS OF.

MY′OSIN. See GLOBULINS.

MYOSOTIS. See FORGET-ME-NOT.

MYR′IAP′ODA (Neo-Lat. nom. pl., from MGk. μυριόπους, *myriopous*, having ten thousand feet, from Gk. μύριοι, *myrioi*, ten thousand + ποῦς, *pous*, foot). A class of arthropods resembling annelids in their lengthened form, and in the great number of equal, or nearly equal, segments of which the body is composed; but in most of their other characters more nearly agreeing with insects, among which they were ranked by the earlier naturalists. They differ from insects and all other arthropods in the fact that the posterior segments of the body bear jointed locomotor appendages. In addition to their affinities with insects, myriapods are worm-like and some of them suggest relations with the thysanurans. They have a distinct head, but there is no distinction of the other segments, as in insects, into thorax and abdomen. They have simple or compound eyes; a few are destitute of eyes. They have antennæ like those of insects. The mouth is furnished with a complex masticating apparatus, in some resembling that of some insects in a larval state, in others similar to that of crustaceans. Respiration is carried on through minute pores or spiracles, placed on each side along the entire length of the body, the air being distributed by innumerable ramifying air-tubes to all parts. In most parts of their internal organization the myriapods resemble insects, although a decided inferiority is exhibited, particularly in the less perfect concentration of the nervous system. The resemblance is greater to insects in their larval than in their perfect state. The body of the myriapods is protected by a hard chitinous covering. The number of segments is various, seldom fewer than 24, although in some of the genera they are consolidated together in pairs, so that each pair, unless closely examined, might be considered as one segment bearing two pairs of feet. The legs of some of the lower kinds, as Julus, are very numerous, and may be regarded as intermediate between the bristle-like appendages which serve many annelids as organs of locomotion and the distinctly articulated legs of insects. In the higher myriapods, as Scolopendra, the legs are much fewer, and articulated like those of insects. Some of them feed on decaying organic matter, chiefly vegetable; those of higher organization are carnivorous. The myriapods do not undergo marked metamorphoses, but the young greatly resemble the adults, although some of them are at first quite destitute of feet; and, contrary to what takes place in insects, the body becomes more elongated as maturity is approached—the number of segments and of feet increase.



FORMS OF MYRIAPODS.

1. *Geophilus*. 2. *Polydesmus*. 3. *Julus*.

Myriapods are widely distributed, and are represented in almost every part of the earth. They flourish in moist and dry, hot and cold climates. Like other widely distributed animals, they show great variation in size and color, ranging from microscopic size to a length of more than six inches. Some of the Julidæ and Polydesmidæ of the tropics are beautifully and brilliantly colored. Some of the species of Geophilus are phosphorescent. Most myriapods inhabit dark and obscure places. Some of the cave-inhabiting species from Wyandotte and Bradford caves in Indiana are described by Packard as light in color, and those from the latter cave have rudimentary eyes. The organs of defense throughout the class vary greatly. In the centipedes the large claws, supplied with poison from a gland, are weapons of offense and defense. The millipedes, on the other hand, rely for defense on an acid secretion from certain glands. Other forms are hairy or bristly. Hairiness was the most common mode of defense among fossil myriapods.

A fossil bristled myriapod has been found in America in Paleozoic strata, and two species have been found in the Old Red Sandstone of Scotland. The highest vertebrates in this deposit are fishes, and the highest plants are conifers. The Paleozoic species, about forty in number, all belong to an extinct order (Archipolypoda) and most of them were of gigantic size. Later fossil myriapods, contemporaneous with giant fossil Amphibia, occur in the coal measures. One of these forms from Illinois approaches very closely the Julidæ of to-day. Only one species has been found in the chalk layers, but in Tertiary and recent times plentiful remains have been found. The majority of these belong to the Chilognatha and Chilopoda. They have been found in the gypsum of France, in the brown coal of Germany, and in the Green River formation of North America. Amber has also yielded several species.

CLASSIFICATION. The class Myriapoda is now divided into five orders, the Chilognatha or Diplopoda, the Chilopoda or Syngnatha, the Schizotarsia, the Symphyla, and the Pauropoda. To the Chilopoda belong the common thousand-legs of the family Julidæ, as well as the representatives of seven other families, all of which bear two pairs of legs to each of the body segments except the first three. Verloef states that the males of some of the Julidæ undergo certain seasonal changes. In the spring and autumn the form of the legs and other organs changes. These seasonal changes are correlated with the sexual condition of the Julus just as the males of certain birds and fishes show a brighter coloration and other changes at the breeding season. Julus will feed freely in captivity if the earth is kept at the proper moisture and proper food is furnished plentifully. They will thrive on grass, leaves, and bits of apple and pear. The eggs are numerous, from 60 to 100 being deposited at a laying. The female forms a receptacle for the eggs some distance below the surface of the ground. It is in the shape of a hollow sphere, and is composed of little pellets of mud, which are molded by her jaws and front legs. The nest is perfectly smooth within, but the outside is rough and shows the pellet composition. In the top of the sphere a small opening is left until the eggs are laid. The hole is then plugged up with earth and the eggs are left to chance. The chilopods have many-jointed antennæ and only one pair of legs to each joint. To this group belong the large tropical centipedes of the family Scolopendridæ and the long slender Geophilidæ, as well as the Lithobilidæ and Notophilidæ.

The order Schizotarsia contains but a single family, the Scutigeridæ, of which the common household centipede of the United States (*Scuti-*

gera forceps) is a familiar example. This creature, although viewed with horror by careful housekeepers, preys upon house-flies and small cockroaches, and is by no means an entirely undesirable denizen of households. It is prevalent in the Southern States, and extends as far north as the Hudson River Valley. The order Symphyla contains the single family Scolopendrellidæ, which have a great resemblance to certain of the Thysanura among the insects. The order Pauropoda consists of the single family Pauropodidæ, which contains only three genera. The type-genus, Pauropus, a curious crustacean-like form, was first discovered by Lord Avebury (Sir John Lubbock) in his kitchen garden in 1866.

Consult Sinclair, *Cambridge Natural History*, vol. v. (London, 1895); Scudder, "Systematic Review of Our Present Knowledge of Fossil Insects, Including Myriapods and Arachnids," in *Bulletin of the United States Geological Survey*, No. 31 (Washington, 1886).

MYRICA. An Asiatic and North American shrub. See CANDLEBERRY.

MYRISTIC ACID (from Neo-Lat. *Myristica*, from Gk. μυριστικός, *myristikos*, suitable for anointing, from μυρίζειν, *myrizein*, to anoint, from μύρον, *myron*, unguent), $C_{13}H_{27}.COOH$. A crystalline fatty acid, found in nutmeg, the seed of *Myristica fragrans*, growing on the Molucca Islands, and cultivated in tropical countries. It occurs in the form of a glyceride in the fat of the nutmeg, or nutmeg butter. It has also been found in small quantity among the products of the saponification of spermaceti, and of the fatty matter of milk; and hence this organic acid is one of those which are common to both the animal and vegetable kingdoms.

MYRMECOPHILY. See MYRMECOPHYTES.

MYRME′COPHYTES (from Gk. μύρμηξ, *myrmēx*, ant + φυτόν, *phyton*, plant), or MYRMECOPHILOUS PLANTS. Plants in which there are symbiotic relations between the plants and ants. Typical myrmecophytes are most commonly found in the tropics, and present peculiarities that are hard to explain in a purely scientific way. In some cases ants cut off leaves, take them to their nests, and raise crops of fungi that serve them as food. In other cases, as in the famous South American Cecropia, ants live in peculiar chambers within the plant, and feed upon products that appear to be useless so far as any other purpose is concerned. They appear, on the other hand, to defend the plants in which they dwell against leaf-cutting ants and other enemies. The relation here outlined is one of the most remarkable known types of symbiosis. The terms myrmecophily and myrmecophilous should be discarded for myrmecophytism and myrmecophytic. See SYMBIOSIS.

MYRMID′ONES (Lat., from Gk. Μυρμιδόνες). In the *Iliad*, the Achæans of Phthiotis, in the south of Thessaly, ruled by King Peleus, and led to the Trojan War by his son Achilles. Later writers discovered an eponymous hero Myrmidon, son of Zeus, and father of Actor, the husband of Ægina, daughter of Asopus, who was by Zeus the mother of Æacus. For him Zeus changed the ants (μύρμηκες) on the island of Ægina to men, and this race later wandered to Thessaly. The story is evidently due to the resemblance which the Greeks saw between Myrmidones and myrmekes.

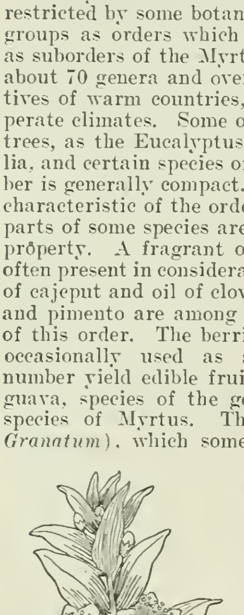
MYROB′ALAN (Lat. *myrobalanum*, from Gk. μυροβάλανος, *myrobalanos*, from μύρον, *myron*, unguent + βάλανος, *balanos*, acorn). The astringent fruit of certain species of Terminalia (natural order Combretaceæ), natives of the mountains of India. Terminalia bellerica and Terminalia chebula produce most of the myrobalans of commerce, but the fruits of other species often appear. Formerly myrobalans were credited with tonic properties; now they are rarely used medicinally. They are largely exported for tanners' and dyers' use, since they give a durable yellow with alum and an excellent black with iron. A number of species are valuable for timber, the best known of which, Terminalia catappa, is a large deciduous tree planted in many tropical countries. It is a popular shade tree in Honolulu, where it is called Mexican almond from the almond-like flavor of the nuts.

MY′RON (Lat., from Gk. Μύρων). An Athenian sculptor, who flourished about the middle of the fifth century B.C. He was a native of Eleutheræ, near the Bœotian frontier of Attica, and is called a pupil of Hagelaïdas of Argos. In his style he belongs in the period of transition just before Phidias, but his works show also a remarkable power of observation and great technical skill. He seems to have taken special pleasure in representing vigorous action, and to have indicated emotion rather by gesture and position than by expression. He was a worker in bronze, and also skilled in the engraving of plate. No original work has survived, but late copies of some of his statues are extant. Of these the most famous is the Discobolus (q.v.), or discus-thrower, of which there are specimens in the Vatican and the British Museum, though the best copy is in the Palazzo Lancelotti in Rome. (See illustration under GREEK ART.) Another work was a group on the Acropolis of Athens of Marsyas preparing to pick up the flutes thrown away by Athena, but starting back at the approach of the goddess. A copy of the Marsyas is in the Lateran Museum in Rome. In antiquity a bronze cow on the Acropolis was especially famed for its truth to nature. Many epigrams on the statue of the runner Ladas have also come down to us. Consult, in addition to the histories of Greek art, Furtwängler, *Masterpieces of Greek Sculpture*, Eng. trans. by E. Sellers (London and New York, 1895).

MYRRH. An umbelliferous plant. See CICELY.

MYRRH (AS. *myrre*, *myrra*. from Lat. *myrrha*, *murrha*, *murra*, from Gk. μύρρα, *myrrha*, myrrh, from Aramaic *mūrā*, Heb. *mōr*, Ar. *murr*, myrrh, from Aramaic *mārr*, Heb. *mārar*, Ar. *marra*, to be bitter). A gum resin produced by Balsamodendron myrrha, a tree of the natural order Amyridaceæ, growing in Arabia and in Eastern Africa. The myrrh tree is small and scrubby, spiny, with whitish-gray bark, thinly scattered small leaves, consisting of three obovate obtusely toothleted leaflets, and the fruit a smooth brown ovate drupe, somewhat larger than a pea. Myrrh exudes from the bark in oily yellowish drops, which gradually thicken and finally become hard, the color at the same time becoming darker. Myrrh appears in commerce either in tears and grains, or in pieces of irregular form and various sizes, yellow, red, or reddish brown. It is brittle, and has a waxy fracture, often exhibiting whitish veins. Its smell is balsamic. its taste aromatic and bitter. It is used in medicine as a tonic and stimulant. in disorders of the digestive organs, excessive secretions from the mucous membranes, etc., also to cleanse foul ulcers and promote their healing, and as a mouth-wash and gargle. particularly in a spongy or ulcerated condition of the gums. The best myrrh is known as Turkey myrrh, being brought from Turkish ports. Most of the myrrh of commerce, however, passes either through Aden or through Bombay. The chief constituents of myrrh are: A resin known as myrrhin; a gum; a volatile oil known as *myrrhol* and having the composition $C_{10}H_{14}O$. and a bitter principle. An excellent mouth-wash for sore gums may be prepared by mixing 1 part of myrrh, 16 parts of eau de cologne, 1 part of borax, 3 parts of water, and 3 parts of syrup.

MYRTA'CEÆ (Neo-Lat. nom. pl., from Lat. *myrtus*, Gk. *μύρτος*, myrtle, from Pers. *mūrd*, myrtle), or MYRTLE FAMILY. A natural order of dicotyledonous trees and shrubs. Even as restricted by some botanists, who exclude various groups as orders which other botanists consider as suborders of the Myrtaceæ, this order contains about 70 genera and over 2000 species, chiefly natives of warm countries, but represented in temperate climates. Some of the species are gigantic trees, as the Eucalyptus or gum trees of Australia, and certain species of Metrosideros. The timber is generally compact. Astringency seems to be characteristic of the order, and the leaves or other parts of some species are used in medicine for this property. A fragrant or pungent volatile oil is often present in considerable quantity, of which oil of cajeput and oil of cloves are examples. Cloves and pimento are among the best known products of this order. The berries of several species are occasionally used as spices. A considerable number yield edible fruits, among which are the guava, species of the genus Eugenia, and some species of Myrtus. The pomegranate (*Punica Granatum*), which some botanists place in this order, Engler makes the type of the order Punicaceæ. Bentham and Hooker place it in the order Lythraceæ. The chief genera of the order as limited by Engler are Myrtus, Psidium (the guava), Pimenta (allspice), Eugenia (cloves), Metrosideros, Eucalyptus, Melaleuca, and Darwinia.



COMMON MYRTLE (*Myrtus communis*).

MYRTLE (*Myrtus*). A genus of plants of the natural order Myrtaceæ. The common myrtle (*Myrtus communis*) is well known as a beautiful evergreen shrub, or a tree of moderate size, with white flowers. It is a native of the Mediterranean region and of the temperate parts of Asia. The leaves are astringent and aromatic, contain a volatile oil. and were used as a stimulant by the ancients. The berries are also aromatic, and are used in medicine in Greece and India. A myrtle wine, called myrtidanum, is made in Tuscany. Myrtle bark is used for tanning in many parts of the south of Europe. Among the ancient Greeks the myrtle was sacred to Venus as the symbol of youth and beauty, and was much used in the festivals. It is often mentioned in poetry. The small-leaved myrtle (*Myrtus microphylla*) of Peru has red berries of the size of a pea, of a pleasant flavor and sugary sweetness. Those of the lima (*Myrtus Luma*) are also palatable. and are eaten in Chile, as are those of Myrtus Ugni, the Chilean guava, which is said to become a large tree with very hard and useful wood. These species have all been successfully grown in California as outdoor ornamental shrubs.

MYRTLE-BIRD. The American yellow-rumped warbler (*Dendroica coronata*). It is about 5¾ inches long, bluish ash above, streaked with black; white below, with a black patch on the breast; crown, rump, and sides bright yellow, and the throat white. It is one of the most numerous and earliest of spring migrants in the United States, and scatters all over the country, but passes on to the north, and few breed south of the latitude of Lake Ontario. The name refers to the prevalence of this warbler in the Southern States in winter, where they feed on berries, especially those of the wax-myrtle (*Myrica cerifera*). From the Rocky Mountains to the Pacific Coast a very similar species (differing mainly in having the throat yellow) takes the place of the Eastern form; it is known as Audubon's warbler (*Dendroica Auduboni*).

MYRTLE FAMILY. A popular name for the natural order Myrtaceæ (q.v.).

MY'SIA (Lat., from Gk. Μυσία). In ancient geography, a district in the northwest of Asia Minor, bounded on the north by the Hellespont and Propontis, on the east by Bithynia and Phrygia, on the south by Lydia, and on the west by the Ægean. In a stricter sense, Mysia was only the southeastern part of this district. The principal rivers were the Granicus, Scamander, Caïcus, Æsepus, and Rhyndacus. The surface is mountainous in the interior, and in part tableland, among the mountains being Ida in the west and Olympus in the east. The inhabitants were thought by some ancient writers to be of Thracian, and by others of Lydian descent; probably there were immigrations from both countries. Mysia was subject to the Lydian monarchy, and under the Persian dominion formed, together with Lydia, one of the satrapies created by Darius. After the death of Alexander the Great it shared in the vicissitudes of Asia Minor during the wars of his successors and the Gallic invasion, but first assumed prominence in history with the rise in the third century B.C. of the Kingdom of Pergamum. Among its principal towns were Abydos, Cyzicus, Prusa, Lampsacus, Adramyttium, Alexandria Troas, and Pergamum.

MYSLOWITZ, mĭs'lȯ-vĭts. A town in the Province of Silesia. Prussia, on the Przemsa, 110 miles southeast of Breslau (Map: Prussia, H 3). Coal-mining. zinc-refining. flax-spinning, and brick-making are its principal industries. Population, in 1900, 13.365.

MYSORE, mī-sōr', or **MAISUR**, mī-sōōr'. A native State of Southern India, bounded on the east, south, and west by Madras, on the southwest also by Coorg, and on the north by Bombay and Madras (Map: India, C 6). Area, 27,936 square miles. The country consists of a plateau from 2000 to 3000 feet above the sea, inclosed in the angle between the Eastern and Western Ghats. Its surface is undulating, somewhat level in the east, but rugged and mountainous in the west, where it is heavily forested and sparsely populated. It consists mainly of primitive rocks, and basaltic trap formations are common; the *drugs*, precipitous rocky masses rising more than 1000 feet above the plateau, are characteristic features of the State. The rivers are all unnavigable mountain streams; most of them flow toward the Bay of Bengal, and are largely utilized for irrigation purposes; the northern streams belong to the basin of the Kistna, and the southern to the Kavery basin. Grain and oil-seeds form the major part of the crops. The betelnut and cocoanut palm are important, and coffee is grown in large quantities. There are a number of gold mines in the eastern part of the State.

Mysire is ruled by a Maharaja, whose word practically is law. A representative assembly meets annually, but its powers are limited to discussion. The State maintains a small military force of about 4000 men. An annual tribute is paid to the British Government in consideration of military protection. British interests are looked after by a political agent who resides at Mysore, the capital. In 1901 the population was 5,538,482, showing an increase of 12 per cent. for the decade. Nearly 94 per cent. of the population are Hindus. The remainder are mainly Mohammedans. The principal town is Bangalore.

History. Frequently mentioned in Hindu literature under the rule of various dynasties, the territory was merged with the Balala Kingdom of Delhi after the Mohammedan invasion of the fourteenth century. After the overthrow of the Ballala rule by Ala-ud-Din, a new State arose, including Mysore and part of the Carnatic, with Vijayanagar as capital. In 1565 its ruler, Raja Ram, was defeated and killed at the battle of Talikot by a Moslem confederation, and the State again became divided under the rule of several minor chiefs. One of these, Raja Wodeyar, captured Seringapatam in 1610, and his successors strengthened their rule until, at the close of the seventeenth century, their sovereignty extended throughout Mysore. This dynasty was supplanted in the eighteenth century by Hyder Ali (q.v.), the formidable foe to the rising British power in India. By the defeat and death of his son Tipu, Sultan at Seringapatam, in 1799, the State came under British control. Part of the territory was annexed to India, and a descendant of Wodeyar was appointed to rule over the remainder. Owing to misrule, the British took charge of the administration from 1831 to 1881.

MYSORE, or **MAISUR**. The capital of the native State of the same name, India, 10 miles southwest of Seringapatam and 245 miles southwest of Madras (Map: India, C 6). The town is picturesquely situated in a valley at the foot of the temple-crowned Chamundi Hill, which rises on the southeast 3489 feet above the sea. It is a well-built town, with wide and regular streets; area, about three square miles. The houses generally are built of teak and roofed with tiles; the chief buildings are the quadrangular fort inclosing the Maharaja's palace, the Residency, the Mohan Mahal or pleasure palace, the summer palace, and the European churches. Modern methods have greatly improved the sanitation of the town. The manufacture of carpets is the leading industry, and there is an active trade in the products of the State. Mysore was tributary to Seringapatam until its ruler captured that city in 1610, and henceforth it was the capital of the State and the seat of the Raja. During the period of English rule (1831-81), the capital was removed to Bangalore. Population, in 1891, 74,048; in 1901, 68,111.

MYSTAGOGUE, mĭs′tȧ-gŏg (Lat. *mystagogus*, from Gk. μυσταγωγός, one who introduces into mysteries, from μύστης, *mystēs*, initiate, from μύειν, *myein*, to initiate, close the lips or eyes, from μῦ, *my*, slight sound made by the lips + ἀγωγός, *ayōgos*, leader, from ἄγειν, *agein*, to lead). In the Greek religious system, the functionary who directed the preparations of the candidates for initiation in the mysteries (q.v.). They were men who had passed through all the grades of initiation, and were probably under the cognizance of the State. Prior to presenting himself for initiation, each votary had to place himself under the guidance of one of these mystagogues, and received instruction from him as to the various purifications and ceremonies to be performed. The mystagogue passed upon the fitness or unfitness of the applicant to receive the rites. In the Christian writers the term is used of the priest who prepared candidates for the sacraments of baptism, confirmation, and the Eucharist.

MYSTERIES (Lat. *mysterium*, from Gk. μυστήριον, from μύστης, *mystēs*, initiate). Secret rites connected with the Greek religion. These rites have been divided into two great groups: (1) those where the participants were a small circle of priests, officially connected with the sanctuary, and (2) those where the participants were numerous. Naturally our information on these matters is very scanty, and by no means trustworthy, and the subject has been a fertile field for ingenious speculation. For a long time the view was prevalent that the mysteries concealed deep truths and the remnants of a primitive revelation, too profound for the popular mind. The chief representative of this doctrine was Creuzer in his *Symbolik und Mythologie der alten Völker* (4 vols., Leipzig and Darmstadt, 1836-43). The death-blow to these theories, so far as critical scholarship was concerned, came from Lobeck, who in his *Aglaophamus* (Königsberg, 1829) showed that such occult wisdom was no part of their teaching. Mysteries were numerous in Greece, and were celebrated in honor of many gods, but in only a few places did they reach a national importance. Of these the most celebrated and reverenced were the Eleusinian mysteries, connected with the worship of Demeter and Cora (or Persephone) at Eleusis (q.v.) in Attica. With these goddesses there appear in the Eleusinian cult an anonymous god and goddess (θεός, *theos*, and θεά, *thea*), Pluto, Iacchus, Triptolemus, and Eubuleus, whose connection with the worship is by no means clear. The rites and legends connected with this cult are very similar to those prevailing not long ago among the European peasants, and point clearly to a similar belief in a 'corn-spirit,' which dies and is reborn yearly. So far as can be judged, the Eleusinian mysteries consisted largely in the rehearsal before the initiated (*μύσται, mystai*) of a sort of miracle play, in which the rape of Cora, the sufferings of Demeter, and the final reunion of mother and daughter, together with the bestowal of the art of agriculture on man by Demeter, were represented in dramatic form. The initiation seems to have symbolized the redemption of the soul from the powers of the lower world and its reception by the goddess as pure. So far as can be learned from literature and art, the candidate was purified by a sacrifice, which he himself brought, and, after fasting and preparation, wandered through a series of dark and confused passages, beset by terrifying sights and sounds, but emerging at last into the light where he saw the goddesses. We know that candidates had to be initiated first into the Lesser Mysteries at Agræ, near Athens, six months before the ceremonies at Eleusis. The *Mystæ* seem to include all, while those who had been fully received are sometimes called *ἐπόπται, epoptai*, 'those who see.' As to the public ceremonial, we are better informed. The Lesser Mysteries were celebrated in the month Anthesterion (approximately February). They were accompanied, like the Greater Mysteries, by a sacred truce. The Greater Mysteries were celebrated in Boëdromion (approximately September) at Eleusis, though there was much preliminary ritual at Athens. On the 14th certain sacred relics (*τὰ ἱερά, ta hiera*) were brought from Eleusis to Athens and deposited in the Eleusinia; the next day seems to have been given to the gathering of the celebrants; on the 16th the Mystæ went in procession to the beach at Phalerum for solemn purification in the salt water; the 17th and 18th were filled with offerings and ceremonies at various sanctuaries in Athens; on the 19th, early in the day, the sacred procession escorted the image of Iacchus and the sacred relics to Eleusis. At the bridge over the Cephissus jests and gibes were exchanged, and it was evening (hence the 20th in Greek reckoning) when they arrived at the great sanctuary. The following nights and days were given up to the performance of the sacred ritual and the ceremonies of initiation, which certainly made a strong impression on the spectators. On the 23d the ceremonies closed with a solemn pouring out of water from two earthen jars toward the east and west. It is certain that no dogmatic teaching formed part of the Eleusinian worship. The chief officials connected with this sanctuary were the Hierophant, who was always from the Eleusinian family of the Eumolpidæ, and from the family of the Kerykes, the Dadouchos or torch-bearer, the Hierokeryx or herald, and the priest at the altar (*ὁ ἐπὶ βωμῷ ἱερεύς, ho epi bōmō hiereus*). In connection with the celebration a sacred truce, extending from the full moon of the previous month to the tenth day of the following was proclaimed so that the Mystæ could travel in security. Initiation was open to all ages and conditions, including even slaves, provided they were Hellenes (or later Romans), and were free from any great crime. Eleusinian mysteries were celebrated on a smaller scale at Phlius, Megalopolis, and elsewhere, while at Andania, in Messenia, they appear in combination with the Samothracian worship of the Cabiri.

Consult: Mommsen, *Feste der Stadt Athen* (Leipzig, 1898); Nebe, *De Mysteriorum Eleusiniorum Tempore et Administratione Publica* (Halle, 1886); Strube, *Bilderkreis von Eleusis* (Leipzig, 1870, 1872); Foucart, *Recherches sur l'origine et la nature des mystères d'Eleusis* (Paris, 1895), and *Les grands mystères d'Eleusis* (ib., 1900), very valuable, though the author's theory of the Egyptian origin of the mysteries is not generally accepted; Gardner, *New Chapters in Greek History* (London, 1892), and the works cited under ELEUSIS.

Next to the Eleusinian the most prominent were the Samothracian mysteries of the Cabiri or great gods. Originally these seem to have been two in number, though later we find two goddesses added, and the four, Axieros, Axiokersa, Axiokersos, and Kasmilos, were identified by the grammarians with Demeter, Persephone, Hades, and Hermes. The rites were believed to afford protection against the perils of the sea, and were doubtless in early times largely confined to seamen. Consult: Conze, *Archäologische Untersuchungen auf Samothrake* (Vienna, 1875-80), and Preller-Robert, *Griechische Mythologie*, i. 2 (Berlin, 1894).

Another sanctuary of the Cabiri lay near Thebes, where we find the deities worshiped as Cabiros and Pais, or 'boy.' The objects found seem to indicate that these mysteries were orgiastic in character. See *Athenische Mittheilungen des deutschen archäologischen Instituts*, vols. xiii. and xv. (Athens, 1888-90).

In the course of time other mysteries, such as those of Isis, Sabazios, Mithras, and other Oriental deities, spread through the Greek world, and at all times there were private sects, like the followers of Orpheus (q.v.), who professed to possess secret teachings which could insure peace and happiness in the other world to those who followed their directions here.

On the general subject of the Mysteries, consult in addition to the books named above: Petersen, *Der geheime Gottesdienst bei den Griechen* (Hamburg, 1848); Rohde, *Psyche* (3d ed., Leipzig, 1902); Aurich, *Das antike Mysterienwesen in seinem Einfluss auf das Christentum* (Göttingen, 1894).

MYSTERIES OF UDOLPHO. A novel by Mrs. Anne Radcliffe (1794). This once popular romance tells of the Castle of Udolpho in the Apennines, where terrific scenes of horror occur. The victim of these supernatural events is an English girl, Emily Saint Aubyn, who is finally rescued by her lover, the Chevalier Velancourt.

MYSTERY. The name given to a very early type of the mediæval drama, founded upon some part of the Bible narrative, and in England often used indiscriminately with that of miracle play (q.v.). The traditions of the ancient drama survived to some extent the fall of the Western Empire, and on them were modeled religious plays, intended less for acting than for reading. There is extant a Greek play entitled Χριστὸς Πάσχων (The Passion of Christ), long attributed to Saint Gregory Nazianzen, but now thought to be of much later date, which follows the structure of the ancient Greek drama. In the second half of the tenth century, Hroswitha or Roswitha (q.v.), a Benedictine nun of Gandersheim in Saxony, wishing to provide her sisters with a substitute for Terence, who was widely read by the learned throughout the Middle Ages, cast six martyrdoms in the form of the old Latin comedy. Through imitations of this kind, the classic drama may be said to have continued to exert some influence as late as 1200. But the main impetus to a revival of popular dramatic literature came from the Church. The clergy wished to provide some means of making the great events on which their teaching was based more vivid and real to their unlettered flocks. This was the more natural because the service of the Church was in its very nature dramatic. Its chief act of worship was, in no abstruse sense, a representation of the sacrifice of Christ; and both the symbolism of the ritual and the responsive nature of the liturgy shared the same character. Especially at the great festivals of Christmas and Easter it was customary to make it still more dramatic by representing the events then commemorated as actually taking place before the congregation. Traces of this procedure are found as early as the closing years of the tenth century. The words used, the directions to the performers, hymns and anthems, were at first in Latin; but as dialogue was introduced, they were naturally turned into the vernacular. In the thirteenth century, in fact, mysteries and miracle plays lost the favor of the Church. Where they were not still a part of the ritual, they were banished by various decrees from the sacred building, and the clergy were forbidden to take part in them. They passed first to the churchyard, and then to the streets and public squares, where they were performed on movable stages drawn from place to place. The actors in England were frequently members of the trade guilds, who arranged for these performances at Christmas, Easter, and Corpus Christi, supplemented by strolling players. In France they came under the control of the *Confréries de la Passion*, which were established in many of the leading towns—societies half religious, half literary, and wholly secularized by the fourteenth century. The plays devoted to the exposition of special mysteries were combined, in England at least, in an immense cycle, covering the entire range of the Scriptural narrative from the Creation to the Day of Judgment. In texts belonging to the fourteenth, fifteenth, and sixteenth centuries, four of these cycles, more or less complete, have come down to us. They are the York cycle (48 plays), the Towneley (32 plays), the Chester (25 plays), and the Coventry (42 plays); of other cycles there are fragments. A national passion, they died slowly as the regular drama came into existence. As late as 1580, we hear of one being represented at Coventry. Consult for both mysteries and miracle plays: Bates, *English Religious Drama* (New York, 1893); Hase, *Das geistliche Schauspiel des Mittelalters* (Leipzig, 1858; Eng. trans., London, 1880); Stoddard, *References for Students of Miracle Plays and Mysteries*, a classified list (Berkeley, 1887); Sepet, *Le drame chrétien au moyen-âge* (Paris, 1878); Pollard, *English Miracle Plays, Moralities, and Interludes*, with specimens (Oxford, 1890); Manley, *Specimens of the Pre-Shakespearean Drama*, arranged so as to show development (Boston, 1897); Wright, *Early Mysteries* (London, 1838); A. d'Ancona, *Sacre rappresentazioni dei secoli 14-16* (Florence, 1872); Ward, *English Dramatic Literature* (London, 1899); Jusserand, *Literary History of the English People* (ib., 1895); Petit de Julleville, *Les mystères* (Paris, 1886); Davidson, *Studies in the English Mystery Plays* (New Haven, 1892); and for reprints, besides the specimens given above, *York Plays* (ed. L. T. Smith, Oxford, 1885); *Chester Plays* (ed. Wright, London, 1843-47); *Towneley Mysteries* (ed. Raine, Newcastle, 1836); *Digby Mysteries* (ed. Furnivall, London, 1882); *Miracles de notre Dame* (ed. G. Paris and Robert, Paris, 1876-81). See DRAMA; MIRACLE PLAY; PASSION PLAY.

MYSTERY OF EDWIN DROOD. The last and unfinished novel by Charles Dickens. The first number appeared in 1870 and only six were finished when he died. The scene is a cathedral town, where live a music teacher, John Jasper, and his young nephew, Edwin Drood. Both love the same girl, Rosa. Drood suddenly vanishes, and Neville Landless is accused by Jasper of murdering him. The story breaks off, and the mystery was never solved. Notes furnished by Dickens's son-in-law indicate that Jasper was the murderer, but that Rosa finally married Tartar, a sailor.

MYSTERY OF MARY ROGET, mȧ′rē′ rō̇′zhä′. A tale by Edgar A. Poe, published in three parts in *Snowden's Lady's Companion* (1842). It is a sequel to *Murders in the Rue Morgue*, the accounts of the murder of a beautiful Paris grisette, and a parallel, with other localities and names of the murder of Mary Rogers at Weehawken, N. J.

MYSTICISM (from *mystic*, from Lat. *mysticus*, from Gk. μυστικός, *mystikos*, relating to mysteries, from μύστης, *mystēs*, initiate). The name given to certain forms of religious experience, in which man, transcending the ordinary limitations of time and sense, seems to hold direct communion with the Deity. Mysticism may be philosophical as well as religious, in which case its speculations are usually pantheistic in their tendency. Religious mysticism exhibits two wholly different qualities, curiously combined, viz. pure individualism and the sinking of personality. The mystic may have fervently striven to attain the exalted state of communion with God, yet when once it has been reached, conscious activity ceases, and through a sort of passive rapture the subject seems merged in the object of his yearning. Direct intuition supersedes reason. The mystic is not unconscious, yet he seems to be no longer self-conscious in the ordinary sense. The satisfaction which he feels is wholly different from that derived from ceremonial observances, for the true mystic is the opposite of a legalist. His attitude, indeed, is a protest against formalism. He feels himself to be independent of external authorities, whether of rite, creed, priesthood, or Scripture, though, of course, the religion of the Catholic mystic precludes this separation from externals.

In one or another of its forms, mysticism is a very ancient phenomenon, finding illustration in India both in Brahmanism and Buddhism, in Persia among the Sufis, and among the Greeks in Neo-Platonism. It passed over into Greek Christianity from Plotinus, through the writings of pseudo-Dionysius Areopagita (see DIONYSIUS THE AREOPAGITE), and his great commentator, Maximus Confessor (seventh century). John Scotus Erigena (ninth century) translated the pseudo-Dionysius into Latin, and thus introduced Greek mystical theology to Western Europe, where, superimposed upon the mysticism of Saint Augustine, it enjoyed increasing popularity. Monasticism proved a congenial soil for the cultivation of the mystic spirit, and some of its most perfect types are found among the monks, e.g. in the Eastern Church the Hesychastæ of Mount Athos (see HESYCHASTS), and in the Western, Bernard of Clairvaux, Francis of Assisi, and Ignatius of Loyola. The Monastery of Saint Victor, near Paris, was a very influential centre of mysticism in the twelfth century. About the same time an Italian abbot, Joachim of Floris, prophesied that the dispensation of the Spirit would soon begin. Several famous mystics appear among the Schoolmen, some of whom were also members of monastic orders, e.g. Bonaventura, a disciple of the Victorines. Amalric of Bène, a Paris doctor (died 1207), pushed his mysticism to a pantheistic extreme.

Among the Dutch mystics are Ruysbroeck, author of several spiritual tracts (died 1381), Gerhardt Groot, founder of the Brethren of the Common Life (died 1384), and Thomas à Kempis, author of the *Imitation of Christ* (died 1471). Eckhardt (died c.1327) stands in the front rank of German mystics, and among his disciples were Tauler (died 1361) and Suso of Constance (died 1366). The *German Theology*, a popular book of devotion, was published by Luther in 1517. Jacob Böhme (died 1624) belongs to the Protestant school. Among more recent German mystics none perhaps is better known than Novalis, the disciple of Romanticism (died 1801). In England we find George Fox (died 1690). Among his contemporaries, the Cambridge Platonists (q.v.), especially Cudworth, More, and Smith, were both rationalistic and mystical; George Herbert (died 1633), Francis Quarles (died 1644), Henry Vaughan (died 1695), and later William Law (died 1761) were purely mystical. What is known as Quietism (q.v.) was a movement of the same nature with whose earlier stages Saint Francis of Sales, Bishop of Geneva (died 1622), had some sympathy, and which the Spaniard Molinos (died 1696), Fénelon (died 1715), and especially Madame Guyon (died 1717) made more definite. Not a few of the most gifted and honored among mystics have been women, e.g. Saint Hildegarde (died 1178), Elizabeth of Schönau (died 1164), Saint Catharine of Siena (died 1380), and Saint Theresa (died 1582).

Certain philosophical and scientific thinkers, including, for instance, Paracelsus, Giordano Bruno, Spinoza, Hegel, and Schelling, are less properly included among the mystics. But Immanuel Swedenborg (died 1772), eminent in applied science, but still more eminent for his religious allegorizing, deserves prominent mention.

Consult Preger, *Geschichte der deutschen Mystik* (Leipzig, 1874-1881); Vaughan, *Hours with the Mystics* (7th ed., London, 1895); Inge, *Christian Mysticism* (ib., 1899); James, *Varieties of Religious Experience* (London, 1902); Görres, *Die christliche Mystik* (Regensburg, 1836); Bigg, *The Christian Platonists of Alexandria* (London, 1886); id., *Neoplatonism* (ib., 1895). See the notices of the individuals mentioned in this article.

MYSTIC SHRINE, Ancient Arabic Order of Nobles of the. An order asserted to have been founded at Mecca, Arabia, in the year of the Hegira 25. The modern order is of comparatively recent origin. The governing body in America is the Imperial Council, with eighty-five subordinate branches, called Temples. The order is not a Masonic body, but only Masons of the thirty-second degree of the Ancient and Accepted Scottish Rite, or Knights Templars in good standing, are eligible for admission. The membership in America amounts to about 68,000.

MYTH (Lat. *mythos*, from Gk. μῦθος, speech, legend). A form of folk-lore (q.v.) which sets forth as an historic tale the processes of nature, or beliefs concerning cosmogony (q.v.), religion (q.v.), custom (q.v.), tradition, and the like. The sum total of myths is the material for the science of mythology (q.v.), frequently termed comparative mythology. Within this many subdivisions may be set off, as the Greek myths concerning Diana (q.v.), the Teutonic Valhalla myths (see Valhalla), the Polynesian water-myths, or the Hindu myths regarding caste (q.v.). Myth must be distinguished carefully from fable (q.v.) and from legend (q.v.). Thus we may have the fable of Zeus and the frogs, which points a moral teaching, or the legend of Saint Christopher (q.v.), which narrates a miraculous event, which may or may not have a moral bearing, but the Zeus-myth (see Jupiter) is based on belief in a sky-god, and is thus a part of nature-worship (q.v.).

MYTHICAL ISLANDS. Fabulous lands, with which popular lore or the imagination of poets and travelers have, since the earliest times, peopled various parts of the ocean. Among the Greeks, the Islands of the Blessed (q.v.), lying far in the western ocean, were the homes of those whom the divine favor saved from the pains of death to live in eternal bliss. Later, Plato placed in the same part of the world his lost Atlantis (q.v.). Celtic mythology presents a counterpart to the Islands of the Blessed in the fairy land of Avalon (q.v.), where Arthur was carried after his last battle. Of Celtic origin, too, is the mythical land of Saint Brendan (see Brendan or Brennain), lying off the western coast of Africa, in search of which expeditions set out as late as the beginning of the eighteenth century. To Christian refugees from the Iberian Peninsula, at the time of the Mohammedan invasion, legend ascribed the settlement of the long sought for Island of Seven Cities (q.v.). More within the realm of fact is Marco Polo's Cipango, identified by some with Japan. The Age of Discovery was fruitful of legendary lands, cities and islands. Best known among these last were the island of Bimini, in the region of the Bahamas, containing the fountain of youth, and the island of Brazil, which owed its name to its precious dyestuffs.

MYTHOL'OGY (Lat. *mythologia*, from Gk. μυθολογία, from μῦθος, *mythos*, myth + -λογία, *-logia*, account, from λέγειν, *legein*, to say). The science of myths, either a body of more or less doubtful stories, as when we speak of Greek or German mythology, or a rational account of how all such stories originate. Every race has its own myths, and in the first sense of the word a mythology has only to enumerate and classify the special stories of each race. The second application of the term, however, comprises various theories put forward to explain myths. Thus we come to what is now called the science of mythology, which deals with the origins of such myths or popular stories.

Myths may be divided into two sets of categories, arranged either according to the intellectual status of the original myth-makers or according to the subject-matter of the myth itself. Thus we may have myths of savages, as opposed to myths of cultivated races, and we may have myths of cosmogony, as opposed to myths of heroes. In many discussions of mythology it seems to be assumed that the so-called 'savage myths' treated of the same subjects as do the 'higher myths,' only in a less cultivated manner; but this is an error. Hero-myths are sometimes called legends, to distinguish them from cosmogonic myths.

CLASSIFICATION OF MYTHS. The first important fact in mythology is that, however much we use the word mythology as if it were especially concerned with gods, the earliest mythology ignores the gods altogether. Now, if we examine the body of myths found among the most primitive people, we shall find that they are without exception concerned with the same subjects, and we may therefore draw the historical conclusion that mythology begins with the discussion of these subjects, whereas tales of gods and nature-myths are a later development. The two linked subjects thus forming the base of all mythology are the deeds of ancestors and cosmogonic explanation. It is customary to divide myths into historical and scientific, that is, myths of the past of man and myths to explain natural phenomena. But among the most primitive peoples the two sorts of myths become one. A vague tradition of the wanderings of a tribe is simply united with an explanation of a physical process, and thus the scientific myth is also historical. But there is one valid distinction to be kept in mind; that is, the distinction between such a scientific myth and a religious myth. Mythology has to do with religion only because religion is one of the many fields in which the art of telling stories has exercised itself. It does not follow, however, that a story in regard to the flood or to the way the world was made has any religious significance. The former example is a very good illustration of how the historical myth may become a religious myth. Thus in India the story of the deluge was told at first without any suggestion that the flood was a punishment of sin; later, however, it is interpreted as a 'washing out' of sin.

Another important principle in the classification of myths is the relativity of imagination in the myth-makers. This disposes of the rather crude demarcation into 'savage' and 'higher' myths. Thus the Polynesian and Melanesian mythology is almost as rich in stories of the gods as is that of Homer, but for all that the island-blacks are as savage as those of Africa, and their 'higher' mythology merely means that these savages are more imaginative than are the Mishmis and Kacharis of India, who have an active fear of devils, and a very vague idea of any other spiritual power except the ancestral ghost. An excellent illustration of mythology in its lowest stages is offered by the Central Australians. Here the whole burden of myths is concerned with the great deeds of the ancestors in the holy *Alcheringa* or 'time of old.' Of real gods there is only a Creator whose cosmogonic work is briefly described as 'cutting out the world.' The Creator made the world and the half-human ancestors of the tribes, but the mythology is concerned only with the latter. Gods, and especially tales of gods, come much later. If we may conclude that ancestor-deeds, and a somewhat adventitious and remote scientific explanation of the universe as formed by a superior being or as consisting of such a being's dismembered parts (another popular savage myth), constitute the basis of mythology, we shall no less truly find that the doings of the demons constitute the next stage. This phase of mythology is usually not developed beyond simple concrete performances. There is very little mysticism, and no system. A certain devil has had a difficulty with some member of the tribe and is either driven off or slays the man, who then becomes a devil in turn. A further stage is reached as the devil becomes more godlike, i.e. is no longer a mere mischief-maker, but a helper of man. This stage may be reached by savages, and it is characteristic of Polynesian mythology that, while mainly concerned with the doings of demons, it rises also to the conception of a kind-hearted demon, although this happens seldom.

At the stage when demons and not gods are the controlling spiritual agency, we find animal-myths in their crudest form, often, as in totemic tribes, being identical with ancestor-myths, but, again, without such identification. Thus, when the tribe is descended from an animal ancestor, or the ancestor has become an animal, the two sorts of myths merge; but myths about animals may be current without any notion of relationship between man and animal. The same is true in regard to myths about animated trees and mountains, etc. It is quite impossible to draw a sharp line between this stage and that where demons and animals and cult-heroes are elevated to the position of gods, and tales about them become part of theology.

In general we must distinguish between ancestor and cosmogonic myths, the myths of devils and of sprites, and the myths that collect about higher anthropopathic divinities. Again, not exactly cosmogonic, but historical, are the myths of floods and wanderings and of early settlements reflected in tales of hyperborean paradises. As the cosmogonic myths are early attempts to give not a religious, but a scientific or at least a logical explanation of the universe, so this class of myths may be called historical, and they may really reflect some pre-historical movement of races, though most of them are enwrapped in later fable. Thus myths of a deluge may in some cases rest on an actual flood, which as far as the tribe was concerned swept away the world. We cannot suppose, however, that any of these myths have come down to us in a pure condition. They are all accretions built up by successive generations. For this reason the higher mythology contains also the lower, though generally the more savage features in the latter have been softened down. Further, in the frequent amalgamation of tribes into a larger political unit myths often lose their original significance and are attached to quite different gods. Even without visible outward change the hero-god becomes modified in spirit, according to the changing theology. Again, as tribes merge and distribute their myths, so myths by their own charm travel from land to land, the characters being changed. Myths in an advanced stage may become purely allegorical, as when a solar culture-hero is represented as destroying barbarism under the guise of a long anthropomorphic tale, such as the epic of the Rāmāyana in India. Again, in the process of anthropomorphizing, the hero may become so human as to suggest that he was a man, and we thus arrive at the Euhemeristic explanation of all myths as tales told about human beings afterwards elevated to divine rank. Thus, in India the 'mortal gods,' or gods who had originally been men, are a recognized class, the most conspicuous member of the class being the local Crœsus called Kubera, who is usually regarded as king of the under-world wealth, a Pluto; but in this interpretation he is a god divinized out of a rich man named Kubera.

Explanation of Myths. The example just cited (and analogous cases) led to the notion that all myths were to be interpreted in this way, a view held by some rationalists in India, and favored in Greece by many thinkers, but first reduced to an 'atheistic' philosophy of mythology by Euhemerus in the fourth century B.C. In opposition to the older view that myths were to be interpreted allegorically, Euhemerus taught—whether seriously or not is now questioned by some scholars—that the gods were originally men, and that stories about men were transferred to gods, a method here and there countenanced by Plato. Herbert Spencer, who also believes that gods were at first the ghosts of men, has adopted the Euhemeristic explanation in its crudest form. He believes, for example, that there was once a girl called Dawn, and that when she died the Vedic Aryans sang to her ghost the Vedic 'hymns to Dawn'—a view consonant neither with the content of the hymns nor with the practices of the poets. At present, if we pass by Spencer's theory with the brief criticism it deserves, there are two accepted schools of interpretation. The older view is that of Max Müller. In its whole form it is quite as unhistorical as Spencer's, but it contains a truth ignored by the opposing school. Müller held that myths were nature-poetry, and that many of them in an advanced stage of evolution could be explained by what he called 'disease of language,' that is, mythology is the result of the misunderstanding, on the part of a whole people, of their inherited phraseology. Where an old poet referred to sunrise as 'the shining one' (feminine) being followed by 'the bright one' (masculine), his descendants interpreted the grammatical sex as implying sex in person and his phrase meant to them 'the (male god) Bright (sun) courts Miss Dawn,' and so, on the strength of countless errors of this sort, arose mythology, which can be analyzed into its component parts by comparing the names of gods in one language with cognate words in related languages. Müller's error lies in a too sweeping application of this theory, in his lack of appreciation of other causes leading to mythology, and in the weakness of his etymologies. But there is truth in the diction that a misapprehension makes gods. A Vedic poet sings, "Who is the god whom we should revere?" and his sublime word is interpreted by a later generation as meaning "there is a god called Who, and we should make sacrifice to Who." Then later writers go still further and enjoin upon the priests to make two sets of offerings, one to Who and one to Whom, as distinct deities. The folk-lore explanation, which has obtained since Mannhardt and Tylor and is steadily gaining ground, rejects both Euhemerism and language-disease as factors of mythology, and seeks the explanation of the higher myth in the original conception of the lower. Kronos's brutality and *Little Red Riding Hood* are both stories popular in their day and paralleled by many like stories among savage nations to-day. Such tales are retained, toned down, symbolically explained, but in origin they belong to the tales that please savages. There is no doubt that such is the state of the case, and that *Red Riding Hood* is not a sun-myth (exposed to disease of language), but a tale that pleasantly affected peasants. The folk-lore explanation runs to accumulation of tales, however, without a radical explanation, and it ignores too much what is true in Spencer's mythology, that many tales are simply ghost-stories. Nor can it be said that the folk-lore method is successful in explaining all myths. It is an error to suppose that all myths are psychical reflections of physical or of meteorological phenomena, for much must be attributed, even among savages, to poetical fancy. But what Mannhardt has himself called 'nature-poetry' and illustrated by modern examples among the Slavs shows that personalities originally solar are sometimes transferred to poetical representatives explicable only in a solar light. The true explanation of mythology will combine the hitherto antagonistic explanations of Lang and Müller, and will also admit that Spencer's theory of ghost-mythology is at times applicable. No stereotyped formula can include all the phenomena. In the last analysis will be found folk-lore, language-change, and ghost-stories. All three principles are active to-day in India, and probably have always been active among all peoples in proportion to their imaginative powers. The fourth element of poetic fancy affects all the other three. Much that is looked upon as elaborated mythology is nothing but a naïve statement of what appears to the savage as every-day facts, such as the birth of men from beasts or from the elements, the birth of animals from women, metempsychosis, the intimate relations between man and all natural objects.

Bibliography. For the folk-lore theory, consult Tylor, *Primitive Culture* (London, 1871); E. H. Meyer, *Indogermanische Mythen* (Berlin, 1883); Mannhardt, *Mythologische Forschungen* (Strassburg, 1884); Lang, *Custom and Myth* (London, 1884); id., *Myth, Ritual, and Religion* (2d. ed., ib., 1899); id., *The Making of Religion* (ib., 1898); Frazer, *The Golden Bough* (New York, 1900); for the comparative school, Kuhn, *Herabkunft des Feuers und des Göttertranks* (Berlin, 1859); Cox, *Mythology of the Aryan Nations* (2d ed., London, 1882); Schrader, *Sprachvergleichung und Urgeschichte* (2d ed., Jena, 1890); Max Müller, *Contributions to the Science of Mythology* (London, 1897), which contains the fullest and final statement of Müller's views. The ghost theory is given in Herbert Spencer's *Principles of Sociology* (London, 1876-96). Special mythologies are treated by Dowson, *A Classical Dictionary of Hindu Mythology* (London, 1878); Hillebrandt, *Vedische Mythologie* (Breslau, 1891); Oldenberg, *Die Religion des Veda* (Berlin, 1894); Hopkins, *Religions of India* (Boston, 1895); Renouf, *Religion of Ancient Egypt* (London, 1880); Jastrow, *Religion of Babylonia and Assyria* (Boston, 1898); Barton, *Semitic Origins* (New York, 1902); Preller, *Griechische Mythologie* (Berlin, 1894); Gruppe, *Griechische Mythologie und Religionsgeschichte* (Munich, 1898); Wissowa, *Religion und Cultus der Römer* (ib., 1898); De la Saussaye, *Religionsgeschichte* (Freiburg, 1897); id., *Religion of the Teutons* (Boston, 1903); Gill, *Myths and Songs from the South Pacific* (London, 1876); Brinton, *Religion of Primitive Peoples* (New York, 1897).

MYTHOLOGY IN ART. That portion of art which is concerned with the representation of mythological concepts. Religious notions are symbolized at a very early stage in the history of mankind. Conceptions which can be given in vague and poetic terms in the literature, must of necessity in art be represented concretely. The first beginnings are rude and uncouth; yet they develop in the course of time into the most beautiful of all expressions of national art. They are thus important not only from the point of view of history of art, but as one of the main sources for an accurate knowledge of the history of religion. We may trace in them also in many cases the influence which one religion has exercised upon another. If, for instance, we find the bearded figure within a circle as the Iranian symbol of Ormazd, and in Assyrian sculpture see the same figure hovering over a field of battle, it is at once evident that the religious art of Assyria has influenced that of ancient Persia, and the implication follows that the actual concept of the deity of Ormazd has been modified by a Semitic deity.

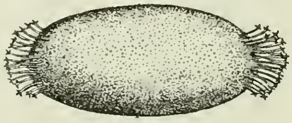
Nowhere are the distinct national characteristics of mythology so clearly set forth as in art. In the Egyptian paintings and statues of deities, we have the stiff outlines and the grotesque animal-headed figures, which stand in marked contrast to the brutal and massive religious art of Assyria and Babylonia. From the point of view of comparative religion the most perfect productions of art are as a rule inferior to the rude and archaic. It might almost be laid down as a rule that the higher the artistic merit, the less the purely religious value. The most important contributions of Assyrian art to a knowledge of its mythology are to be found not in the finished productions of the late period, but in the more ancient seal-cylinders, whose purely artistic merit is often slight. In Greece, in like manner, the early religious art is rude, but here we find in the most archaic periods traces of influence from Egypt, or again, as in certain pictures of the struggle of Hercules with the Nemean lion, an analogue too close to be accidental with Babylonian pictures of the Gilgamish cycle. Though the highest religious sentiments of a people at a given period are embodied in its art, the endeavor to make this embodiment perfect tends in the course of time to an increased purity in the type and symbolization of religious concept. This interacting process is stimulated by the fact that the statue or the painting is conceived to be in itself divine, and at later period a portion of godhood; later still it is a symbol which may indeed be a god to the vulgar, but to the cultured or to the initiated is but a representation of divinity. Artistic conceptions of divinities naturally vary, according to the character of the god represented. Thus in ancient Mexico we find beside the figure of the beneficent Quetzacoatl the horrible statue of the wargod Huitzilipochtli, on whose altar human sacrifices were offered. If the religious art of Mexico is rugged, that of India is effeminate. In India again, in harmony with the grotesque religious legends, we find strange divine figures. The monkey-god Hanuman, in harmony with his energetic character, has no touch of the effeminate about him, as has the love-god Kama, and in like manner we find the voluptuous figure of Parvati, the wife of Siva, in her kindly aspect, beside the frightful and demoniac figure of Durga, the malignant form of the same goddess. In Greece, where mythology in art was developed to its utmost perfection, we find this principle carried out in its entirety. Beside the austere Athene stands the seductive Aphrodite; with the powerful Hercules is contrasted the delicate, almost too beautiful Apollo, and over all the Pantheon towers the majestic figure of Zeus. See Art; Mythology; and the various articles on National Art as well as the plates of Egyptian Deities, Hindu Deities, Greek Art; Jupiter; Lysippus; and Parthenon Frieze.

MYTILENE, mĭt′ĭ-lē′nḗ (Lat., from Gk. Μυτιλήνη, Turk. *Midillü*), or Mitylene. The largest island in the Ægean Sea, also known as Lesbos (q.v.).

MYTILENE, or **MITYLENE** (modern Kastro, q.v., or Mitilini). The capital of the island of Lesbos (q.v.). It was colonized in very ancient times by the Æolians. Its situation on the southeast coast of Lesbos on a promontory that had been an island gave it two excellent harbors (Map: Turkey in Europe, F 5). Of its internal political history down to the time when Pittacus became practically dictator early in the sixth century B.C., something is to be learned from the fragments of the poetry of Alcæus (q.v.). Meanwhile the city had become the most important centre of the Asiatic Æolians and a great naval power, and had founded colonies in Mysia and in Thrace. After the Persian wars it became an important member of the Athenian Confederacy (see Athens), but in B.C. 428, the fourth year of the Peloponnesian War, it rebelled against Athenian domination. Defeat after a famous struggle ended its power (B.C. 427). Mytilene fought on the side of King Mithridates in his war against Rome (B.C. 88), and after his defeat suffered for it. Consult: Leithäuser, *Der Abfall Mytilenes von Athens* (Leipzig, 1874); Cichorius, *Rom und Mytilene* (ib., 1888).

MYTILUS. See Mussel.

MYXINE (from Gk. μύξα, *myxa*, mucus). The single genus of the family Myxinidæ, represented by the single species *Myxine glutinosa*, the hagfish or 'borer' of the North Atlantic Coast. These eel-shaped parasitic animals, which burrow into the bodies of fishes, are extraordinary in their reproductive habits. According to Nansen, Myxine is generally or always in its young stage a male, while at a more advanced stage it becomes transformed into a female. The ovary is single, and on the right side, and there are no oviducts, the mature eggs falling into the abdominal cavity and being extruded through the peritoneal opening at the side of the vent. The eggs are few and large, and each is inclosed in an oblong horny case, with threads at each end, by which the egg adheres to some fixed object until it hatches. See Hagfish.

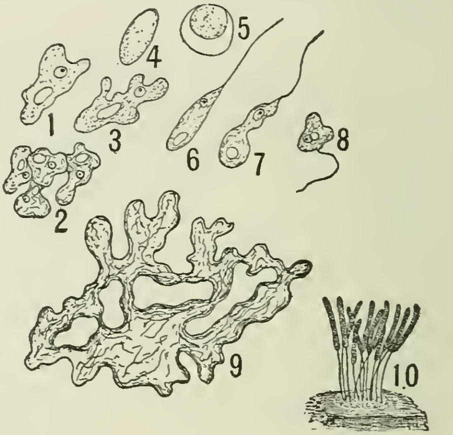


EGG OF MYXINE.

MYX′ŒDE′MA (Neo-Lat. nom. pl., from μύξα, *myxa*, mucus + οἴδημα, *oidēma*, swelling). A progressive disease characterized by widespread changes in nutrition and by the invasion of the subcutaneous tissues by solid œdema, due to diminished functional activity of the thyroid gland. It has been called *cachexie pachydermique* (Charcot), *cachexia thyroidca* (Kocher), and *hydroparesie* (Féris). Myxœdema is caused by destruction of the tissue of the thyroid gland by disease, or as a result of removal of it by operation. It occurs principally in women, and is in fact an acquired cretinism in adult life. By far the greater number of cases occur between the ages of thirty-five and forty-five. In some families there is a distinct inheritance of a predisposition to disease of the thyroid gland. The disease occurs most frequently in cold climates, and is perhaps most frequent in Europe. The symptoms of the disease develop gradually, in most cases nearly a year elapsing before the disease becomes distinct. Among the principal symptoms are languor: sensibility to cold; absence of perspiration; loss of hair; decay of nails and teeth; pallor; subnormal temperature; hallucinations of sight and hearing, and even actual insanity; anæmia: indigestion; and enlargement of lymphatic glands. The treatment is to feed the patient with thyroid gland extract or dry thyroid, together with tonics, such as phosphoric acid and iron. Thyroid grafting has proved efficacious in many cases. The partial or entire thyroid of an animal is transplanted into the peritoneal cavity or into the subcutaneous tissue of the patient, to whom thyroid has been administered for a considerable time previously to the grafting, as suggested by Victor Horsley. Treatment by the administration of thyroid extract has been largely employed since it was first used in 1891 by Murray of England. The extract is made by macerating sheep's thyroids in glycerine. It must be administered with great care, degeneration of the heart or of the great vessels being an indication for very small initial dosage. In some patients profuse diarrhœa results, in others vomiting, sweating, headache, swelling of the glands about the jaw, and prostration. The remedy may be used hypodermically. After the symptoms of the disease have disappeared, the patient must take a small quantity of the thyroid extract at regular intervals as long as she lives, to maintain the improved condition. See CRETINISM. Consult: Gull, "On a Cretinoid State Supervening in Adult Life in Women," in *Clinical Society's Transactions* (London, 1874); Murray, in *British Medical Journal* (London, 1891); Virchow, in *Berliner klinische Wochenschrift* (1887); Horsley, in *Brown Lectures* (London, 1884); Osler, in *American Journal of the Medical Sciences* (Philadelphia, 1893): Gimlette, *Myxœdema and the Thyroid Gland* (London, 1895).

MYXOMYCETES, mĭk′sȯ-mi̇-sē′tēz (Neo-Lat. nom. pl., from Gk. *μύξα, myxa*, mucus + *μύκης, mykēs*, fungus). A group of organisms commonly called slime molds. Certain phases of their life history are very animal-like, but the final fructification has many plant characteristics, and as the forms are described and classified by the fructification the work has naturally fallen within the province of botany. They are here treated as one of the great groups of the fungi (q.v.). The purpose of the fructification is the production of multitudes of very minute spores. The spores germinate in moist situations on the soil and in humus, giving rise each to a motile protoplasmic body provided with a cilium (Figs. 6, 7, 8). These swarm cells swim around in the moisture, increasing in number by division (fission). After an active period they become more quiet and creep around like amœbæ (Figs. 1, 2, 3), finally approaching one another and fusing in pairs, or perhaps several together. Such fused groups become centres of attraction to many hundreds of swarmers, which contribute their substances to the common mass. The result is a large protoplasmic body, called a plasmodium (Fig. 9), which moves over the surface of the humus and into crevices like a gigantic amœba. Its food is largely bacteria and other fungi, which are taken directly into the protoplasmic body and digested, the hard and worthless portions being discarded.

Vegetating plasmodia shun the light and seek moisture. But these habits are reversed when the fructification is to be formed; the plasmodia then come to the light and take position in the driest situations that they can find. This is the time when plasmodia are most conspicuous and are frequently found on stumps, bark, and humus. The largest plasmodia may cover several square inches, but most of them are much smaller, and some are no larger than a pin-head.



MYXOMYCETES.

Chondrioderma: 1, 2, 3, amœboid stage; 4, 5, resting stage; 6, 7, 8, motile stage; 9, plasmodium stemonites; 10, sporangia.

The form of the fructifications is exceedingly various, some being large and irregular, and others with an extraordinary delicacy and complexity of structure, but the general history of spore formation is much the same. The plasmodium excretes a great deal of material (and frequently mineral matter) which forms the wall of the spore-case (sporangium) and its stalk if present (Fig. 10). A filamentous network called the capillitium may also be developed inside the spore-case, its function being to distribute the spores. The protoplasm which remains after these activities divides up into minute rounded bodies which, investing themselves with walls, become the spores. The plasmodia of slime molds have been favorite subjects of observation by physiologists, who find here the largest masses of protoplasm that can be studied.

For a general account consult: Engler and Prantl, *Die natürlichen Pflanzenfamilien* (Leipzig, 1887): and for special descriptive treatment, Lister, *A Monograph of the Mycetozoa* (London, 1894); McBride, *The North American Slime Moulds* (New York, 1899).

MYZONTES, mī-zŏn′tēz. Same as Cyclostomi (q.v.).

N

N The fourteenth letter and eleventh consonant of the Roman alphabet. This character has varied very little in form and not at all in value since the origin of the alphabet. The original letter was apparently called *nun*, which in Phœnician and in the North Semitic languages signified 'fish.' Apparently the early pictographic character represented a fish. See Alphabet.

Phonetic Character. *N* stands for the dental or alveolar nasal sound which is the equivalent to *d* and *t*. The sound is produced by a check or mute contact and sonant vibration of the vocal cords as in *d* with the addition of the opening of the nasal passage made by lowering the soft palate. The size and shape of the resonance-chamber make the difference between *n* and the other nasal letters. Under certain conditions *n* may have a syllabic or vocalic value, as in *rotten, forgotten*. In scientific linguistics this value is represented by *n̥*. It is sometimes silent after *m* or *l* in the same syllable as in *damn, hymn, autumn, kiln*. Before *g, k, ch* it receives a semi-guttural or palatal coloring to harmonize with the consonant it precedes, as in *long, think, pinch*.

Source. In its historic development *n* represents an original *n* which has been preserved with great constancy through the Indo-Germanic period to the present time. Thus *night*, Gothic *nahts*, Skt. *nakti*, Lat. *nox;* or again Idg. **newos*, 'new,' Skt. *navas*, Gk. νεός, Lat. *novos*, Goth. *niujis*, Ger. *neu*, Eng. *new*. In Anglo-Saxon an original Germanic *n* disappears before *s, f*, and þ.

As a Symbol. As a numeral N = 90 and N̄ = 90,000. In chemistry N = nitrogen; Na = sodium (i.e. natrum).

NABA, nä'bå. A seaport of Japan. See Nafa.

NABAB, nȧ'bȧb', Le (Fr., the Nabob). A story by Alphonse Daudet (1877), based on the career of a contemporary adventurer. Its characters are in large part actual persons thinly disguised.

NAB'ATÆ'ANS (Gk. Ναβαταῖοι, *Nabataioi*, Ar. *Nabaṭu*). An Arab people or tribe settled in various parts of the country east and southeast of Palestine, who formed during the Græco-Roman period a petty independent kingdom. Their history is known to us from classical authors, especially Diodorus and Josephus, as well as from numerous coins, and from inscriptions, dating from the year B.C. 169 to A.D. 105, which have been collected by De Vogüé (1868), Doughty (1884), Huber (1884), and Euting (1885). They are located at various places from the Hauran in the North to Madain Salah (Al-Hijr in Northern Arabia) in the South. The Arabic character of the Nabatæans is evinced by their proper names, though they used a Western Aramaic language and script, as the Northern Arabic had not yet been reduced to writing. It is uncertain whether they are to be connected with the Nabaioth, an Arabic tribe mentioned together with Kedar as a son of Ishmael (Gen. xxv. 13; xxviii. 9; xxxvi. 3; I. Chron. i. 29; Is. lx. 7) and several times referred to as *Nabaiati* in the Assyrian inscriptions of Tiglathpileser, Sargon, and Asshurbanipal. The Nabatæans are first met with about 312 B.C. at Petra as nomads, but so strongly intrenched here that both the generals sent against them by Antigonus, Athenæus and Demetrius, were unable to dislodge them. The Nabatæan kingdom arose in ancient Edom upon the ruins of the Seleucid and Ptolemaic empires. Its first prince was Aretas I., to whom the high priest Jason fled in B.C. 169. Its first king was probably Erotimus (Taim-Allat, B.C. 110-100). Obedas I. (B.C. 90) was able to hold his own against Alexander Jannæus, and Aretas III. (Philellenos) against Antiochus XII. of Cœle-Syria. The latter even conquered Damascus, but was driven out by the general of Pompey. Antony presented part of the land of the Nabatæans to Cleopatra. When Malchus I. (B.C. 50-28) refused to pay tribute, his land was overrun by Herod. War broke out between Herod and Aretas IV. (A.D. 9-40), in which the Nabatæans were successful. When Paul was in Damascus, that city must have been once again in the power of the Nabatæans (II. Cor. xi. 32). At the time of the Emperor Claudius, King Abias undertook an expedition against Adiabene, but he was beaten back. Damascus was lost to Nero in the reign of Malchus II. (48-71). The last King of the Nabatæans was Rabel II. (71-106). In 106 Cornelius Palma, Governor of Syria, made the region from Petra in the South to Bostra in the North into a Roman province. In the fourth century two provinces were created: Arabia with Bostra as a centre, and Palæstina Tertia with Petra as centre. The latest inscriptions in Nabatæan characters are those of Al-Namarah (328), Zebed (512), and Harran (568); but the language is purely Arabic. Later Arabic writers use the word Nabatæan as the equivalent of Aramæan. The importance of the Nabatæans is due to the fact that they formed a sort of buffer State against the Arabs of the desert and because their country lay in the direct line of the caravan route from Arabia to Syria. Al-Hijr was an emporium for the products of Yemen; and many mausoleums built in the rocks and beautifully carved are evidence of the riches which were concentrated here. The national temple was also situated at this place. The chief gods of the Nabatæan Pantheon seem to have been Dusares (*Dhu al-Shara*), Manat, Kais, Allat, and Hobal. Consult: Euting, *Nabatäische Inschriften aus Arabien* (Berlin, 1885); Schürer, *Geschichte des jüdischen Volkes*, vol. i. (Leipzig, 1886-90).

NABAYUGAN, nä′bȧ-yōō′gȧn. A head-hunting Malay tribe in Cagayan Province, Luzon. See Philippine Islands.

NABBES, năbz, Thomas (1605-?). An English dramatist, born in Worcestershire. His first comedy, *Covent Garden*, was produced in London in 1632-33. His second attempt, *Tottenham Court* (1633), was followed by *Hannibal and Scipio: An Hystorical Tragedy* (1635), and a comedy called *The Bride* (1638); but more talent was displayed in his masques, such as *Spring's Glory* (1638). An edition of his works was published by Bullen (London, 1887; *Old English Plays*, new ser., vols. i. and ii.).

NABHA, nä′bȧ. An eastern native State of the Punjab, India (Map: India, C 2). Area, 936 square miles. Population, in 1891, 282,756; in 1901, 297,949. Capital, Nabha.

NA′BOB, or **NA′BAB** (Hind., Ar. *nawwāb*, deputy, from Ar. *nāba*, to replace, to be a deputy). Under the Mogul Empire of India, the administrator of a province comprised in the region ruled by a *subahdar* or viceroy. The title was continued under the British rule, but gradually was applied to unofficial wealthy natives. In the United Kingdom and other European countries it is applied derisively to Euro-Indians who, having amassed fortunes in India, return to make an ostentatious display of their wealth.

NA′BONAS′SAR (Ass. *Nabu-nasir*, Nabu (or Nebo) protects). King of Babylonia (B.C. 747-734). His contemporary in Assyria, Tiglathpileser III. (B.C. 745-727), succeeded with the help of the Aramæan hordes that at all times were a menace to Babylonian security in obtaining complete control of Babylonia, and emphasized his success by giving himself in his inscriptions the title of King of Sumer and Accad (i.e. Southern and Northern Babylonia), and by worshiping at the shrines of the Babylonian gods in the most important cities of the south: Sippar, Nippur, Babylon, Borsippa, Cuthah, Kish, Dilbat, and Erech. It is evident, therefore, that Nabonassar must have been merely a vassal to Tiglathpileser III., but a semblance of independence was permitted to Babylonia because of a desire on the part of the Assyrian rulers to deal leniently with the old empire in the south for fear of incurring the displeasure of the Babylonian gods who were also the gods of Assyria. The history of Babylonia, therefore, in Nabonassar's reign is merely a part of Assyrian history. His name is preserved in the Ptolemaic canon, whose list of Babylonian kings begins indeed with Nabonassar. Why the beginning should have been made with this ruler is not clear. There is nothing to warrant the supposition that the Babylonians began a new era—historical or astronomical—at the time of Nabonassar, though that date was adopted as a new astronomical era by the Greeks. Equally mysterious is Berosus's statement, preserved by Syncellus, that Nabonassar first collected and then destroyed the chronicles of his predecessors. Consult Rogers, *History of Babylonia and Assyria*, vol. ii. (New York, 1900); and for the reign of Tiglathpileser, Rost, *Keilschrifttexte Tiglat-Pilesers III.* (Leipzig, 1893).

NABON′IDUS (Ass. *Nabu-na'id*, Nabu (or Nebo) is exalted; Herodotus (i. 74, 77, 188) has erroneously *Λαβύνητος*, *Labynētos*). The last King of the Neo-Babylonian Empire, sixth in order of succession from Nabopolassar (q.v.), the founder of this empire. He came to the throne in B.C. 555 as a result of a conspiracy formed apparently by the priests of the city of Babylon against Labosoarchod (Ass. *Labashi-Marduk*), the grandson of Nebuchadnezzar (through the female line), which cost Labosoarchod his life. Nabonidus was a native Babylonian and not, as his predecessors since Nabopolassar, a Chaldean. In his inscriptions, of which a large number have been found, he appears chiefly in the light of a builder and restorer of the sacred edifices in such ancient centres as Ur, Harran, and Sippar. While he did not neglect the sanctuaries of Marduk and Nebo at Babylon and Borsippa, yet his greater devotion to other centres appears to have aroused the opposition of the priests and of the population of Babylon, and the neglect of suitable preparation to resist the threatening advance of Cyrus (q.v.), the leader of the Medes, is probably to be ascribed to internal dissensions. It would appear that Nabonidus was not even present in the city of Babylon when in the summer of 538 the Persian army marched upon the capital. His son Belshazzar (Ass. *Bel-shar-usur*, Bel, protect the King) had been placed in control, while the father's official residence was at a place called Tema, the exact location of which is not known. Babylon fell, as a Babylonian chronicle puts it, 'without battle,' and in the autumn Cyrus himself entered the city in triumph and became heir to the glorious past of Mesopotamia and the Euphrates Valley. Belshazzar was put to death, while Nabonidus was banished to Karmania. Consult: Rogers, *History of Babylonia and Assyria* (New York, 1900); and the Babylonian-Assyrian histories of Tiele (Gotha, 1886), Hommel (Berlin, 1885), and Winckler (Leipzig, 1892).

NAB′OPOLAS′SAR (Ass. *Nabu-apal-usur*, Nebo, protect the son). The founder of the Neo-Babylonian Empire, King of Babylonia B.C. 625-605. He was not of royal birth, as is indicated by the absence of any reference to his father in the inscriptions that we have of him. By his own efforts he rose to a position of supremacy over the district of Chaldæa lying to the south of Babylonia proper as far as the Persian Gulf, which had managed even during the height of the Babylonian Empire to retain a certain measure of independence, and whose separate position continued to be recognized by the Assyrian kings when Babylonia had come under the control of Assyria. At various times the Chaldæans made attempts to regain their independence, and the growing weakness of Assyria after the death of

Asshurbanipal in B.C. 626 furnished the desired opportunity for the Chaldæans to reassert themselves and to extend their control from Chaldæa to Babylonia. About B.C. 607 Nabopolassar, with the aid of the Medes and the northern invaders indefinitely known as the Scythians, brought about the fall of Nineveh and the destruction of the Assyrian realm. The Neo-Babylonian Empire now became the controlling influence in Mesopotamia and the Euphrates Valley. The few inscriptions of Nabopolassar which have been found show him to have been a man of force and energy, who managed not only to maintain his position against great odds, but to hand over to his son, Nebuchadnezzar, an empire almost as extensive and as powerful as was that of Assyria in her best days. He improved and enlarged the famous temple of Marduk in Babylon, and the sanctuaries of Shamash, the sun-god, and of Belit at Sippar, and constructed a canal at the latter place to bring the waters of the Euphrates to the city walls. The Chaldæan origin of the Neo-Babylonian Empire led to the use of the term Chaldæan among classical writers for Babylonia. Consult: Rogers, *History of Babylonia and Assyria* (New York, 1900), and the Babylonian-Assyrian histories of Tiele (Gotha, 1886), Hommel (Berlin, 1885), and Winckler (Leipzig, 1892).

NABOTH. The owner of a parcel of land, described as a 'vineyard,' in Jezreel, adjoining the palace of Ahab, King of Israel. When the latter proposed to buy the land, Naboth refused to sell (Num. xxxvi. 7). Thereupon the Queen, Jezebel, had Naboth put to death by the elders of his city on a false accusation of treason against God and the King, and the King took possession of the land. The crime was denounced by Elijah, and the downfall of the house of Ahab and the barbarous murder of Jezebel were regarded as its just punishment (I. Kings xxi.; II. Kings ix. 21-30). The story is interesting for the hints it gives as to local customs and popular ideas in Israel in the ninth century B.C. See Ahab; Jezebel.

NABU, nä'bōō. See Nebo, Mount.

NABUA, nä'bōō-ȧ. A town of Southern Luzon, Philippines, in the Province of Camarines. It is situated in a low, marshy region occupied by rice-fields, about 20 miles southeast of Nueva Cáceres (Map: Philippine Islands, H 6). Population, in 1896, 17,789.

NABULUS, nä'bụ-lōōs', or **NABLUS.** One of the chief cities of modern Palestine, the ancient Shechem (q.v.). It is situated about 35 miles north of Jerusalem, in a well-watered and productive valley, between the mountains Jebel esh-Shemali (Ebal) on the north and Jebel et-Tor (Gerizim) on the south. It is the seat of government for central Palestine and the corresponding region beyond the Jordan, the residence of a Greek bishop, has several mosques and Mohammedan schools, and English and Latin mission establishments. It has considerable industries, especially the manufacture of soap, and carries on a lively trade with the east-Jordan country and Jaffa. It has about 24,000 inhabitants, including the surviving remnant of the Samaritans, who occupy the southwest part of the town. See Samaritans.

NAC'CAYSH. A fish. See Mooneye.

NACHTIGAL, näG'tė-gȧl, Gustav (1834-85). A German explorer, born at Eichstedt, near Stendal. He studied medicine, practiced as a military physician in Cologne, and in 1863 went to Algiers, and then became a physician in the service of the Bey of Tunis. In 1869 he joined a caravan which was dispatched to carry from the King of Prussia to the Sultan of Bornu some gifts in recognition of the latter's services to various German explorers. After a journey in the Tibbu country he set out for Kuka, the capital of Bornu, where he arrived in 1870. He made a thorough exploration of Bornu; then went to Lake Chad. Making his way to Bagirmi, he followed up the Shari River and its tributaries. In the spring of 1874 he set out for Egypt, going through Wadai, which he was the first European to penetrate. He visited Abeshr, the capital of Wadai, passed through Darfur and arrived at Cairo in November, 1874. In 1875 he returned to Europe, where his explorations had made him famous. In 1884 he visited the west coast of Africa, where his explorations resulted in the acquisition by Germany of the important colonies of Togoland, Kamerun, and Lüderitzland. Before finishing his labors, however, he was taken sick and died. His greatest work, *Sahara und Sudan*, was published in 1879-89. Consult Ruhle, *Gustav Nachtigal* (Münster, 1892.)

NACOGDOCHES, nä'kỏ-dō'chĕz. A city and the county-seat of Nacogdoches County, Texas, 138 miles north by east of Houston; on the Houston, East and West Texas and the Texas and New Orleans railroads (Map: Texas, G 4). It has lumber mills, cotton gins, cotton compress, cottonseed oil mill, brick plants, etc.; and, as the commercial centre of a productive cotton-growing and farming section, controls wholesale interests of importance, and a trade in cotton, produce, hides, and lumber. Population, in 1890, 1138; in 1900, 1827. Nacogdoches owes its origin to a Spanish mission, established here early in the eighteenth century. As an outpost against American encroachment it played a part in the controversy between Spain and the United States over the Spanish possessions in the Southwest. It was captured in 1812 by an American filibustering party under Magee and Gutierrez.

NADAL', Ehrman Syme (1843—). An American author, born at Lewisburg, W. Va. He graduated at Yale in 1864, was second secretary of the United States Legation at London in 1870-71 and 1877-83, and after 1884 was for several years a member of the staff of the New York *Nation*. His publications include *Impressions of London Social Life* (1875); *Essays at Home and Elsewhere* (1882); and *Zwiebak: Notes of a Professional Exile* (1895). He also contributed in similar vein to reviews and other periodicals.

NADAUD, nȧ'dỏ', Gustave (1820-93). A French song-writer, born at Roubaix (Nord). He was educated for commercial life, but the success of some of his songs decided him to take up song-writing as a profession. Collections of his compositions appeared in 1849, 1852, 1862, 1870, 1879-80, and 1882, and many of the songs became popular. He also wrote three operettas, *Une idylle* (1861), a novel, and *Solfège poétique et musical* (1886), *Miettes poétiques* (1888), and *Nouvelles chansons à dire ou à chanter* (1889).

NA'DEN, Constance Caroline Woodhill (1858-89). An English poet, born at Edgbaston, Birmingham, January 24, 1858. She attended classes in science at the Birmingham and Midland Institute and at Mason College, and became a close student of Herbert Spencer, on whose philosophy she frequently gave lectures. She died December 23, 1889. Miss Naden published two volumes of poems: *Songs and Sonnets of Springtide* (1881), and *A Modern Apostle and Other Poems* (1887). containing pieces, as "The Pantheist's Song of Immortality," that give her an assured place among the lesser poets. Consult the *Memoir* by W. R. Hughes and others (London, 1891); *Induction and Deduction*, a prize essay, ed. by Lewins (ib., 1890); and *Complete Poetical Works*, ed. by Lewins (ib., 1894).

NA'DIR (Ar. *nazir*, similar, corresponding (i.e., to the zenith), from *nazara*, to behold, to be face to face). That point in the heavens which is diametrically opposite to the zenith, so that the zenith, nadir, and centre of the earth are in one straight line. The zenith and nadir are 90° distant from every part of the horizon (q.v.). See ZENITH; MERIDIAN CIRCLE.

NADIR SHAH, nȧ-dēr' shä (1688-1747). A King of Persia. He belonged to the Afshars, a Turkish tribe. He was born near Kelat, in the centre of the Persian province of Khorasan. At the age of seventeen he was taken prisoner by the Usbek Tatars, but, escaping after four years of captivity, he entered the service of the Governor of Khorasan, and soon obtained high promotion. Having, however, been degraded and punished for some real or supposed offense, he became an outlaw and for several years was the leader of a band of 3000 robbers. At this period the Persian throne was occupied by a usurper, Mir Vaiz, of the Afghan tribe of Ghilzai, who were bitterly hated by the Persians for cruelty and oppression. In favor of the rightful heir, Tahmasp II., Nadir took up arms against Malik Ashraf, the successor of Vaiz, and in token of his loyalty assumed the name of Tahmasp Kuli, or Slave of Tahmasp. Defeating the usurper in a series of engagements, he freed the provinces of Irak, Fars, and Kirman of even the semblance of Afghan domination. The assassination of Ashraf during his retreat terminated the war. Tahmasp then ascended the throne, and Nadir received for his services the government of the provinces of Khorasan, Mazanderan, Seistan, and Kirman. He was sent against the Turks in 1731, and defeated them at Hamadan, regaining the Armenian provinces which they had seized in the preceding reign. Meanwhile Tahmasp himself had been unsuccessful in his operations against the Turks. Nadir took this as a pretext to imprison the Shah, whose infant son, Abbas II., he placed on the throne in 1732. The death of this puppet, in 1736, opened the way for the elevation of Nadir himself, who was crowned as Nadir Shah, February 26, 1736. To win the support of the Afghans, the new ruler declared the Sunnite form of Mohammedanism to be the State religion instead of the Shiite, which has always been favored by the Persians. Nadir resumed the war with the Turks, and, though totally defeated in the first two battles by the Grand Vizier Asman, turned the tide of fortune in the subsequent campaign, and granted peace to the Turks on condition of receiving Georgia. He also conquered Afghanistan, and drove back the invading Usbeks. His ambassador to the Great Mogul having been murdered together with his suite at Jelalabad, and satisfaction having been refused, Nadir, in revenge, ravaged the Northwest Provinces and took Delhi, the capital of the Great Mogul, which was pillaged against his will (1739). With booty to the amount of four hundred million dollars, including the Koh-i-nur (q.v.) diamond and the famous peacock throne, he returned to the west bank of the Indus. He next reduced Bokhara and Khwarezm, restoring to Persia her limits under the Sassanids, and formed plans, which were never realized, for making Persia a maritime power. Embittered by an attempt to assassinate him in 1741, of prompting which he suspected the heir apparent, Rizakuli, whom he blinded and imprisoned, Nadir's character underwent a sudden change. Formerly open-hearted, liberal, and talented, he became suspicious, avaricious, and tyrannical. He was assassinated on June 20, 1747, and was succeeded by his nephew, Ali, who ascended the throne as Adil Shah, or the 'righteous king,' but was deposed within a year. Consult Maynard, *Nadir Shah* (Oxford, 1885).

NADLER, nä'dlẽr, KARL CHRISTIAN GOTTFRIED (1809-49). A German poet, who wrote in the dialect of the Rhenish Palatinate. He was born at Heidelberg, and studied there and at Berlin. His poems, under the title *Fröhlich Palz, Gott erhalts* (1847; 8th edition, 1882), were excellent pieces of genre verse, the drinking songs being peculiarly rollicking and musical.

NADSON, nät'sôn, SEMYON YAKOVLEVITCH (1862-87). A Russian lyric poet, born in Saint Petersburg, of Jewish extraction on his father's side. In 1878 he published his first poem, *At Dawn*. Shortly after he entered the army, but soon left it because of poor health. His volume of poems was bequeathed to the *Literary Fund*, which had advanced him a loan to go abroad. Its sale—over 50,000 copies—was unprecedented. It is now in the fourteenth edition, and a special *Nadson Fund* of 50,000 rubles has accumulated. His poetry charms by the soft melancholy of a youthful dreamer who is a prey to physical suffering.

NÆ'VIUS, GNÆUS. One of the earliest Latin poets, probably born in Campania, in the first half of the third century B.C. In his youth he served in the First Punic War, but later made his appearance at Rome as a dramatic writer. He was very decidedly attached to the plebeian party, and in his plays satirized and lampooned the Roman nobles with extreme virulence. His rashness ultimately caused his banishment to Utica in Africa, where he died about B.C. 200. Besides his dramatic writings, comprising both tragedies and comedies, he wrote an epic poem, *De Bello Punico*, in the old Saturnian metre. Of the plays only a few very unimportant fragments are extant, which may be found in Bothe's *Poetarum Latinorum Scenicorum Fragmenta* (Halberstadt, 1824); Klussmann's collection of the same (Jena, 1843); Müller's *Livii Andronici et Cn. Nævi Fabularum Reliquiæ* (Berlin, 1885); or Ribbeck's *Scænicæ Romanorum Poesis Fragmenta* (Leipzig, 1897-98). See also Sellar's *Roman Poets of the Republic* (Oxford, 1881).

NÆVUS (Lat., mole, wart, birth-mark), or Birth-Mark, Mother's Mark. A congenital mark upon the skin consisting of the product of excessive development of fibrous tissue, hair, blood-vessels, or pigment in a circumscribed area. The term is generally and perhaps more properly limited to a variety of angioma, or vascular tumor, usually of small size, composed of enlarged capillaries which communicate freely with other capillaries of the skin. The ordinary form of nævus is the *vasculosus.* This is present at birth or appears during the early months of the child's life, presenting itself as a red stain, or a diffuse flat patch, somewhat elevated above the surrounding surface. It may be a punctate spot, or may cover the side of the face, or even the neck and chest, for example. This variety is called 'port-wine mark,' 'wine stain,' *tache de feu,* or *Feuermal.* The *nævus araneus* or 'spider cancer' is not a cancer, but an angioma, consisting of a central elevated red point from which radiate dilated vessels so that there is a rough resemblance to a star. It is commonly single and occurs usually in children of about a year or two years old, and is generally situated on the nose or cheeks. The nævi of vascular variety are found in the papillary layer of the upper part of the corium, and consist of irregularly intertwined and dilated capillary vessels of new growth with free anastomosis. In some there is a layer of connective tissue found encircling the vessels, or an enormous growth of connective tissue, so that the result may resemble elephantiasis (q.v.). The treatment for the removal of nævi is surgical. Excision with the knife, ligature, transfixion of the growth with a cataract needle, compression by means of pads retained in place with a rubber band, chemical caustics, such as nitric acid or the acid nitrate of mercury, multiple linear scarification, electropuncture, and electrolysis are the means employed, the last named being the best method of procedure. Vaccination directly upon the nævus is an obsolete means of removal. Port-wine marks may be removed by creating several minute cicatrices with the electric needle. Entire removal of an elevated mass may be effected by electrolysis, as in the case of a tumor (q.v.).

NAFA, nä'fȧ, **NABA,** or **NAVA.** A seaport on the western coast of the island of Okinawa, in the Loo-choo group, Japan (Map: Japan, G 7). It is the principal seaport of the group, and exports sugar, cotton, and silk to Japan. Population, in 1898, 35,453.

NÄFELS, nā'fĕls. A village in the Canton of Glarus, Switzerland, on the Linth, four miles by rail north of the city of Glarus (Map: Switzerland, C 1). It was the scene of a famous battle, in 1388, in which 1500 natives defeated an Austrian force of four times their number. The anniversary of this battle, which freed the canton from the Austrian yoke, is still celebrated. Population, in 1900, 2500.

NAFTIA, näf'tē-ȧ, Lago, or Lago dei Palici. A small lake in Sicily, near Palagonia, in the Province of Catania. It is situated in a plain, near craggy hills, in an ancient crater, about 100 meters in diameter. At several points the water bubbles violently, sometimes rising to the height of two feet or more under the pressure of the outpouring of carbonic acid gas. The water is greenish, or turbid, and has an odor of naphtha. The atmosphere is fatal to birds attempting to fly across the surface of the lake, and to small animals which approach it to satisfy their thirst; while to lean over it is believed to produce dizziness and headache in man. The ancients regarded these phenomena with great dread. Here were worshiped by the Siculi, the pre-Greek inhabitants of the island, a pair of chthonic gods of mighty power, called commonly by the Romans Palici (Gk. παλικοί). In the great servile revolt against Rome (B.C. 104) the temple was the centre of the conspirators. Consult Freeman, *History of Sicily, I.* (Oxford, 1891).

NĀGA, nä'gȧ (Skt., serpent). In Hindu mythology, a member of a fabulous race of semi-divine serpents with human faces, but reptile forms, inhabiting the lower world, where their capital, Bhogavati, was a scene of magnificence and splendor. Sesha, the sacred serpent of Vishnu, was their king. The name Naga was applied also to an actual race of people in Central India, perhaps so called from their worship of serpents, and this people has left historical traces, although fable and myth doubtless become mixed in allusions to the serpent race.

NAGA. A town of Cebú, Philippines, on the east coast, 11 miles southwest of Cebú. It is a port of call for steamers and coasting vessels. Population, in 1896, 15,093.

NAGANA, nȧ-gä'nȧ. A disease of live stock prevalent in South Africa, caused by parasitic Hæmatozoa, which are carried from a diseased animal to a healthy one by the tsetse-fly (q.v.).

NAGANO, nȧ-gä'nō. An inland city of Hondo, Japan, about 95 miles south-southwest of Niigata (Map: Japan, F 5). It is celebrated principally for the Buddhist Temple of Zenkoji, one of the most famous temples in Japan, founded in the latter part of the seventh century. The town is visited by many pilgrims, and carries on a considerable trade in textiles and woven goods. Population, in 1898, 31,319.

NAGĀRJUNA, nȧ-gär'jōō-nȧ, or **NĀGASĒNA,** nä'g*a*-sā'nȧ. A great Buddhist sage and teacher, the founder of the Madhyamika School of Northern Buddhism, also famous because of his religious conference or discussion with the Græco-Bactrian King Menander or Milinda (q.v.).

NAGAS, nä'gȧz. The natives of the Naga Hills in Southeastern Assam. The Nagas of Manipur and the mountains extending to the north (Patkoi, Barai) of this country seem to be Indonesians, more or less pure, while on the Lushai Hills, south of Manipur, are probably Nagas mixed with Kyens and Burmese of Arakan. The Nagas live in permanent villages, the head-men of which hold their power largely by the exercise of sacerdotal functions. Marriage is exogamous, with paternal relationship. Many interesting taboos and kindred usages are in vogue. The Nagas are best subdivided into the Angami and Kanpui of the west, who wear a petticoat or apron, the Lhota and Hot in the centre, who wear a plaid, and the Nangta, or naked, in the east. Consult Hodson, "The Native Tribes of Manipur," in the *Journal of the Anthropological Institute* (London, 1901).

NAGASAKI, nä'gȧ-sä'kē. The capital of an important prefecture of the same name and one of the principal seaports of Japan, situated on a small peninsula in the northwest of the island of Kiushiu, in longitude 129° 52′ E. and latitude 32° 44′ N. (Map: Japan, A 7). The harbor, about three miles long, is one of the safest in the East, and sufficiently deep for vessels of twenty-six feet draught. The town has water-works with filter beds, a meteorological station, schools, a theatre, and hospitals. The principal industrial establishments are the Akanoura Engine Works and several ship yards. The foreign commerce of Nagasaki amounted in 1900 to about $11,000,000, of which about $3,500,000 represented exports. The principal imports are cotton, coal, sugar, and petroleum, and the chief exports coal, rice, flour, camphor, vegetable wax, and tobacco. The shipping amounted in 1900 to nearly 2,000,000 registered tons. Nagasaki is an important coaling station. The principal countries of the world are represented at Nagasaki by consuls. Population, in 1900, 120,865, including 1705 foreigners, of whom 1144 were Chinese. The commercial importance of Nagasaki dates from the sixteenth century, when it became the stronghold of the Japanese Christians, and an important centre in the foreign trade of Japan. When the Europeans were expelled from Japan, the Dutch were permitted to maintain their factory on the islet of Deshima (q.v.). Nagasaki then became the only point of communication between Japan and Europe. It was opened to foreign commerce by the treaty of 1858.

NAGCARLÁN, näg′kär-län′. A town of central Luzon, Philippines, in the Province of Laguna (Map: Luzon, G 10). It is situated 11 miles south of Santa Cruz, and has a population of about 13,000.

NAGEL, nä′gel, Albrecht Eduard (1833-95). A German ophthalmologist. He was born at Danzig; studied at Berlin under Gräfe; and after practicing in his birthplace for several years, became docent (1864) and professor (1867) at Tübingen. His most important discovery was the identity of the retinas as opposed to the theory of projection. This is explained in his book, *Das Sehen mit zwei Augen* (1861). Nagel's further writings include: *Die Refraktions- und Akkommodationsanomalien des Auges* (1866); *Behandlung der Amaurosen und Amblyopien mit Strychnin* (1871); and *Die Vorbildung zum medizinischen Studium* (1890).

NÄGELI, nā′ge-lē, Karl Wilhelm (1817-91). A Swiss botanist, born in Kilchberg, near Zurich. After studying at Zurich, Geneva, and Berlin, he began in 1842 to teach botany in Zurich, was made extraordinary professor in 1848, full professor at Freiburg in 1852, in 1855 at Zurich, and finally was appointed to the chair of botany at Munich. He gave to the morphology of plants, especially cryptogams, a great impetus. He also worked upon the genera of phanerogams, pointing out the limitations of species, with especial reference to the occurrence of hybrids, and to their origin through the transformation of species. He was a somewhat voluminous writer on systematic, cytological, and morphological subjects. He discussed in his *Mechanisch-physiologische Theorie der Abstammungslehre* (1883) the causes of the transformation of species, maintaining that each species is compelled by some peculiar internal cause to develop into a new form independently of the environment, and up to a certain degree independently of the struggle for existence. See Progression.

NÄGELSBACH, nā′gĕls-bäg, Karl Friedrich (1806-59). A German classical scholar and professor at Erlangen (1842); was born in Nuremberg; author of a popular *Lateinische Stylistik* (1846, and often reissued); *Die homerische Theologie* (revised ed. 1861); *Die nachhomerische Theologie* (1857); and *Aeschylus Agamemnon* (revised ed. 1863).

NAGLER, nä′glẽr, Georg Kaspar (1801-66). A German writer on art, born at Untersüssbach, Bavaria. Having settled at Munich as an antiquary, he began the publication of his *Neues allgemeines Künstlerlexikon* (22 vols., 1835-52), a monument of industry and careful research. Another important work is *Die Monogrammisten* (vols. i.-iii., 1857-63; vol. iv., ed. by Andresen, 1871; vol. v., ed. by Clauss, 1879); besides which he published the monographs, *Raphael als Mensch und Künstler* (1835); *Albrecht Dürer und seine Kunst* (1837); *Michel Angelo Buonarotti als Künstler*, and *Leben und Werke des Malers und Radirers Rembrandt van Ryn* (1843).

NA′GOR (African name). A West African antelope (*Cervicapra redunca*), one of the reedbucks.

NAGOYA, nȧ-gō′yȧ. The capital of the Province of Owari, Japan, in the island of Hondo, 94 miles by rail east-northeast of Kyoto (Map: Japan, E 6). It formerly belonged to the House of Owari, one of the most prominent houses in Japan, whose castle, dating from the beginning of the seventeenth century, is the principal feature of Nagoya, and contains many specimens of the work of some of the best artists of Japan. Another interesting feature is the Buddhist temple of Higashi Hongwanji with beautiful specimens of wood-carving. In the vicinity of the town is the industrial settlement of Seto, where the first glazed pottery in Japan was produced in the thirteenth century, and where the first work in *cloisonné* enameling in the country was done in the nineteenth century. Nagoya is still one of the most important pottery centres in Japan, the industry employing almost its entire population. It has also extensive manufactures of cotton and silk and embroideries. Population, in 1898, 244,145.

NAGPUR, nȧg-po͞or′, or **NAGPORE**. A division of the Central Provinces (q.v.), British India, comprising the districts of Nagpur, Bhandara, Chanda, Wardha, and Balaghat (Map: India, C 4). Area, 24,127 square miles; population, in 1891, 2,982,507; in 1901, 2,716,748. There are extensive tracts of low marshland throughout the region, and the climate generally is unhealthful. In the more fertile districts, cotton, rice, maize, oil-seed and other seeds, fruits, and vegetables are largely cultivated, and the division is famous for its oranges. The chief minerals are coal, antimony, ochre, and gold. The Gonds (q.v.) inhabit the hilly sections. Nagpur, formerly a part of the great Mahratta kingdom, was ruled by rajas, sometimes called the rajas of Berar, until 1853, when the dynasty became extinct, and the territory was annexed by the British. Capital, Nagpur.

NAGPUR, or **NAGPORE**. The capital of the Central Provinces, British India, and of a division and district, 520 miles by rail east-northeast of Bombay (Map: India, C 4). It occupies an unhealthful site on the banks of the Nag, a small stream, and with its extensive suburbs covers an area seven miles in circumference. The European quarter is in the Sitabaldi suburb, centred by the fort-crowned Sitabaldi Hill. Here, also, on the north, are the bazaars and the cantonment. Several fine Hindu temples of Mahrattan architecture, handsome gardens, monumental tanks, and the tombs of the Bhonsla Rajas are notable native features. There are manufactures of silk, cotton, and cutlery, and a considerable trade in agricultural produce, salt, and European manufactured goods. Nagpur became the capital of an independent Mahratta raja in 1740. In 1817 it was the scene of an attack by Raja Appa Sahib with 18,000 troops on the British Residency. The Resident, Mr. Jenkins, who had anticipated trouble, and had managed to assemble 1350 men under Col. Scott, defeated the assailants after eighteen hours' fighting. A second battle a month later resulted in the Raja's submission and subsequent deposition. Population, in 1891, 117,014; in 1901, 127,734.

NAGUILÍAN, nä'gē-lē'än. A town of Northern Luzon, Philippines, in the Province of La Unión, situated 11 miles southeast of San Fernando (Map: Philippine Islands, E 3). Population, 10,400.

NAGY-BÁNYA, nŏd'y'-bän'yŏ. A town of Northeastern Hungary, situated among the Lápos Mountains, 90 miles east of Debreczin (Map: Hungary, H 3). It has a State college, and its chief industries are gold, silver, and copper mining. Population, in 1900, 11,169.

NAGY-BECSKEREK, bĕch'kĕ-rĕk. A town of Hungary. See Becskerek.

NAGY-KÁROLY, kä'rôl-y'. The capital of the County of Szatmár, Hungary, situated 43 miles by rail east-northeast of Debreczin (Map: Hungary, H 3). It has a fine church, a palace of the Counts Károlyi, a Piarist monastery, and gymnasium. Its chief products are coarse cloth, linen, and leather. Population, in 1900, 15,382.

NAGY-KIKINDA, kē'kēn-dŏ, or Gross Kikinda. A town of Hungary, situated 36 miles by rail west of Temesvár (Map: Hungary, G 4). It has a higher gymnasium and an extensive trade in agricultural products and domestic animals. Population, in 1890, 22,923; in 1900, 28,843, over one-half Serbs.

NAGY-KÖRÖS, kẽ'rẽsh. A town of Hungary. See Körös.

NAGY-SZEBEN, sĕ'bĕn. A town of Hungary. See Hermannstadt.

NAGY-SZOMBAT, sôm'bŏt. The Hungarian name of Tirnau (q.v.).

NAGY-VÁRAD, vä'rŏd. A town of Hungary. See Grosswardein.

NAHANT'. A town in Essex County, Mass., on a peninsula extending into Massachusetts Bay; reached by stage from Lynn (four miles), and in summer by steamers from Boston (ten miles) (Map: Massachusetts, F 3). It has a public library with 13,500 volumes. Nahant has been for years a favorite place of summer resort for Boston business men, and has many handsome seaside residences. Population, in 1890, 880; in 1900, 1182. The site of Nahant is claimed to have been the landfall of the Northmen. It was visited in 1614 by Capt. John Smith, and in 1622 was granted to Capt. Robert Gorges. Until 1853, when it was incorporated as a separate town, Nahant was a part of Lynn. Consult Hurd, *History of Essex County, Massachusetts* (Philadelphia, 1888).

NAHARRO, nȧ-är'rō, Bartolomé de Torres. A Spanish poet and dramatist, born at La Torre, near Badajoz, toward the end of the fifteenth century. He lived at Rome and subsequently at Naples, where he published his collected works under the title *Propaladia* (1517), and dedicated them to Ferdinand d'Avalos, the husband of Vittoria Colonna. His plays have action, character, and plot, and are of historic value; Naharro is called the creator of Spanish comedy. He also wrote ballads, sonnets, and epistles. It was some time before his plays became known in Spain, and the first Spanish edition of them did not appear until 1520. But during the following century his works were very popular, although, owing to his manner of describing the clergy, the later editions were expurgated.

NAHR-EL-ASI, när'ĕl-ä'sē. A river of Syria. See Orontes.

NAHUATLAN (nȧ-wät'lȧn) **STOCK**. An American linguistic group centred about the southern part of the central plateau of Mexico, but with isolated tribes farther to the south, almost to the Isthmus of Panama. The Nahuatlan stock, in the commonly accepted scope of the term, includes the Nahua proper or Aztec (q.v.) in and adjoining the valley of Mexico (States of Mexico and Puebla), the Tlascaltec (Tlaxcala), the Cuitlateco (Michoacan), the Cora, the Huichol (Jalisco), the Acaxee (Sinaloa and Durango), the Alaguilac, the Pipil (Guatemala and Salvador), the Niquiran (Nicaragua), and the Segua (Costa Rica), with numerous subtribes and dialects. Traditional and linguistic evidence makes the Nahuatlan emigrants from the north, who acquired most of their culture from contact with the superior Mayan and Tarascan civilization after establishing themselves in the southern part of the peninsula. As their social condition advanced, the simple primitive system of ruling chiefs developed in some cases, particularly among the Aztec, into a regular hereditary monarchy. Descent and inheritance, both of office and property, were in the male line, but land was held by the clan, and marriage was regulated by gentile laws of kinship. Agriculture was the basis of national existence and was governed by strict laws, while the arts of weaving, pottery, and architecture reached a high degree of perfection. Gold, silver, and copper were worked, and a bronze alloy has been reported, but the ordinary tools and implements were still of stone or obsidian. Religious rites were observed with elaborate and imposing ceremonials, conducted by priestly orders of both sexes, which controlled also the education of the children. At Tenochtitlan or Mexico, the capital of the Aztec Empire, thousands of captives were annually devoted to the bloody rites of human sacrifice and cannibalism in honor of the god of war. Literature was extensively cultivated in the form of pictograph records and rituals, which were painted in brilliant colors upon books of maguey paper or dressed skins, very similar to those in use among the Maya. The calendar, which was the common property not only of the southern Nahuatlan nations, but also of several neighboring peoples, recognized the year of 365 days, and may have been of Maya origin, although developed along different lines. The Nahuatlan are now represented by nearly two million people, most of whom, although subjugated and to a certain extent Christianized, still occupy their ancient territories in nearly their ancient fashion, having adopted but little of the newer civilization in the place of that destroyed by the conqueror. The principal sources of information upon the history and civilization of the Nahuatlan tribes are: Sahagun, *Historia general de las cosas de Nueva Espana* (Mexico, 1829-30), and Prescott, *History of the Conquest of Mexico* (New York, 1843). See CORTEZ, MEXICO, MONTEZUMA, and tribal headings.

NAHUEL-HUAPI, nȧ-wāl′wȧ-pē′, or TIGER LAKE. A lake on the eastern slope of the Andes Range in Argentina, on the boundary between the territories of Neuquen and Rio Negro (Map: Argentina, C 12). It is 75 miles long, with an average width of 10 miles and an area of 309 square miles. It contains a number of islands covered with luxuriant vegetation, and its banks are fertile and well watered. It receives many streams, and discharges into the Atlantic Ocean through the Rio Negro.

NAHUM. The seventh of the minor prophets according to the usual arrangement. Nothing is known of his life except what may be gathered from the notice in the first verse of his prophecy, where he is called 'the Elkoshite.' Where Elkosh was is uncertain. It has been located in Galilee and in Assyria; a third identification is with Beit Jibrin (Eleutheropolis) in the Shephelah. Nahum's prophecy consists of two parts, besides the introductory verse: (1) A psalm (i. 2-ii. 2), which describes the majesty of God and His punishment of His enemies in somewhat general terms; and (2) the prophecy proper (ii. 3-iii. 19), which foretells the doom of Nineveh. The style is full of animation and fancy, and, at the same time, clear and rounded. The text is in part corrupt. The date of the prophecy cannot be fixed exactly, but must have been later than the capture of Thebes in Egypt (the "No" of iii. 8; see NO-AMON), by Asshurbanipal, B.C. 664-663; and it must have been before the fall of Nineveh, about B.C. 606. The recent investigations of Bickell and Gunkel have established with certainty traces of an original acrostic arrangement in the psalm, and this artificiality points to a late date for this part of the book; it fits in with the conditions existing during the Persian rule in Palestine, when the religious community of Jerusalem was struggling against great odds, and may have been prefixed by an editor to the genuine prophecy of Nahum as an appropriate introduction. If this be the fact, it would be quite in accordance with the free treatment to which older discourses were subjected by post-exilic compilers. Consult the commentaries mentioned in the article MINOR PROPHETS; Bickell, *Beiträge zur semitischen Metrik* (Vienna, 1894); Gunkel, in *Zeitschrift für alttestamentliche Wissenschaft*, vol. xiii. (1893); Nestle, in *Zeitschrift des deutschen Palästinavereins*, vol. i. (1878); Davidson, *Nahum, Habakkuk, and Zephaniah*, in the *Cambridge Bible for Schools and Colleges* (Cambridge, 1896).

NAHUYS VAN BURGST, nä′hois vȧn bo͞orGst, HUBERT GERARD, Baron (1782-1858). A Dutch colonial soldier and geographical author, born in Amsterdam. In 1809 he went to Batavia, where he entered the army, and fought against the English in Bengal. In 1814 he was appointed commissioner to the Prince of Java. Nahuys was pensioned in 1830, and nine years afterwards returned to Holland, settling at Breda. His writings, which are of no small geographical importance, include: *Schets van Benkoelen op de westkust van het eiland Sumatra* (1826), and *Beschouwingen over Nederlandsch-Indië* (1847; 2d ed. 1848).

NAIADS, nā′yădz (Gk. Ναΐδες, *Naïdes*, Νηϊάδες, *Nēïades*, from *νᾶν*, *nan*, to flow; connected with Lat. *navis*, Gk. *ναῦς*, *naus*, Skt. *nāu*, ship). In Greek mythology, the nymphs of the springs, and hence also of rivers. Caves, especially with trickling water, were sacred to them and believed to be their dwellings. Owing to the medicinal qualities of some springs, the Naiads naturally appear as healing divinities, and as divination was associated with the water, they became prophetic. Under their influence the prophet became inspired or even mad. See also NYMPHS.

NAIANT, nā′ănt, or **NATANT,** nā′tănt (OF. swimming). An heraldic term applied to a fish when borne horizontally across the shield in a swimming position. See HERALDRY.

NAIL (AS. *nægel*, OHG. *nagal*, Ger. *Nagel*, nail, Goth. *ga-nagljan*, to nail; connected with OChurch Slav. *nogŭtĭ*, Lith. *nagas*, Skt. *nakha*, nail). The terms nail, claw, and hoof are popular names for different developments of the same epidermal formation. All are horny secretions formed from the outer layer of the skin, primarily to protect the tip of the digits in the higher vertebrates. Nails have retained this function, while claws have become specialized as weapons of offense or defense, and hoofs are specialized to protect the whole of the terminal joint of the digit. Hoofs are usually thick, heavy, and blunt, and are best developed where the number of digits is reduced; they are characteristic of the great group of herbivorous animals known as Ungulata, and reach their highest development in the horse. Nails are flattened, usually thin, and more or less rounded at the end. They are present in some reptiles, in certain birds (as the grebes), and in many mammals, especially the monkeys and man. Compare HORN.

HUMAN NAILS. These are the elastic, horny plates placed as protective coverings on the dorsal surface of the terminal phalanges of the fingers and toes. Each nail consists of a root, or part concealed within a fold of skin; a body, or exposed part attached to the surface of the skin; and a free anterior extremity called the edge. The skin below the root and body of the nail is termed the matrix, from its being the part from which the nail is produced. This is thick and covered with highly vascular papillæ, and its color is seen through the transparent horny tissue. Near the root the papillæ are smaller and less vascular; hence the portion of nail corresponding to this part is of a whiter color; from its form, this portion is termed the lunula. The chemical composition of the nails is given in the article HORN. According to the observation of Beau, the finger-nails grow at the rate of about two-fifths of a line in a week, while the toe-nails only grow with about one-fourth of that rapidity. The general state of health influences the growth of nails, and after illness a deficient formation of horny matter may result, shown by the production of a groove across the nail. The breadth and position of this groove indicate roughly the period and duration of the illness. An inflammation of the matrix of the nail is called *onychia*, and an acute inflammation of the tissues about the nail is termed *paronychia* or *whitlow*. When a nail has been removed by violence, or has been thrown off in consequence of the formation of matter (pus) beneath it, a new nail is speedily formed, provided the matrix has not been seriously injured.

There is a very common and troublesome affection popularly known as *ingrowing nail*. Its most usual seat is the great toe. It does not in reality arise from any alteration of the nail, but from the adjacent soft parts being constantly pressed by the use of tight shoes against its edge. These parts become swollen and inflamed; suppuration ensues, and an intensely sensitive ulcer is formed, in which the nail is imbedded. In obstinate cases, it is not infrequently necessary to remove a portion of the nail, an operation which may be done under local anæsthesia without pain.

NAILS. Slender pieces of metal, tapering toward and sometimes pointed at one end, and with flattened or rounded heads. Nails are made of many different materials, as copper, zinc, brass, iron, or steel, but the bulk of the nails in ordinary use are made of steel wire. Iron nails, in turn, may be either wrought, cut, or cast, or made from wire.

Until almost the close of the eighteenth century all nails were hand-made. In France for nearly a century light nails for carpenter work have been made of wire, but until 1850 they were made by hand with a hammer. The hand-made nail was pinched in a vise, with a portion projecting. A few blows of a hammer flattened one end into a head. The head was beaten into a counter sunk in the vise, thus regulating its size and shape. In Northern Europe, Britain, and America nails were made, at first, by forging on an anvil. The iron used for hand nail-making was first formed into nail-rods, which were sold in bundles. The nail-rods were prepared either by rolling the malleable iron into small bars of the required thickness or by the much more common practice of cutting plate iron into strips by means of rolling-shears. In colonial days the making of nails from these rods was a household industry among the New England farmers.

To America belongs the distinction of having first made cut nails by machinery, and with the advent of machine-cut nails the household industry of nail-making rapidly declined. Of these early inventions, the only one that has survived is that patented in 1786 by Ezekiel Reed, of Bridgewater, Mass. At the close of the eighteenth century twenty-three patents for nail machines, or improvements thereto, had been granted in the United States, and their use had been generally introduced into England, where they were received with enthusiasm. In 1883 cut nails were first made of steel.

The manufacture of tacks was also a household industry in New England till well into the nineteenth century. The wire was pointed on a small anvil; it was then placed in a vise, worked by the foot, which clutched it between jaws furnished with a gauge to regulate the length. A certain portion was left projecting, which was beaten by a hammer into a flat head. New England, and particularly the city of Taunton, Mass., is now the centre of the tack-making industry in the United States.

Wire nails were first made in the United States by William Hersel, of New York, in 1851 or 1852. In 1875 Father Goebel, a Catholic priest, came to Covington, Ky., from Germany, where the art of making wire nails was practiced. Goebel began the manufacture of wire nails at Covington, and in 1876 the American Wire and Screw Nail Company was established under his leadership. At first the nails were made by hand, but soon a French machine was imported. In this machine the nails were held in dies to form the head. The blow of the hammer which produced the head was caused by a board or single leaf spring suspended from a ceiling, against which the machine, in rotating, pushed a cam. The release of the latter produced the blow.

For a time the wire nails were made with barbs, that they might hold more securely, and the new industry grew but slowly. In 1876, at the Centennial Exhibition, the company received a silver medal over French and German competitors. This called the attention of the trade to the article, and two other firms at once took up its manufacture. By 1885 there were twenty-six firms in the business, and the wire nail had been adopted by many manufacturers. Since then their use has rapidly increased.

Two types of wire-nail machines are described in Smith's *Treatise on Wire*. (See BIBLIOGRAPHY at end of article.) In one type "The wire is automatically straightened from the coil and fed into the machine, where dies grip it, whilst a pair of nippers cuts the wire off in suitable lengths, when it is automatically pointed and headed. The latter operation is effected by means of the spring-bolt mechanism operated by a cam on the main shaft, and which remains inoperative until a sufficient length of wire has been fed to the machine for the next nail. The cutting and pointing are performed in one operation." In the second type, the heads are formed by steady pressure instead of intermittent striking.

The older process of making cut nails is, in general, as follows: The ore, whether hematite or magnetic, is smelted in a blast-furnace, run into pigs, puddled, squeezed, and, if need be, hammered, rolled in the puddling-ball train, and cut to lengths. These are then fagoted—that is, piled so as to break joints—reheated to a white heat, drawn, passed through the nail-plate train, and the sheets, of the required width and thickness, allowed to cool. It is next cut across its length (the width of the sheet being usually about a foot) into strips which are a little wider than the length of the required nail. These plates, heated by being set on edge on hot coals, are seized in a clamp and fed to the machine, end first. The pieces cut out are alternate, and slightly tapering, of course, with the fibre, and are squeezed and headed up by the machine before going into the trough.

In 1897 the wire nails produced in the United States amounted to 8,997,245 kegs of 100 pounds each. The output of cut nails for the same year was 2,106,799 kegs. American wire nails are largely exported to Europe and to other parts of the world. In 1898 the total number of cut-nail and cut-spike works in the United States was 55; the total number of wire-nail works was 79. The accompanying table shows the export of nails from the United States for the past decade.

Nails Exported from the United States

(From the Statistical Abstract for 1900, prepared by the Bureau of Statistics, under the direction of the Secretary of the Treasury)

YEAR	Cut		Wire, wrought, horse-shoe, and all other, including tacks		Wire		All other, including tacks	
	Pounds	*Value*	*Pounds*	*Value*	*Pounds*	*Value*	*Pounds*	*Value*
1891	11,723,727	$283,839	1,768,433	$156,858				
1892	12,197,669	273,191	2,056,267	160,239				
1893	15,604,347	330,554	2,300,501	158,093				
1894	16,736,643	330,118	3,233,776	180,607				
1895	16,895,428	283,646	4,367,267	210,192				
1896	20,730,260	428,630	8,031,297	321,055				
1897	26,476,585	519,471	9,941,714	357,541				
1898	32,310,399	612,234	....	....	22,894,099	$458,787	4,308,082	$245,722
1899	32,869,265	604.215	....	....	51,193,212	973,434	4,619,843	285,427
1900	24,915,866	647,711	....	....	84,635,468	2,124,528	4,341,249	278,709

Consult: Swank, *History and Manufacture of Iron in All Ages* (Philadelphia, 1892); Smith, *Treatise on Wire, Its Manufacture and Uses* (London and New York, 1891).

NAIN, nā'ĭn (Gk. Ναΐν). A town in Galilee, mentioned in Luke vii. 11-17 as the scene of Jesus' miracle of raising a widow's son from death. The site is now occupied by a miserable mud village (modern name *Na'in*), but ruins near by show that once a city of some size existed on the spot. The situation on the slopes of 'Little Hermon,' about six miles southeast of Nazareth, is beautiful, commanding a view of the plain of Esdraelon, Mount Carmel to the southwest, Mount Hermon to the northeast, and of the varied landscape of Central Galilee.

NAIN SING (?-1882). A Hindu explorer in Central Asia. He was born at Numaon; was trained by a Colonel Montgomerie for exploring work, and in 1856 and 1857 was employed in Kashmir and Ladak by the Schlagintweits. His journey to Lhasa (1865-66) was rewarded by the Royal Geographical Society; in 1867 he explored the gold mines of Thok Jalung, and he went with Sir Douglas Forsyth to Yarkand in 1873. His most important journey was from Leh across the unexplored plateau of Tibet in 1874-75, marking its many lakes, to Lhasa, and thence to Calcutta. For a description, with map, of this expedition, consult the *Geographical Magazine* of 1876.

NAIPALI (nī-pä'lē) **LANGUAGE.** The Indian language spoken in Nepal. This dialect approaches in general structure more closely to Hindi than to any other of the modern Indian vernaculars. Thus, as examples showing the affinity of Naipali to the New Indian dialects, may be cited Naipali *pāk*, 'ripe,' Bengali *pākā*, Hindi *pakkā*, Sindhi *pakō* (Skt. *Pakva*); Naipali *mahaingō*, 'costly,' Hindi *mahaingā* (Skt. *mahārgha*); Naipali *ḍhīlō*, 'loose,' Hindi *ḍhīlā* (Skt. *śithila*); Naipali *dūt*, 'milk,' Hindi *dudh*, Panjabi *dudd* (Skt. *dugdha*). In inflection also there are parallels, as Naipali *gar chum*, 'I do,' Gujarati *karuṁ chuṁ*. Distinctive marks of Naipali are the occasional aspiration of medial consonants (e.g. *aghi*, 'before,' Hindi *agē*, Prakrit *aggē*, Skt. *agrē*), softening of initial surds (e.g. Naipali *garanu* 'to make,' Hindi *karnā*, Skt. *kar*), and the use of an agential case as the active subject of a passive voice (a curious phenomenon widespread in the modern Indo-Iranian languages), in *-le* corresponding to the Hindi *-nē* (e.g. Naipali *dūtlē*, '[by the] milk,' Hindi *dudhnē*). The language has a number, possibly one-fifth, of loan-words from its Tibeto-Burman neighbors, but has maintained itself on the whole with considerable purity. It has a very scanty literature written in the Devanagari character.

Consult: Turnbull, *Nepali Grammar, and English-Nepali and Nepali-English Vocabulary* (Darjeeling, 1888); Hoernle, *Comparative Grammar of the Gaudian Languages* (London, 1880).

NAIRN, nârn. The capital of Nairnshire, Scotland, a royal and Parliamentary burgh, 15 miles northeast of Inverness, at the mouth of the river Nairn (Map: Scotland, E 2). It is noted for the excellence of its sea-bathing and artificial baths. It manufactures rope and twine. Population, in 1891, 4500; in 1901, 5100.

NAIRNE, nârn, Carolina (Oliphant) (1766-1845), Baroness. A Scotch song-writer, born at Gask, Perthshire. In 1806 she married her second cousin, Major William Murray Nairne (afterwards sixth Lord Nairne); lived in Edinburgh till her husband's death (1829); afterwards in Ireland and on the Continent; and returned to Gask, where she died. Between 1821 and 1824 she contributed songs to *The Scottish Minstrel* of R. A. Smith. As a song-writer, she is highly esteemed. Particularly beautiful are "Land o' the Leal," "Caller Herrin'," "The Laird o' Cockpin," and "The Auld House." Consult: Rogers, *Life and Songs of Lady Nairne* (Edinburgh, 1869); Kington Oliphant, *Jacobite Lairds* (Grampian Club, 1870).

NAIRN'SHIRE. A county in the northeast division of Scotland (q.v.), bounded by the Moray Firth and the counties of Inverness and Moray (Map: Scotland, E 2). Its area is 195 square miles, of which about 26,000 acres are under cultivation. There is considerable agricultural activity, and the county is known for its cattle-breeding. Nairn is the only town of importance. Population, in 1801, 8300; in 1851, 10,000; in 1891, 9155; in 1901, 9300.

NAIRS, nā'ērz. The inhabitants of Malabar, in Southwestern Hindustan. They are a conglomerate of different castes and tribes, and in many cases contrast sharply with the Dravidians by their fine type, their light complexion, and their thin and prominent nose. They seem to have some linguistic and somatological affinities with the Indo-Aryans. They are probably a mixed race of Aryans and Malayalas. By all writers they are described as a tall people, prepossessing in their physical characteristics and their general bearing, and gracious in manner. Many of the women are quite pretty. The history of the Nairs begins with the invasion of the ancient Hindus and the establishment of a Brahman aristocracy—a conflict between these privileged classes and the democratic masses ended in victory for the latter and laid the foundations of the prosperity of the Nairs in the thirteenth century. Islam of a sort is in vogue, together with the older Hinduism. Through all these changes the peculiar marriage system, which has made the Nairs of special interest to ethnologists, has remained unchanged. This system, often called 'the Nair family,' is polyandry (often adelphic) with matriarchal joint family, though polyandry and polygamy may exist side by side or be inextricably mixed. The wealthy tend to be polygamous, the poor polyandrous. Consult: E. S. Schmidt, "Die Nairs," in *Globus*, vol. lxviii. (Brunswick, 1895); Fawcett, "Nayars of Malabar," in *Bulletin of the Madras Government Museum*, vol. iii. (Madras, 1901).

NAISSANT, nā′sänt (Fr., being born). A term applied in heraldic blazon to an animal depicted as coming forth out of the middle—not, like *issuant*, out of the boundary line—of an ordinary. See HERALDRY.

NA′JA (from Hind. *nāg*, Skt. *nāga*, snake). A genus of elapine venomous serpents of the tropical parts of the Old World, which includes the cobras. The typical species is the common hooded cobra (*Naja haje*) of Africa, called 'asp' in the north and 'spy-slange' or spitting-snake among the Dutch of South Africa. Other species are the cobra di capello and hamadryad. See COBRA; HAMADRYAD; PROTEROGLYPHA.

NAJAC, nȧ′zhȧk′, EMILE, Count de (1828-89). A French dramatic author, born at Lorient (Morbihan). Except for a short time spent in a Government position, he gave himself entirely to the writing of farces, texts for operas, and vaudevilles, sometimes in collaboration, and sometimes alone. Among these are: *Un mari en 150* (1853); *La fille de trente ans* (1859, with Scribe); *Le capitaine Bitterlin* (with About, 1860); *Un mariage de Paris* (with About, 1861); *Nos gens* (with About, 1866); *Bébé* (with Hennequin, 1877); *Nounou* (with Hennequin, 1879); *Divorçons* (with Sardou, 1880); and *Le fiacre 117* (with Millaud, 1886).

NAKAMURA MASANOWO, nä′kȧ-mōō′rȧ mä′sȧ-nō′wō (1825-?). A Japanese scholar, born in Yedo. He went to England in 1866 and remained there for two years, returning home on the outbreak of the Revolution. Thenceforth until his death he labored perseveringly in the interest of modern education. His schools and translations exerted wide influence, and his services were recognized by posthumous honors conferred by the Emperor.

NAKED BAT. A large Malayan, long-tailed, emballonurine bat (*Chiromeles torquatus*), remarkable in having the skin entirely hairless except for a fringe of hairs about the neck. It has a projecting, pig-like snout and a thick tail. It inhabits the forests of Java, Sumatra, and Borneo, where it appears only at night. Its most curious feature is the presence of a pouch or pocket of skin on each side of the body under the arms, which is present in both sexes, and contains the mammæ. In this pouch the young are carried while suckling. Consult: Dobson, *Catalogue of Cheiroptera in the British Museum* (London, 1878); Horsfield, *Zoölogical Researches in Java* (London, 1828). See Plate of BATS.

NAKHITCHEVAN, nä′kĕ-chĕ-vän′. A former town in the Government of Ekaterinoslav, Russia, situated on a hill on the right bank of the Don, 2½ miles from Rostov-on-the-Don, with which it is now incorporated. It has manufactures of silk, woolen, and silver goods, and has a considerable trade in jewelry and precious stones with Constantinople, Turkestan, Circassia, and Astrakhan. The town was founded by Armenians from the Crimea in 1779, and is the see of the Russian Greek-Armenian Patriarch. Population, in 1897, 29,312, mostly Armenians.

NAKONG (African name). One of the 'harnessed' antelopes of South-Central and East Africa, called also 'Speke's antelope,' 'sititunga,' and *Tragelaphus Spekei*. It is peculiar for its perfectly uniform grayish color when mature. It formerly gathered in herds, and was one of the most highly prized of the smaller species. See Plate of GAZELLES.

NAKSHATRA, nȧk-shä′trȧ (Skt. *nakṣatra*, star, luminary; of doubtful etymology). A Sanskrit term used in the Vedic period in the sense of star. At a later time it was applied to the asterisms lying in the moon's path, or to the mansions in which the moon was supposed to rest in its path. The number of these asterisms was reckoned originally at 27, later at 28; and mythology transformed them into the daughters of Daksha, who became the wives of the moon. The French astronomer Biot endeavored to show that the Hindu system of the Nakshatras was derived from the Chinese *sien;* but this theory won little favor. The arguments later advanced warmly favored the Indian origin of the system of the Nakshatras. Weber sought for Babylonian influence to explain the Nakshatras and some support has been given to this view. Consult Thibaut, "Astronomie, Astrologie und Mathematik," in Bühler, *Grundriss der indo-arischen Philologie* (Strassburg, 1899).

NAKSKOV, näks′kôv. A town of Denmark, situated on a fiord of the west coast of the island of Laaland (Map: Denmark, E 4). It is the terminus of the Laaland Railroad, and has a harbor with considerable shipping and an active trade in grain. Population, in 1901, 8317.

NALA, nä′lȧ. A legendary king of ancient India whose domain was Nishadha, apparently a district between the modern Oudh and Berar. The story of his marriage with Damayanti, the daughter of King Bhima of Vidarbha (modern Berar), together with the events which followed in consequence of his passion for gambling, the loss of his kingdom, his desertion of wife and children, the final reunion with them, and the restoration of his fortunes, forms one of the most romantic episodes of the *Mahābhā-*

rata (q.v.). This episode, entitled the *Nalōpākhyānam*, or Story of Nala, has often been separately edited and translated; as an edition of the Sanskrit text, together with Dean Milman's translation, by Monier Williams (Oxford, 1879); a versified rendering by Sir Edwin Arnold, *Indian Idylls* (Boston, 1883); a translation into German prose by Kellner, *Nala und Damayantī* (Leipzig, 1886), and several others.

The subject of Nala's career was a favorite theme with the Hindus. One of these, the Sanskrit *Nalōdaya*, or Rise of Nala, describes in four cantos the restoration of Nala's fortunes. This artificial poem is ascribed to Kalidasa (q.v.), but it probably belongs to a much later age. It is a remarkable specimen of the so-called Kavya style of artificial composition, abounding in elaborate metrical devices, alliterative versification, and intricate rhythms, complicated constructions, and pedantic imagery. It has been edited by Benary (Berlin, 1830), by Yates (Calcutta, 1844), and by Vidyasagara (ib., 1873). An excellent German translation, imitating the artificial devices of the original, was made by von Schack, *Stimmen vom Ganges* (2d ed., Stuttgart, 1877).

To the same Nala cycle belongs the *Nāishadhīya*, or *Nāishadha-Carata*, Adventures of Nala of Nishadha, written in twenty-two cantos by one Sri-Harsha, who belongs to the latter half of the twelfth century of our era. An edition of this, with the Sanskrit commentary of Narayana, was published by Röer (Calcutta, 1855), and Swadatta (Bombay, 1894).

NAMANGAN, nä'mån-gän'. A district town in the Territory of Ferghana, Russian Turkestan, situated on the canal of Yangi (fed by the Narym), about 45 miles northwest of New Margelan, the capital of the territory (Map: Asia, Central, F 1). The chief occupations are cotton-ginning and the manufacturing of soap, leather, etc. The trade in cotton, fruit, and animal products is important. Population, in 1897, 61,906, including only a few Russians.

NAMAQUALAND, nå-mä'kwå-lănd, LITTLE. A division of Cape Colony (q.v.) bordering on German Southwest Africa (Map: Cape Colony, D 6). It has an area of 19,154 square miles, with a population of 16,800 in 1891. It is important on account of its copper deposits. The chief town is Port Nolloth on the coast.

NAMAYCUSH, năm'â-kŭsh (North American Indian name). The lake or Mackinaw trout (*Christiromer namaycush*), the largest of the Salmonidæ. It is closely related to the chars, from which it differs slightly in the character of the vomerine teeth. It is a very good food-fish and is the second in commercial importance of the fish of the Great Lakes. Extreme weights of 125 pounds have been reported, but the average is from 15 to 20 pounds. Its food is fishes and a great variety of other things. The spawning season is during September and November. The namaycush occurs in the Great Lakes, and in the inland lakes of New York and Northern New England, where the local names 'longe' and 'togue' are applied to it. It is also found in the headwaters of the Fraser and Columbia rivers, and the streams of Vancouver Island. A deep-water variety, called siscowet (q.v.), is found in Lake Superior. Its flesh is fatter and less desirable as food. See SALMON; TROUT; and consult authorities there cited. See Plate of TROUT AND GRAYLING.

NAM DINH, näm dēn'y'. A city of Tongking, French Indo-China, situated 40 miles southeast of Hanoi, on the Tongking River, 30 miles from the sea (Map: French Indo-China, E 2). It lies in the most fertile region of the delta, and is prosperous and well built, with broad, paved streets. It is the seat of a French resident, and the intellectual centre of Tongking. It is almost as important commercially as Hanoi, has numerous well-stocked shops, regular boat service on the river, and a brisk trade in rice, silk, cotton, and indigo. Population, about 30,000.

NAME (AS. *nama*, Goth. *namō*, OHG. *namo*, Ger. *Name;* connected with Lat. *nomen*, Gk. ’ονομα, *onoma*, Ir. *ainm*, OPruss. *emnes*, OChurch Slav. *ime*, name, and with Lat. *gnoscere*, Gk. γιγνώσκειν, *gignōskein*, Skt. *jñā*, Ger. *kennen*, Eng. *know*). In law, a word or words employed to designate a person, place, or thing. In early times in England the Christian name was the only one recognized by the law, and surnames were mere words of description to identify one person from another of the same Christian name. This practice was confirmed and given legal sanction by a statute (1 Henry V., c. 8), called the "Statute of Additions," which provided that not only the name of an individual should be inserted in a writ or indictment, but his estate or degree, his calling or business, and the town or district in which he resided. By reason of the above custom and the statute, many persons who had not otherwise adopted surnames were known by the name of their calling, place of residence, or by some other characteristic. Thus, George, the smith, became George Smith, and John of Wessyngton became John Wessyngton or Washington.

The middle name or initial of a person is generally regarded as of no importance, and not a part of his legal name. Therefore the omission of it in a legal instrument or proceedings is not considered an error, except in a few jurisdictions. In general a person's Christian name should be written out, and in some States the mere initial of the Christian name, together with the surname, has been held insufficient under statutes requiring the names of persons to be subscribed to certain instruments, as a petition for a highway.

Owing to the almost infinite variety of surnames and the consequent difficulty in spelling them properly, the courts have adopted a rule known as *idem sonans* (the same sound), by which they determine whether or not an incorrect spelling of a name is a fatal error in legal documents. Briefly stated, the rule provides that where a name is not correctly spelled, if it sounds identically like the name intended to be written, it will be held sufficient, the error in spelling being disregarded. Thus the surnames Preyer, Prior, and Pryor have been held to be *idem sonans*. This rule is followed as to legal instruments and transactions generally, but where a name in an instrument varies in some irregular manner from the common method of spelling a name identically the same in pronunciation, the necessity for departing from such a doctrine is apparent, as in the case of such as Jaeger and Yaeger, which may be pronounced so as to sound alike, and a person searching against the name of Jaeger would naturally not find the record of the conveyance under Yaeger; and accordingly the courts may hold that the public is not bound by constructive notice in such a case.

There are statutory provisions in some jurisdictions requiring the registration of fictitious trade names, where persons adopt them and do not do business under their correct names. Corporations are usually required to adopt names which are not identical with those of other corporations in the same State. At common law there is no property right in a name, but the United States Statutes provide for protection in the use of trade names to a certain extent, and courts of equity will sometimes interfere to enjoin the wrongful use of the business name of another, to prevent fraud. See COGNOMEN; MISNOMER; TITLE; TRADE NAME; TRADE-MARK.

NAMUR, nȧ′mụr′. A province of Belgium, bounded on the north by Brabant and Liège, on the east by the Province of Luxemburg, on the south by France, and on the west by Hainault (Map: Belgium, C 4). Area, 1390 square miles. The province is traversed through the centre by the Meuse River. Its surface is partly level, partly hilly, and in part densely forested. The soil is very fertile, and agriculture is the chief occupation, though a large proportion of the population is engaged in mining and allied industries. About 750,000 tons of coal are mined yearly, and the province is rich in iron, lead, sulphur, alum, and marble. Population, in 1900, 346,512. Namur appears as a county as early as the tenth century, and came later successively under the counts of Hainault and Flanders, and the dukes of Burgundy, finally constituting one of the seventeen provinces of the Netherlands.

NAMUR. The capital of the Province of Namur, Belgium, at the confluence of the Sambre and Meuse, 35 miles southeast of Brussels (Map: Belgium, C 4). Two bridges across the Meuse connect it with the extensive suburb of Jambes, and several bridges span the Sambre, connecting it with the suburb of Salzinnes. An extensive circle of nine detached forts has revived its former military importance, and there are large cavalry barracks in the town. Among many fine churches is the Renaissance Cathedral of Saint Aubin, built in 1751-67, and noted for the beauty of its statues, carvings, and paintings. The Archæological Museum has a valuable collection of Roman and Frankish antiquities, and an art gallery is attached to the Hôtel-de-Ville. Namur is an important industrial centre, with iron and brass foundries, and is known for its manufactures of cutlery, glass, leather, and bronze art objects. The city was taken by the forces of Louis XIV. in 1692, and three years later was besieged and captured by William III. It was taken by the French in 1746, and restored to Austria in 1748. For a third time it fell into the hands of the French in 1792. Population, in 1900, 32,333.

NANA, nȧ′nä′. One of the Rougon-Macquart series of novels by Emile Zola (1880). It is a study of a courtesan in whom are depicted the fruits of an evil heredity and their reflex influence on society.

NANAIMO, nȧ-nī′mō̇. A town and port of Vancouver Island, British Columbia, Canada, on Departure Bay, on the east coast (Map: British Columbia, E 5). It is opposite Vancouver town on the mainland, with which it has daily steamboat communication. It has a safe and commodious harbor, and is the centre of the coal-mining industry of British Columbia, its coal fields having an area of 200 square miles. It also has large lumber mills. The town dates from the erection of the Hudson Bay Company block-house in 1833. It was incorporated in 1874, and has municipal gas, electric lighting, and water works, telephone system, etc. The United States is represented by a consular agent. Population, in 1891, 4595; in 1901, 6130. Consult Bell, *Canadian Mining Manual* (Montreal, 1893).

NANA SAHIB, nä′nȧ sä′hĭb (c.1820-?). A Hindu, one of the leaders of the Sepoy mutiny of 1857. He is said to have been the son of a Brahman from the Deccan, and his real name was Dhundu Pant. He was born about 1820, and was adopted as a son in 1827 by Baji Rao, the childless ex-peshwa of Poona, whose estate, which amounted to more than a million dollars, he inherited. He was refused, however, the annual pension of eight lacs of rupees, or about four hundred thousand dollars, which had been granted Baji Rao during his lifetime. This rankled in his mind, although he was allowed to retain some of the state of a native prince, a retinue of 200 soldiers, with three field-pieces, and a fortified residence at Bithur, 10 miles west of Cawnpore. He had long maintained an agent in England, Azim Ulla Khan, who told him tales of British weakness. When, therefore, the mutiny broke out in May, 1857, Nana Sahib offered to assist the English, but treacherously placed himself at the head of the mutineers in Cawnpore. The European troops were induced, on June 25th, to capitulate to Nana Sahib, who promised they should be sent down the Ganges in safety. They embarked on boats provided for them, but had no sooner done so than a murderous fire was opened upon them. The sepoys were ordered to shoot the men, but to spare the women and children, who were removed to a house in Cawnpore. On July 15th Sir H. Havelock, who had advanced from Allahabad, defeated the sepoys in two engagements, one within eight miles of Cawnpore; and Nana Sahib thereupon directed that the women and children should be put to death and that their corpses should be cast into a well, which is now marked with a beautiful statue in their memory. A long series of engagements against Nana Sahib followed, in which he was always the loser, and he was ultimately driven beyond the English frontier into Nepal, where he probably perished in the jungle.

NAN-CHANG-FU, nȧn′chȧng′fo͞o′. The capital of the Province of Kiang-si, China, situated at the head of the delta formed by the Kan-kiang at its entrance into the Po-yang lake, about 175 miles southeast of Hankow (Map: China, E 6). It is an important centre of the porcelain trade. Population, estimated at 100,000.

NANCY, näɴ′sē̇′. The capital of the Department of Meurthe-et-Moselle, France, and an important railroad junction, 220 miles east of Paris, and 94 miles west of Strassburg, on the left bank of the Meurthe, six miles above its junction with the Moselle (Map: France, N 3). It is a strongly fortified and well-built city, with fine squares, broad streets, and imposing edifices.

The city owes much of its architectural ornamentation to Stanislas Leszczynski, King of Poland, who resided here as Duke of Lorraine. His statue stands in the Place Stanislas, the most important square in the city, surrounded by imposing edifices, including the theatre, the Hôtel-de-Ville, and the Episcopal Palace.

The Hôtel-de-Ville, dating from the seventeenth century, contains a fine ballroom with mural paintings by Girardet. The Ducal Palace is an attractive example of the Gothic style and holds the Musée Lorraine, a collection of historical and other antiquities. The cathedral is a creation of the famous Mansart. Nancy has seven fine triumphal arches, the most elaborate one being the Porte Royal, constructed under Louis XV. Among other structures of note are the Gothic Church of Saint Epvre, an ancient Gothic castle, and the Palais du Gouvernement, now used for military purposes.

Nancy has a university (see below), a noted school of forestry (the only one in France), one of the two French hypnotic schools, an important hospital, a seminary, a botanic garden, and a public library of over 100,000 volumes and 5000 MSS. Attached to the school of forestry is a valuable forestry museum.

The situation of Nancy on the Eastern Canal and the Canal Marne-au-Rhine gives it a large trade. Its principal manufactures are embroidery, hardware, boots and shoes, straw hats, woolen goods, and agricultural implements. The great breweries here are among the most important in France. In art industries the city furnishes many unique features and varieties. Not a few of the artistic specialties in furniture and in printing in France originated here. To facilitate traffic, a belt line railway has been built. Population, in 1891, 78,110; in 1901, 102,559.

Charles the Bold was overwhelmed and slain before the gates of Nancy in 1477 in battle against René of Lorraine and his Swiss mercenaries. Nancy was the seat of the dukes of Lorraine down to 1766, in which year it came to France. The town has greatly grown in general importance since the loss of Alsace-Lorraine by France, large numbers of Alsatians coming here to live.

NANCY, University of. One of the leading universities of France, founded originally at Pont-à-Mousson. It had its inception in the papal bull of 1572, issued at the instance of the Cardinal of Lorraine, and consisted at first of two faculties: Theology and Arts. It was surrendered to the Jesuits to combat heresy. A law faculty was added in 1582 and a medical faculty in 1598. The University maintained a steady growth and in 1608 its attendance reached about 2000. This growth was checked by the wars of the seventeenth century. In 1768 it was removed to Nancy by the order of Louis XV. During the stormy days of the French Revolution it went down with the rest of the French universities, but was not reorganized at the establishment of the University of France. In 1852, at the instance of forty municipalities a rectorate was established, and in 1854 the faculties of Letters and Science were organized. In 1864 the faculty of Law and in 1871 the faculty of Medicine, consisting mostly of professors who had come over from Strassburg University, were established. Until 1896 these were known as Facultés de Nancy and were under the control of the University of France, but with the dissolution of that university, Nancy became autonomous. In 1902 the University of Nancy consisted of the faculties of Law, Medicine, Mathematics, Natural Science, and Philosophy, and the School of Pharmacy. It also included the chemical, serotherapic, electrotechnic, and agriculture institutes and the "Etudes Coloniales." The attendance in 1902 was 1130. The library contains about 38,000 volumes.

NANDA DEVI, nŭn'da dä'vē. A peak of the Himalaya (q.v.).

NANDU, nän'dōō. The Brazilian name of the South American ostrich. See Rhea.

NANEK, nä'nĕk, or **NANAK,** nä'nȧk (1469-1538). Founder of the religious sect of Sikhs (q.v.). He was born at the village of Talwandy, now called Nankana, on the bank of the river Ravi, near Lahore, India, and was a Kshatriya in caste. In his youth he showed a tendency toward mysticism. He was at first a shepherd, and afterwards became a Government official, in charge of the State's granary. He visited all the sacred places of India for the purposes of formulating the religious system he wished to introduce among his neighboring tribes. He spent two years in the town of Livanobbhon, where he associated himself with Kabir, the founder of a monotheistic sect. It was due to the influence of Kabir, whom Nanek often quotes in his book, that he determined to found a similar sect. Having previously made pilgrimages to Mecca and Medina, he returned to India, where he compiled the great work known as the *Adi-Granth.* For many years he traveled widely, and proclaimed everywhere the doctrines of his new religion. He preached the abolition of caste, the unity of God, and the obligation to lead a pure life, and soon had a large following. Upon his death, which occurred at Kirtipur on the Ravi River, his disciple Lina (or Labona) assumed the leadership of the sect. Ten apostles, or 'gurus,' as they are termed, are traced from Nanek down to Govind Sinh in 1708, with whom the succession stopped.

NANGASAKI, nän'gȧ-sä'kē. A seaport of Japan. See Nagasaki.

NANINI, nȧ-nē'nē, Giovanni Maria (c.1540-1607). An Italian composer, born at Tivoli. He opened the first public school of music ever controlled by an Italian musician in Rome. The famous Palestrina and a nephew, Bernardino, were two of his assistants. He succeeded Palestrina as *maestro* at Santa Maria Maggiore in Rome, and in 1577 became a member of the Papal Choir. Three years before his death he was appointed *maestro di cappella* of the Sistine Chapel. A six-part motet, *Hodie Nobis Cœlorum Rex,* composed by him, is sung annually on Christmas morning in the Sistine Chapel. Some of his most important works remain in MS. and are the private property of the Sistine Chapel and the Vatican Library. His printed works include motets, madrigals, canzonets, and church pieces, most of which examples are regarded as representing the best of the Palestrina period. He died at Rome.

NANKEEN' CLOTH. A fabric formerly imported extensively from China, and said to be the manufacture of Nanking; the color, a yellowish buff, being a favorite one. In the middle of the nineteenth century this material was much used for clothing, especially for trousers. Lately nankeen has been largely superseded by ordinary cotton, artificially colored to imitate the genuine fabric.

NANKING′ (Chin., Southern Capital.) The capital of the Province of Kiang-su, China, and seat of the viceroy for the three provinces of Kiang-su, Kiang-si, and Ngan-hwei. It is 194 miles northwest of Shanghai, near the Yang-tse River, latitude 32° 40′ N., longitude 118° 47′ E. (Map: China, E 5). It was made the capital of the Empire and called Nanking in 1368, but was the capital only until 1403. Its official name, given by the Manchu Dynasty, is Kiangning. It is an ancient city, having been the capital as far back as A.D. 317-582. It has been famous as a literary centre and for its fine arts, manufactures, and monuments. It was captured by the Tai-pings in 1853, who held it for more than a year. They destroyed the beautiful porcelain tower from fear of its geomantic influences, and so injured the city that it has not yet recovered fully. The first British treaty was signed in Nanking in 1842. Its present importance in part is from its military college, arsenal, and factories for the making of war material. It is a centre of missionary activity. The climate is exceedingly unhealthful. The population is variously estimated at from one-quarter to one-third of a million inhabitants. It was opened to foreign trade in 1899, but its commercial importance is insignificant, owing to the proximity of Chinkiang (q.v.). In the vicinity are the famous Ming tombs.

NAN′-NING′. A treaty port of Southern China, in the Province of Kwang-tung, situated at the head of navigation on the Yu-kiang River, 320 miles west by south of Canton (Map: China, C 7). It is one of the principal trading stations near the southern frontier, and lies on the route of the proposed railroad from Hanoi to Canton. Population, 40,000.

NANNINOSE (corruption of American Indian *mananosay*), or **MANNINOSE.** A local name in use along the South Atlantic coast for the soft clam (*Mya arenaria*). See CLAM.

NANSEN, nän′sen, FRIDTJOF (1861—). A Norwegian Arctic explorer and naturalist, born near Christiania, Norway. He was educated in the university of his native city, and was trained as a zoölogist. In his twenty-first year he undertook a trip to East Greenland waters for zoölogical specimens; the same year he was appointed curator in the Natural History Museum at Bergen. He became known to the world as the first man to cross the ice cap of Greenland, an adventurous journey from the east to the west coast, undertaken in 1888, which he described in two volumes, *The First Crossing of Greenland* (1890). He spent the winter of 1888-89 among the West Greenland natives, which resulted in a volume on *Eskimo Life* (1893). After his return to Norway he was appointed curator in the Museum of Comparative Anatomy at the Christiania University. From his twenty-third year he was constantly planning for the great journey into the polar regions, upon which he did not embark till nine years later. He had unusual natural and acquired qualifications for the work, and his winter among the Eskimos was of inestimable value to him in his later experiences.

Nansen inferred, partly from the appearance in Greenland of a pair of trousers which had been left upon the ice south of Siberia when the *Jeannette* was abandoned, partly from the presence in Greenland of driftwood from Siberia, and partly from the experience of other explorers, that a ship driven with the ice by prevailing winds might drift from above Siberia across the pole. The weight of Arctic authority did not support this plan; nevertheless, with the assistance of the Government and private citizens Nansen built and equipped the Arctic exploring vessel *Fram* (Forward), left Norway in 1893, skirted the north coasts of Europe and Asia, put into the polar pack ice near the New Siberia Islands on September 22, 1893, and drifted northwest till March 14, 1895. On that day, with a single companion, Lieutenant Johansen, he left the *Fram* frozen in the pack and started toward the Pole with dog sledges. On April 7, 1895, he reached latitude 86° 4′ N., within 272 statute miles of the North Pole, and 184 miles nearer to it than any man had ever been before him. Further progress was impossible, and he retreated to Franz Josef Land, where he and Johansen spent the winter in a snow hut, living on Arctic game. In the spring they started southward for Spitzbergen, but fortunately found the winter camp of the Harmsworth expedition under Jackson, and returned home on the ship of that party in the summer of 1896. Meanwhile the *Fram* drifted around to the north of the Franz Josef Land Archipelago, reaching the latitude of 85° 57′, then blasted her way southward to open water, and reached the coast of Europe within a week of Nansen's arrival there. The scientific results of the expedition were very great, and were published in a series of reports. Nansen also wrote *Farthest North*, a popular description of the expedition. His achievements were recognized by many geographical societies, which conferred their highest honors upon the explorer. He made extensive lecture tours in Europe and the United States.

Nansen failed to find any form of life above the 84th parallel. His discovery of a wide sea of oceanic depth, north of the New Siberia Islands, overthrew the theory of the prevailing shallowness of the Arctic Ocean. He found that, owing to the predominance of water in the far North, the temperatures there were higher than along the north coast of Asia. He discovered no land except a few little islands near the Asian coast; and the free movement of the ice masses driven, as Nansen observed, by the winds in every direction, has led geographers to conclude that there is no large land near the North Pole. See POLAR RESEARCH.

NANTEL′, GUILLAUME ALPHONSE (1852—). A Canadian advocate, journalist, and politician, born at Saint Jerome. He was educated at Sainte Thérèse de Blainville, was admitted to the bar, and after several years of practice established at Saint Jerome the colonization newspaper *Le Nord*, whose publication he continued until 1887. From 1887 to 1892 he was editor of *La Presse* at Montreal, and in 1897 established the weekly journal *Le Monde Canadien*. In 1882 he was returned by Terrebonne to the Quebec Assembly, and in 1886, 1890, and 1892 was reëlected by acclamation. From 1891 to 1896 he was Minister of Public Works. He became a director of the Great Northern Railway and of the Northern Colonization Railway, and published in the interests of colonization *Notre nord-ouest provincial* (1888).

NANTERRE, näɴ'târ'. A town of France in the Department of Seine, situated a few miles north of Paris, near Saint Denis. According to the tradition, it is the birthplace of Sainte Geneviève, the patron saint of Paris. Population, in 1901, 9214; of commune, 14,140.

NANTES, näɴt. An important seaport town, capital of the Department of Loire-Inférieure, France, situated on the right bank of the Loire, at its confluence with the Erdre and the Sèvre-Nantaise, both navigable streams (Map: France, E 4). It is about 250 miles by rail southwest of Paris. Besides railways, there is communication with the interior by steamers on the Loire. The city is handsome and well built. Among the numerous striking and beautiful buildings, the chief are the Cathedral of Saint Pierre and the old castle, dating from 938. The Bourse is a modern building and one of the finest in France. There are a public library containing 200,000 volumes, a museum of paintings, a museum of natural history, an ecclesiastical college, several learned societies, and three theatres. A very beautiful promenade, formed by the Cours Saint Pierre and the Cours Saint André, extends from the Erdre to the Loire. It is planted with four rows of trees, bordered with lines of palatial houses, and ornamented with statues. On the right bank of the river there are six miles of quayage. Formerly vessels of 200 tons only could reach the port, vessels of greater burden unloading at Paimbœuf, or Saint-Nazaire, but a ship canal on the left bank now admits large sailing vessels and steamers directly to Nantes. In the manufacture of sugar Nantes stands next to Paris and Marseilles. Its ship-building industry and its tobacco factories are also very important. There are also iron, copper, and lead foundries, oil and soap works, food-preserving establishments, saw mills, and manufactures of railroad material, of cotton and woolen goods, chemicals, and cement.

Nantes, anciently Condivincum, was founded before the Roman conquest. It took its present name from that of a Gallic tribe, the Namnetes. It was the capital of the Duchy of Brittany, and its history until the fifteenth century is a record of struggles with successive invaders in defense of its independence. In 1491 the duchy was united to France by the marriage in the castle of Anne of Brittany to Charles VIII., King of France. The castle also witnessed the signing of the famous Edict of Nantes (q.v.) by Henry IV. in 1598. From the fifteenth century the commerce of the town began to have a great development, and in the seventeenth and eighteenth centuries its prosperity increased on account of the slave trade, but in 1790 Nantes had declined greatly in importance. During the Revolution it was the scene of the *noyades* and other atrocities of the infamous Carrier (q.v.). The population, which showed a falling off in 1880 and in 1890, in the last decade advanced again, and in 1901 Nantes had 132,990 inhabitants. Consult Maillard, *Nantes et le département au XIXème siècle* (Nantes, 1896).

NANTES, Edict of. The name given to the famous decree signed in the city of Nantes by Henry IV. of France, April 13, 1598, which secured to the Protestant portion of his subjects partial freedom of religion. The document consisted of ninety-two patent or public articles and fifty-six secret or close ones, and among its chief provisions were the following: the proclamation of a full amnesty; the granting of liberty of conscience to the Huguenots; the permitting to Huguenot chiefs and noblemen of public religious exercises attended by themselves, their families, and the families of their dependents. In addition the Huguenots were to be allowed to establish new churches, except in Paris and the surrounding districts, and in the royal residences; and to maintain universities, or theological colleges, of which the Huguenots had four, those at Montauban, Saumur, Montpellier, and Sedan. Adherents of the reformed faith were also to be eligible to all civil offices and dignities; but they were obliged outwardly to celebrate the festivals of the Catholic Church, and to pay tithes to the Catholic priesthood. In each Parlement a *chambre de l'édit* was created to take cognizance of all cases arising out of the act and to supervise its working. Owing to the difficulties and delays in registering the Edict of Nantes, it was not published until a year after it had been signed by the King. It remained in force until revoked by Louis XIV., October 22, 1685. See Huguenots.

NANTEUIL, näɴ'tē'y', Robert (1630-78). A celebrated French engraver, born at Rheims. He studied in his native city under Nicolas Regnesson. About 1645 he went to Paris, and there worked in crayon and pastel for some time before he took up the graver again. His plates having come to the King's notice, he was appointed designer of the Cabinet (1658). He is credited with the decree of 1660, dated from Saint Jean de Luz, by which engraving was raised to an equality with painting and set apart from the purely mechanic arts. He left about three hundred plates, which include portraits of many of the celebrities of the time. Consult Duplessis, *Histoire de la gravure en France* (Paris, 1861).

NAN'TICOKE. A former important Algonquian tribe of Maryland. They were noted for their dark complexion and peculiar customs and ceremonies, from which they acquired the reputation of being a tribe of sorcerers. Their power was broken by the Iroquois in 1678. In 1707 they had seven villages, and in 1722 their principal village still contained about one hundred inhabitants and was the seat of an 'empress,' who ruled over all the neighboring Indians. The whole tribe then numbered about 500. Soon afterwards they began a gradual removal to the Iroquois country, and settled in several villages on the eastern branch of the Susquehanna, in southern New York, although a portion of them continued to reside in their old country. In 1753 a part of those on the Susquehanna became incorporated with the Iroquois, but the majority removed to the Ohio and joined the Delaware tribe, with which they became completely merged. There are still several score of mixed-blood Nanticoke in southern Delaware.

NAN'TICOKE. A borough in Luzerne County, Pa., eight miles west-southwest of Wilkesbarre; on the Susquehanna River, and on the Pennsylvania, the Lackawanna, and the Central of New Jersey railroads (Map: Pennsylvania, E 2). It is chiefly engaged in mining and preparing for market anthracite coal, but has also hosiery mills, a canning factory, etc. Settled in 1850-55, Nanticoke was incorporated in 1874; it is governed under the charter of that date, which provides for a burgess, elected every three years, and a unicameral council. Population, in 1890, 10,044; in 1900, 12,116.

NANTUCK′ET. A town and the county-seat of Nantucket County, Mass., co-extensive with Nantucket Island and several small outlying islands; 60 miles southeast of New Bedford, with which it has steamboat communication (Map: Massachusetts, G 5). Nantucket is widely noted as a summer resort, presenting much of picturesque and historic interest. It was formerly the seat of a great whaling industry, but at present the community is engaged principally in fishing, agriculture, and the coastwise trade. The town, including within its corporate limits several villages, contains the Athenæum (public library), Admiral Sir Isaac Coffin's Lancastrian School, and Muskeget Park. The government is administered by town meetings. Population, in 1890, 3268; in 1900, 3006.

In 1659 the first settlers, headed by Thomas Macy, came to the island and settled at Madeket, the present site of Nantucket not having been chosen until 1673. Consult Hinchman, *Early Settlers of Nantucket, Their Associates, and Their Descendants* (Philadelphia, 1896).

NANTWICH, nănt′ĭch. A market-town in Cheshire, England, on the Weaver, 20 miles southeast of Chester (Map: England, D 3). The parish church, one of the finest country churches in England, was restored in 1864. Nantwich was famous in former times for its brine-springs and salt-works. Shoes, gloves, cotton goods, and ale are manufactured. The town owns its water supply and markets. Nantwich dates from the Roman period, and was formerly called Halen Gwyn—the white salt town. Population, in 1891, 7400; in 1901, 7700.

NANTYGLO, năn′tĭ-glȯ, and **BLAINA,** blā′-nȧ. A town in Monmouthshire, England, 7½ miles southwest of Abergavenny (Map: England, C 5). It has important coal-mining and iron industries. Population, in 1891, 12,400; in 1901, 13,500.

NAOGEORG, nä′ȯ-gȧ-ôrg′, THOMAS (1511-63). A German Protestant dramatist, whose name in the vernacular was Kirchmeyer. He was born at Hubelschmeiss, near Straubing; possibly studied at Tübingen; and in 1535 became pastor. His Latin poems, all animated by the most bitter opposition to the Papacy, include the dramas, *Pammachius* (1538); *Incendia seu Pyrgopolinices* (1541); *Mercator seu Indicium* (1541); and the satiric poem *Regnum Papisticum* (1553). These were often rendered into German, and were long popular, as were his weaker biblical dramas, *Hamanus* (1543); *Hieremias* (1551); and *Judas Iscariotes* (1551).

NAOROJI, nou′rȯ-jė, DADABHAI (1825—). The first Indian member of the British House of Commons. The son of a Parsi priest, he was born at Bombay, and educated in the school of that city which afterwards became the Elphinstone Institution. He was appointed professor of mathematics and of natural philosophy there in 1854, but after 1855 he lived chiefly in England. He was instrumental in founding the East India Association in 1867, and three years afterwards he succeeded in having certain positions in the civil service opened to native Indians. In 1874 he was made Prime Minister to the Prince of Baroda. From 1885 to 1887 he was a member of the Bombay Legislature, and he was president of the Indian National Congress in 1886 and in 1893. He was a liberal member of Parliament for Central Finsbury in 1892-95, and in 1895 was appointed a member of the royal commission to inquire into Indian affairs. His publications include: *England's Duties to India* (1867); *The Wants and Means of India* (1870); collected articles published in 1887; and *Poverty and Un-British Rule in India* (1901).

NA′OS (Gk. ναός, Attic νεώς, from ναιειν, *naiein*, to dwell). The central chamber of a Greek or Græco-Roman temple. See CELLA; PRONAOS.

NAPA, nä′pȧ. A city and the county-seat of Napa County, Cal., 46 miles northeast of San Francisco; on the navigable Napa River, and on the Southern Pacific Railroad (Map: California, B 2). It is the seat of a State Hospital for the Insane, and has attractions of beautiful scenery and special features of interest in Napa Soda Springs, Napa Redwoods, Calistoga Hot Springs, and petrified forests. The leading industries are fruit-growing and the manufacture of tanned leather, shoes, gloves, and woolen goods. At Napa Junction there are Portland cement works, the vicinity having extensive deposits of cement rock. Settled in 1847, Napa was incorporated in 1863. The present government is administered under a charter of 1893, which provides for a mayor, elected every two years, and a unicameral council. Population, in 1890, 4395; in 1900, 4036.

NAP′ANEE. A town and port of entry, Lennox County, Ontario, Canada, at the mouth of the Napanee River, on the Bay of Quinté, 23 miles west of Kingston. It has a station on the Grand Trunk Railway and is the terminus of the Bay of Quinté and Napanee Railway. It is a grain-trading centre and the seat of a United States consular agent. Population, in 1891, 3433; in 1901, 3143.

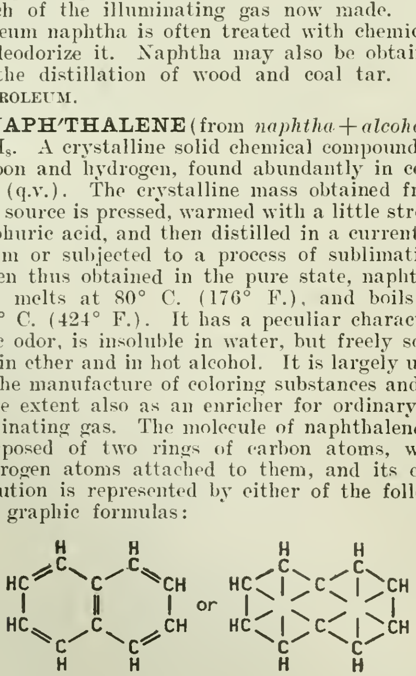
NAPATA, nȧ-pä′tȧ. The ancient capital of Ethiopia (q.v.), mentioned in inscriptions as early as B.C. 1450, and later the seat of independent kings. It was rivaled by Meroë (q.v.) after the Persian period. For the ruins of the city, destroyed by Petronius, see BARKAL.

NA′PERVILLE. A city in DuPage County, Ill., 30 miles west of Chicago; on the DuPage River, and on the Chicago, Burlington and Quincy Railroad (Map: Illinois, D 2). The city, chiefly a residential place, has the Nichols Library, and is the seat of Northwestern College (Evangelical Association), established in 1861. There are quarries, a furniture factory, and a fly-net factory. The electric-light plant is owned and operated by the municipality. Naperville was settled in 1830, and was incorporated in 1857. Population, in 1890, 2216; in 1900, 2629.

NAPH′TALI. According to Gen. xxx. 7-8, the fifth son of Jacob, and the second born to him by Bilhah. In the actual history of the Hebrew Confederation, the tribe Naphtali plays but a minor part. Its territory lay in the north, bordering on the Sea of Galilee. According to Judges iv. 6, Barak came from Kedesh in Naphtali, but it is doubtful whether the addition 'Naphtali' is correct here, though both the clans Naphtali and Zebulon were involved in the struggle against the King of Hazor. (See DEBORAH.) According to Josephus (*Wars*, iii. 3, 2) the Naphtalites were men of valor. Their dangerous position as a border tribe made them among the first to fall into the hands of Assyria (B.C. 734; cf. II. Kings xv. 29). In the religious development of Israel the tribe plays no part, but in the post-exile period Tiberias (q.v.), on the western shore of the Sea of Galilee, comes into prominence, and after the destruction of Jerusalem it became one of the centres of Jewish learning.

NAPHTHA (Lat., from Median Pers. *νάφθα*, Av. *napta*, Pers. *naft*, moist; connected with Lat. *Neptunus*, *Neptune*, name of the sea-god). A term originally applied to an inflammable liquid which exudes from the soil in certain parts of Persia. Subsequently the use of the term spread to include some of the more volatile oils found in Europe and even in America. The product of the oil fields of Southern Russia is usually called naphtha, although it differs in no way from the ordinary grades of petroleum. Naphtha properly includes the lighter oils which pass off first in the distillation of petroleum, the gravities ranging from 90 to 62 degrees Beaumé. Pennsylvania crude oil contains from 8 to 20 per cent. of naphtha. In the refining of such naphtha several products are obtained by fractional distillation, those which pass off first, namely rhigolene and cymogene, are gases at ordinary temperatures and are seldom saved. The next product is known as gasoline, a material largely used in machines and for illuminating purposes. After this come stove naphtha and gas naphtha, the latter being the base of much of the illuminating gas now made. Petroleum naphtha is often treated with chemicals to deodorize it. Naphtha may also be obtained in the distillation of wood and coal tar. See PETROLEUM.

NAPH′THALENE (from *naphtha* + *alcohol*), $C_{10}H_8$. A crystalline solid chemical compound of carbon and hydrogen, found abundantly in coal-tar (q.v.). The crystalline mass obtained from this source is pressed, warmed with a little strong sulphuric acid, and then distilled in a current of steam or subjected to a process of sublimation. When thus obtained in the pure state, naphthalene melts at 80° C. (176° F.), and boils at 218° C. (424° F.). It has a peculiar characteristic odor, is insoluble in water, but freely soluble in ether and in hot alcohol. It is largely used in the manufacture of coloring substances and to some extent also as an enricher for ordinary illuminating gas. The molecule of naphthalene is composed of two rings of carbon atoms, with hydrogen atoms attached to them, and its constitution is represented by either of the following graphic formulas:



A number of interesting derivatives of this hydrocarbon are obtained by the action on naphthalene of chlorine, nitric acid, etc. The most important derivatives commercially are the so-called sulphonic acids. By acting on naphthalene with an excess of sulphuric acid, we obtain naphthalene-sulphonic acid, $C_{10}H_7SO_3H + H_2O$, from which, by substitution processes, a large number of compounds are produced, many of these finding employment in the color and dye industry.

NAPIER, nā′pĭ-ẽr. The capital and chief port of Hawke's Bay County and Provincial District, North Island, New Zealand, on the east coast (Map: New Zealand, F 3). Wool is the chief export; there are also large exports of timber, canned and frozen meats. The principal public buildings comprise an Anglican cathedral, town hall, and athenæum. It has railway communication with Wellington and New Plymouth. Population, in 1901, 9015.

NAPIER, nāp′yẽr *or* nȧ-pēr′, Sir CHARLES (1786-1860). A British admiral. His father was the Hon. Capt. Charles Napier, R. N., second son of Francis, fifth Lord Napier. He was born at the family seat, Merchiston Hall, Stirling, Scotland. At thirteen he went to sea as a naval volunteer. In 1808 he received the command of the *Recruit*, 18 guns, serving in the West Indies. He became a post-captain, but being thrown out of active service, volunteered in the Peninsular Army, and was wounded at Busaco. In 1814 he was ordered to America, and took an active part in the operations against Baltimore. In 1829 he received the command of the *Galatea*, a 42-gun frigate, and was employed 'on particular service' on the coast of Portugal. He accepted the command of the fleet of Dom Pedro, the father of the young Queen, Maria da Gloria, in the struggle against her uncle, Dom Miguel, and by defeating the Miguelite fleet, hastened the downfall of the usurper. He was made admiral-in-chief of the Portuguese navy, but soon returned to England. In the war between the Porte and Mehemet Ali, he organized a land force, with which he stormed Sidon, and defeated Ibrahim Pasha among the heights of Mount Lebanon. He took part in the naval attack on Acre. He next blockaded Alexandria, and concluded a convention with Mehemet Ali. For these services he was knighted, and in 1847 he received the command of the Channel Fleet. When the Russian War broke out, he was sent out to command the Baltic fleet, but had to content himself with a prudent and successful blockade of the strongly fortified ports, which somewhat disappointed public expectations of more daring achievements. He twice sat in Parliament, and, until his death, labored with success to reform the British naval administration. He was a man of great personal courage and decision of character, but selfish, vainglorious, and arrogant. These traits are strongly marked in his works: *The War in Portugal* (1836); *The War in Syria* (1842); *The Navy: Its Past and Present State* (1851). Partiality marks the biography by his stepson Gen. Elers Napier, *The Life and Correspondence of Admiral Sir Charles Napier* (London, 1862).

NAPIER, Sir CHARLES JAMES (1782-1853). A celebrated British general, son of Col. George Napier. He was born at Whitehall, August 10, 1782, and in his twelfth year received a commission in the Thirty-third Infantry. His first military experience was in Ireland in 1798. His next active service was in Spain during the Napoleonic wars, and he commanded the Fiftieth Infantry at Coruña, where he was wounded and taken prisoner. Marshal Ney dismissed him on parole, and he went to England, but returned in 1810 to the Peninsula after having been exchanged. At Coa he fought as a volunteer and had two horses killed under him. At Busaco a shot in the face broke his jaw and injured an eye; but he recovered in time to be present at the battle of Fuentes de Oñoro and the second siege of Badajoz, both in 1811. In the summer of 1813 he was with the fleet under Beckwith, and afterwards under Cockburn, engaged in desultory operations on the coast of the United States. In 1815 he took part in the storming of Cambrai, and marched into Paris with the allied armies. From 1822 to 1830 he was Resident (Governor) of Cephalonia, one of the Ionian Islands, the affairs of which he administered with great energy and intelligence. In 1841 he was ordered to India to take command of the army at Bombay. The most splendid service of his life now began, and resulted in the conquest of Sindh against great odds. In the battle of Miani, 1843, Napier with about 2000 troops attacked a strongly posted native force ten times as great, and defeated it, killing more than 6000 men. Thereupon all the ameers surrendered with the exception of Shir Muhammed, who brought 25,000 men into line of battle at Hyderabad. In three hours Napier's little army of 5000 men gained a decisive victory, and a few days afterwards the English general was master of Sindh. The Governor-General, Lord Ellenborough (q.v.), made him Governor of the conquered territory, but though his administration was very successful, as were also various campaigns against the hill tribes, Napier retired in 1847, after having quarreled with the directors of the East India Company. During the Sikh war of 1848-49 he again went to India, but arrived too late to take part in the conflict. After having put down a mutiny among the native soldiers, he returned to England in 1850, having had another quarrel with the directors. He retired to the Hampshire Downs, near Portsmouth, busying himself with literary labors. There he died on August 29, 1853. Napier was a man brave to rashness, quarrelsome with his superiors, but beloved by his soldiers, and one of the most remarkable of the military men of his time. Consult: Bruce, *Life of General Sir Charles Napier* (London, 1885); Butler, *Sir Charles Napier* (ib., 1890). His brother, Sir William Francis Patrick Napier (q.v.), has also written of him.

NAPIER, Sir FRANCIS (1819-98). An English diplomat, born at Thirlestane, in Selkirkshire. He entered the diplomatic service in 1840, was attaché at Vienna and at Constantinople, secretary of legation at Naples, envoy to Washington and The Hague, and ambassador to Saint Petersburg (1860-64) and to Berlin (1864-66). From Berlin he was transferred to India as Governor of Madras, and there labored incessantly and wisely, especially in behalf of public health during the famine in Ganjam. In 1872, after serving temporarily as Governor-General of India, he returned to England and was created Baron Ettrick of Ettrick.

NAPIER, JOHN (1550-1617). A Scotch mathematician, born at Merchiston, near Edinburgh. He was educated at Saint Andrews and probably also abroad. His natural pugnacity of character often involved him in difficulties with his neighbors and tenants. In 1594 he published his *Plaine Discovery of the Whole Revelation of Saint John* (2d ed., London, 1611), in which he sought to prove that the Pope was Antichrist. In somewhat the same spirit, ostensibly to defend his country from "the enemies of God and true religion," he made some secret inventions, including burning-mirrors, a piece of artillery, and a chariot of metal, none of which had any more merit than his theological contributions. Napier's fame rests on his mathematical discoveries, and he is chiefly known as the inventor of logarithms (q.v.). In his earlier investigations he seems to have been considering the subject of imaginary roots, and he refers to this as an important algebraic secret. The idea of logarithms seems to have occurred to him as early as 1594, and thenceforward the rest of his life was spent in developing the idea and computing logarithmic tables. He also invented some mechanical devices for computation known as 'Napier's rods.' (See CALCULATING MACHINES.) By means of these, multiplication and division can be performed, and square and cube roots extracted. He was also the inventor of a number of formulas in trigonometry, known as 'Napier's circular parts.' (See CIRCULAR PARTS.) Napier was one of the first English writers to make any valuable contribution to mathematics, and his discoveries mark an epoch in the history of science. His chief writings are: *De Arte Logistica* (written in 1573, published in 1839); *Mirifici Logarithmorum Canonis Descriptio* (1614 and subsequent editions; Eng. trans., 1616 and 1857); *Mirifici Logarithmorum Canonis Constructio* (1619; Eng. trans. 1889); *Rabdologiæ seu Numerationis per Virgulas Libri Duo* (1617). Consult: Mark Napier, *Memoirs of Napier* (Edinburgh, 1793); Earl of Buchan, *Life of Napier* (ib., 1787). A complete edition of Napier's works appeared in Edinburgh in 1839. A bibliography of Napier's works, by Macdonald, may be found in the English translation of the *Mirifici Logarithmorum Canonis Constructio* mentioned above.

NAPIER, ROBERT (1791-1876). A Scotch marine engineer, born at Dumbarton. He was for a time apprenticed to his father, a blacksmith, and afterwards went to Glasgow, where in 1815, after working for Robert Stevenson, he set up a smithy, with two apprentices. In 1823 he built his first marine engine. In 1830 he supplied engines for the Glasgow Steam-Packet Company, and ten years later he supplied the Cunard Company with engines for their first four steamers. He added shipbuilding to the construction of engines in 1841, and built more than 300 vessels for the Government, and the larger companies.

NAPIER, ROBERT CORNELIS, Lord Napier of Magdala (1810-90). A British soldier, born at Colombo, Ceylon. He studied at the East India Company's military college at Addiscombe, and at the royal engineering school at Chatham, and from 1828 to 1845 was chiefly employed on the public works. In the latter year, however, he participated in several battles of the First Sikh War. During the Second Sikh War (1848-49) he again saw active service, and at its close was appointed civil engineer to the board of administration of the Punjab, in which capacity he inaugurated and partly carried out a comprehensive scheme of public improvements. During the summer and fall of 1857, at the time of the Mutiny, Napier distinguished himself in the movements which resulted in the relief of Lucknow. Later he also planned the recapture of that place. In June, 1858, he coöperated with Sir Hugh Rose in the latter's operations against the insurgent forces under Tantia Topi and the Ranee of Jhansi; and on the 29th, after Sir Hugh's departure, he took the chief command in Central India. In August he coöperated with Brigadier-General Smith in the capture of Paori; in December, with slight loss to himself, destroyed Ferozeshah's army and in April, 1859, captured Raja Man Singh of Narwar and Tantia Topi. Subsequently he was appointed military member of the council of the Governor-General and aided in the amalgamation of the national army and that of the East India Company. Lord Elgin's (q.v.) sudden death left him Acting Governor-General for a short time. In 1868 he commanded the English expedition sent to Abyssinia and stormed the royal stronghold of Magdala. On his arrival in England Queen Victoria created him Baron of Magdala. The next year he was appointed commander-in-chief in India. Six years later he returned to Europe, and in 1883 was raised to the rank of field-marshal. Consult Markham, *History of the Abyssinian Expedition* (London, 1869), and Escott, *Pillars of the Empire* (London, 1879).

NAPIER, Sir WILLIAM FRANCIS PATRICK (1785-1860). An English general and historian, born at Celbridge, Kildare, Ireland, December 17, 1785. He was a brother of Sir Charles James Napier, the conqueror of Sindh, and a cousin of Sir Charles Napier, the English admiral. Entering the army as ensign in the Royal Irish Artillery (1800), he became captain of a regiment in Sir John Moore's brigade (1804); took part in the siege of Copenhagen (1807); went with his regiment to Spain (1808); and for his bravery in the Peninsular campaigns was appointed lieutenant-colonel (1813). Later he became colonel (1830); then Lieutenant-Governor of Guernsey (1842), and general (1859). He was knighted in 1848. Napier passed his last years at Scinde House, Clapham, where he died February 10, 1860. Napier gained an immense reputation by his *History of the Peninsular War* (6 vols., 1828-40). This work, which aimed to tell the truth, led to a long controversy with the officers who had taken part in the campaigns. It is, however, believed to be an impartial statement of facts. His *History of Sir Charles Napier's Administration of Scinde* (1851) is written in his boldest style. Consult the *Life* by Lord Aberdare (London, 1864).

NAPIER'S RODS, or BONES. See CALCULATING MACHINES.

NA'PLES (It. *Napoli;* anciently, *Neapolis*). The largest city and the second seaport of Italy, capital of the Province of Naples, formerly the capital of the Kingdom of the Two Sicilies, situated on the western coast of the Peninsula, at the foot of encircling hills, on the north side of the Bay of Naples, in latitude 40° 51′ N., and longitude 14° 16′ E. (Map: Italy, J 7). It is about five miles long and three miles broad. The climate is mild, although the variations in temperature and humidity, owing to alternating winds from the north and south, are often great and sudden. The thermometer ranges from 26° F. in January to 97° in July, the average winter temperature being 50°, the average summer temperature 75°. Fogs are rare and snow seldom falls. The rainy season lasts from the end of January to the beginning of April. The heat of summer is tempered by the sea wind that blows until about 2 o'clock in the afternoon. Vesuvius acts as a great natural barometer: when its smoke blows toward Capri, fair weather is always expected.

The far-famed situation of the city on the sea, amid its amphitheatre of hills, can be compared perhaps only with that of Constantinople. Across the bay to the south is visible the historic island of Capri; on the eastern shore are villas, vineyards, and orange groves grouped around tiny cities, while over all towers Vesuvius with ominous grandeur. The environs in general are unsurpassed for loveliness and the great variety of interest they present. Sorrento, Capri, Ischia, and the Phlegræan district are localities that delight the sightseer. Other striking attractions are the former monastery of the Camaldolites (q.v.), and the hill of Posilipo with its multiple associations and its fine streets offering magnificent views.

Architecturally Naples is by contrast surprisingly poor. The ancient and commercial part of the city lies east of a line drawn from Capodimonte through Sant' Elmo to Castello dell' Ovo, and is divided from north to south by the Via Roma.

The modern and western part, where are nearly all the principal hotels, is bordered on the south by the famous Riviera di Chiaia along the bay in a curved course of three miles. Here the Villa Nazionale stretches away—a splendid park dating from 1780. It is embellished with lordly allées, statues, and miniature temples. It contains the well-known aquarium of Naples, which is filled with a great variety of extraordinary fish—frutti di mare. It is, in fact, a school established for the scientific investigation of the aquatic fauna and flora of the Mediterranean. The public squares or larghi of Naples are adorned with fountains and obelisks; and within the precincts of the city are several highly prized springs of fresh mineral waters.

The handsome Renaissance Porta Capuana is justly celebrated. The castles are numerous. Among the principal ones are the Castello Nuovo, called the Bastille of Naples, somewhat similar to the Tower of London, and adorned with a fine triumphal arch erected in honor of Alfonso of Aragon; the Castello Sant' Elmo, commanding a magnificent view from the ramparts; and the historic egg-shaped Castello dell' Ovo. The last was begun in 1154. It is situated on an islet connected with the mainland, and is one of the conspicuous features. Near it is the street Santa Lucia—the centre of the noisy Neapolitan life, particularly of the lower classes. Women engaged in domestic duties, naked children, and peddlers of all sorts present a unique spectacle here in a city characterized by festivals and processions and bustling traffic. The neighboring royal palace is of modern construction. It has an imposing façade decorated with rich statues. The interior is uninteresting.

NAPLES

VIEW OF THE CITY FROM THE TOMB OF VERGIL (UPPER)

PIAZZA DEL MUNICIPIO (LOWER)

Of the nearly four hundred churches none is very striking. The cathedral, dedicated to Saint Januarius, contains the celebrated vials in which the liquefaction of the saint's blood is alleged to take place on three annual festivals. The church also contains the tombs of Charles of Anjou and Pope Innocent IV., besides numerous fine paintings and statues. San Martino is an interesting religious precinct, with its belvedere, cloisters, and museum. In the monastery attached to the Church of Santi Severino e Sosio are deposited the valuable archives of the former Neapolitan kingdom, consisting of some 40,000 manuscripts, the earliest dating from 703.

Naples is far richer in archæological than in architectural interest. The Museo Nazionale contains an immense and unsurpassed collection of frescoes, paintings, mosaics, sculptures, antiquities, coins, medals, and inscriptions, including objects excavated at Herculaneum and Pompeii. Among its rarest, most celebrated possessions are the Farnese Bull, the Farnese Hercules, the Mosaic of the Battle of Alexander, the Pompeiian frescoes, and a valuable collection of bronzes and vases.

The splendid Galleria Umberto Primo was completed in 1890 at great expense.

At the head of the educational system is the university (q.v.). There are also an engineering school, an Oriental institute, an astronomical observatory, a botanical garden, several unions for the study and diffusion of many leading branches of knowledge, a marine school, and a royal conservatory of music. The charitable institutions are numerous, on an extensive scale, and richly endowed. Besides that of the university there is the National Library, with over 350,000 volumes, 200,000 pamphlets, and about 8000 manuscripts. Naples has many good playhouses. The San Carlos is one of the largest and most famous of opera houses. The marionette theatres and the theatres where the famous Neapolitan Pulcinella is to be seen are a never-failing source of entertainment.

Naples is one of the most important manufacturing centres in Italy. Ships, locomotives and cars, and stationary engines are built; and glass, cotton, wool, gloves, perfumery, linen and silk products are manufactured. The extensive steel works are chiefly in the hands of English firms. Copies of ancient vases and bronzes, lava articles, and coral and tortoise-shell goods are also largely dealt in. The commerce of Naples is even more important than are its industries. It has regular communication by steamers with nearly all parts of the world. The harbor has been much improved in the last decade. The tonnage of vessels entering was 3,356,435 in 1900, an increase of nearly 1,700,000 tons during the decade. The chief articles of import are coal, iron and steel (Great Britain, Germany, and Belgium), grain (Russia and India), lumber (Austria-Hungary), cotton (United States and India), wool, leather, oils, and wines (France), and chemicals (Germany and Great Britain). The leading exports are wine and brandy, dried and subtropical fruits, nuts, paper, and hemp. The total value of the imports in 1900 was $11,594,567, showing an increase of nearly $2,800,000 since 1898. The exports for 1900 were valued at $20,916,631.

Half of the population of Naples, including the countless lazzaroni and trovatori, were huddled together in the slums in ancient unsanitary buildings that crowded narrow, crooked streets, until the cholera epidemic of 1884 aroused the whole country. In 1885 the Italian Parliament voted $20,000,000 toward a systematic renovation which, when entirely completed, will cost city and nation not less than $100,000,000. A new water supply was at once introduced from the mountains near Avellino, 50 miles away, and plans were elaborated for a new sewer system, for new streets, new squares, and new buildings. Of 271 old streets 144 were to be abolished and 127 widened; the habitations of 90,000 people were to be destroyed, and the density of the population reduced from 645 to 280 per acre. The work so far has been done on contract by private companies, and the resale of street frontage on the new business streets has to some extent reimbursed the Government. The water-works are owned by a private company. The population of Naples in 1901 was 563,731.

Consult: Colletta, *History of the Kingdom of Naples*, translated by Horner (Edinburgh, 1858); Beloch, *Kampanien Geschichte und Topographie des antiken Neapel* (2d ed., Berlin, 1890); Del Balzo, *Napoli e il Napolitani* (Milan, 1884); Forbes, *Rambles in Naples* (New York, 1886); Hare, *Cities of Southern Italy* (London, 1883); Waters, *Naples* (Boston, 1894); Pellet, *Naples contemporain* (Paris, 1894); Rolfe, *Naples in the Nineties* (London, 1897); Whitehouse, *The Collapse of the Kingdom of Naples* (New York, 1899); Norway, *Naples Past and Present* (New York, 1901); Rispoli, *La provinsia e la città di Napoli* (Naples, 1902).

NAPLES, Bay of. A bay of the Mediterranean Sea on the southwest coast of Italy (Map: Italy, J 7). It is 20 miles wide from Cape Miseno on the northwest to Point Campanella on the southeast, and extends inward about 10 miles. The bay is famous for its beautiful scenery, the view including the city of Naples, Castellamare, and the other towns and villages along the shores, dominated by Mount Vesuvius on the east, while at the entrance to the bay are the lovely islands of Ischia and Capri.

NAPLES, Kingdom of. See Two Sicilies, Kingdom of the.

NAPLES, University of. An Italian university, founded in 1224 by the Emperor Frederick II. It was reformed or reconstructed at least three times before 1266, when Charles I. of Anjou finally placed it on a sound footing. Among its earliest and most brilliant scholars was Thomas Aquinas, who lectured here during its short but brilliant revival about 1272-74. It was reorganized in 1780, and since the incorporation of Naples with Italy, 1860, it has increased remarkably in numbers and influence. It had in 1901 a budget of over 900,000 lire and more than 5100 students, chiefly in law and medicine. Its library contains about 160,000 volumes and 30,000 pamphlets.

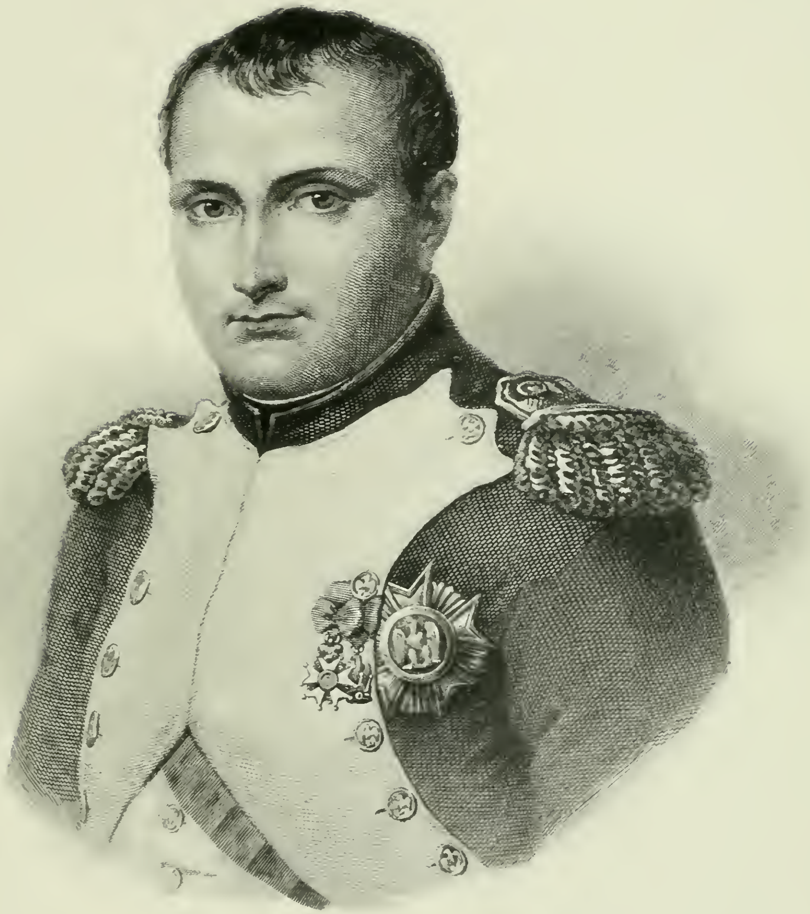
NAPO, nä'pō. A tributary of the Upper Amazon. It rises on the slope of Mount Cotopaxi in Ecuador and flows southeast, emptying into the Amazon near the eastern boundary of Ecuador after a course of 750 miles (Map: Ecuador, C 4). In its upper course it flows in a steep incline through a rough and rocky valley, but after emerging from the mountains it traverses a vast forest-covered plain, almost unexplored, and sparsely inhabited by savages. The Napo is navigable for steamers nearly 400 miles, but the natural wealth of the region, including gold, sarsaparilla, and rubber, is but little exploited.

NAPO'LEON. A village and the county-seat of Henry County, Ohio, 35 miles southwest of Toledo; on the Maumee River, the Miami and Erie Canal, and the Wabash and Detroit and Lima Northern railroads (Map: Ohio, B 3). It is of some importance as an industrial centre, its chief manufactured product being flour. The water-works and electric-light plant are owned by the municipality. Population, in 1890, 2764; in 1900, 3639.

NAPOLEON I., *Fr. pron.* nȧ'pō'lȧ'ōɴ' (Napoleon Bonaparte) (1769-1821). Emperor of the French, born at Ajaccio, on the island of Corsica, August 15, 1769. The family of Buonaparte (as the name was spelled until 1796) was of Tuscan origin, but had been settled in Corsica since 1529. The parents of the future Emperor were Carlo Maria de Buonaparte and Letizia Ramolino, a descendant of a good Florentine family. Napoleon was the fourth child and the second son. After a few months spent in learning French in a school at Autun, he entered the military school at Brienne on April 23, 1779, and there remained until he was transferred to the great military school in Paris in September, 1784. Just a year later he received his commission as second lieutenant in La Fère Regiment of Artillery, which was stationed at Valence. He served with this regiment until 1791, but passed the greater part of his time (1786-88 and 1789-91) on furlough in Corsica, where he took part in the patriotic movement under Paoli. He was in Paris during the events of August 10, 1792, when the mob of Paris attacked the Tuileries, and on August 30th attained the rank of captain in the army. He returned to Corsica, but this time he had a falling out with Paoli and identified himself with the French Revolutionary Party on the island. The defeat of this party compelled Napoleon and the other members of his family to escape and take refuge in France in June, 1793. As yet Napoleon had shown little indication of his genius and of the mighty career he was destined to lead. Self-contained and gloomy, he had made scarcely any friends except Bourrienne. He had mastered his profession of arms, had shown a capacity for intrigue, and had learned to rely upon himself. In his long leisure hours he had devoted himself faithfully to books of a solid character. He was in the beginning an enthusiastic admirer of Rousseau, and his earliest writings, which date from the Valence period, reveal an amount of sentiment that is strangely unlike the man who later squandered human lives by the hundred thousand in order to gratify his ambition. Buonaparte rejoined his regiment in Southern France, participated in the occupation of Marseilles by the Revolutionary forces, and then marched to Toulon to take part in the siege of that town. As *chef de bataillon* in the Second Regiment of Artillery he was practically in charge of the artillery during the siege operations, and won for himself golden opinions from the commissioners of the Convention with the army. One of these commissioners was Robespierre's younger brother, Augustin, whose intimate friend and confidant Buonaparte now became. His conduct at Toulon won him promotion to the rank of general of brigade, but his relations with the younger Robespierre and his outspoken Jacobinism caused his imprisonment after the coup of the 9th Thermidor. An old Corsican acquaintance, Saliceti, was one of the commissioners of the Convention in the south of France at this moment and intervened on behalf of the young artillery officer. Marmont, who was in position to help Buonaparte at this time, said that he did so because he saw "there was so much future in his mind." He was released on August 20, 1794, and after further misfortunes he turned up in Paris, where he found temporary employment in the topographical bureau.

The Convention was now drawing to a close, but was forced to face one more insurrection, one antagonistic to the new Constitution of the Year III. (See FRENCH REVOLUTION.) The work of defending the Convention was intrusted to Barras (q.v.), who selected as his second in command Buonaparte, whom he had seen at Toulon, and whom he now found in Paris half fed and shabbily clothed, awaiting the next turn of the wheel of fortune. "From the first," says Thiébault, "his activity was astonishing; he seemed to be everywhere at once: he surprised people by his laconic, clear, and prompt orders: everybody was struck by the vigor of his arrangements, and passed from admiration to confidence, and from confidence to enthusiasm." With the 'whiff of grape shot' he swept the Parisian mob from the streets on the 13th Vendémiaire (October 5, 1795). The Convention came to an end, the Directory took its place with Barras as one of the Directors, and Buonaparte succeeded Barras as commander of the Army of the Interior. Barras welcomed the young hero of the hour to his salon, where the grace of person and charm of manner of a young Creole widow, Josephine de Beauharnais, aroused in Buonaparte passionate admiration and love. Despite a disparity of six years in their ages, the influence of Barras brought about a marriage on March 9, 1796. Meanwhile the favor of another Director had brought to Buonaparte a much more important command in the army. Buonaparte had visited the Genoese Riviera in 1794, and at the Topographical Bureau he had taken the opportunity to prepare a plan of campaign in Northern Italy, which he now perfected and presented to Carnot (q.v.), who admired it and ordered its execution. Schérer, the general of the Army of Italy, replied that if the Directors wanted the plan carried out they could send down the man who devised it to do it. He was taken at his word; Buonaparte was appointed to the command, and left Paris two days after his marriage, arriving at Nice in March, 1796.

At this moment, after the treaties of Basel, France was still at war with England, Austria, and Sardinia. England was no longer a factor in the military situation on the Continent; Austria had been attacked only in Southern Germany, while on the Italian frontier France had done nothing except to make intermittent attacks on Sardinian territory. Italy was made up of patches of Austrian territory and of petty States under Austrian influence, which offered a rich spoil for the conqueror. The main body of the Austro-Sardinian army was at Montenotte, occupying the pass between the Maritime Alps and the Apennines at the headwaters of the Bormida and the Tanaro, two affluents of the Po. One



NAPOLEON I.

FROM AN ENGRAVING OF A PORTRAIT BY DAVID

road followed the latter northwest to Turin, the other road followed the Bormida to the northeast to Milan; between the two was an almost impassable mountain country. A successful blow would compel the Sardinians to retreat on their capital, Turin, and the Austrians on Milan, their headquarters in Italy, without hope of reuniting their forces. This army of 52,000 men was somewhat scattered and could not be used in full force at any one point, and many of the men were sick. The French Army of Italy was no better off. There were 42,000 poorly equipped, worse clad, and unpaid men scattered in detachments along the Riviera from Nice to Savona. Their new commander, Buonaparte, was a slender, delicate-looking youth of twenty-six, who was known only for some skill shown in handling artillery at Toulon and in Paris. Rumor said he owed his appointment to a discreditable intrigue between Josephine and Barras. Certainly there was little to promise one of the greatest military campaigns in all history, the most dazzling success of modern times. Bonaparte (as he now spelled his name) from the moment of his arrival took hold of things with the grasp of an experienced general skilled in the management of men. His address to his army kindled their imagination: "Soldiers, you are half-starved and half-naked; the Government owes you much, but can do nothing for you. I am about to lead you into the most fertile valleys of the world; there you will find flourishing cities and teeming provinces; there you will reap honor, glory, and riches. Soldiers of the Army of Italy, will you lack courage?" Reënforcements arrived which raised the army to about 50,000 men, whom Bonaparte concentrated at Savona. The campaign opened at Montenotte on April 11th. Three successive attacks compelled the Sardinians under Colli to retreat toward Turin, while the Austrian commander, Beaulieu, fell back toward Milan. Bonaparte pressed on against Colli, and, though he had no power to negotiate, compelled him to sign the armistice of Cherasco (April 28th), which gave France military control of Piedmont and left Bonaparte free to attack Beaulieu. From this moment Bonaparte showed the Directory that they had no ordinary general to deal with. He did not wait for orders. He did things and then reported; he preferred no requests, but presented demands coupled with an ultimatum. Immediately after the signature of the armistice with Colli, Bonaparte reassembled his forces, which had scattered to forage and plunder, and prepared to attack Beaulieu, who had retreated across the Po and the Ticino. Beaulieu expected Bonaparte's attack near Pavia. The French commander turned his flank, seized Piacenza on May 7th, and compelled Beaulieu to retreat across the Adda, leaving Milan to the French. Bonaparte pursued the retreating Austrians and defeated them at the bridge of Lodi across the Adda, on May 10th. After this battle it is said the troops gave Bonaparte the endearing name of the Little Corporal; from this time they were thoroughly devoted to him. Bonaparte promptly occupied Milan and there displayed his characteristic qualities. He appealed to the popular enthusiasm, and led the Milanese to believe that he was their deliverer. He established a temporary administration, welcomed artists and writers, and showed an interest in the University of Pavia. On the other hand, he extorted a war contribution of 20,000,000 francs and seized and sent to Paris numerous literary and art treasures. The young general did not dally. In a few days he was again pushing on against the Austrians, and on June 3d the siege of Mantua was begun. This strongly fortified town was the key to Northern Italy. While the siege was in progress Bonaparte paid his respects to the Dukes of Modena and Parma, to the Grand Duke of Tuscany, and to the Pope, each of whom he compelled to buy peace with large sums of money and with treasures of art and literature. The Austrians raised army after army for the relief of Mantua, but in vain. The first, under Wurmser, advanced from Tyrol in three divisions, and compelled the raising of the siege of Mantua by Bonaparte, who marched to meet the Austrians and defeated them at Castiglione on August 5th. Wurmser made a second attempt by the valley of the Brenta, but was defeated at Bassano on September 8th, and driven into Mantua, the siege of which was resumed by the French. Alvinczy, by the way of the Brenta, and Davidovich, by the way of the Adige, brought the second Austrian army into Italy, planning to concentrate 60,000 men at Verona. Bonaparte had to meet them with about 40,000, and at Caldiero, on November 12th, he met a severe check; but, driven to desperation, he put forth superhuman efforts, and after three days of fighting defeated the Austrians at the bridge of Arcole and forced them to retreat. Alvinczy, from the wreck of his army and with reënforcements, created the third Austrian army and advanced southward between Lake Garda and the Adige. Bonaparte hastened to meet him, seized the important strategic position at Rivoli, repulsed Alvinczy on January 14, 1797, and hurled him back into Tyrol. Turning back on Mantua, Bonaparte captured at La Favorita two days later an important detachment of Alvinczy's force which by a flank movement had almost succeeded in reaching Mantua. Wurmser surrendered Mantua on February 2d. In this famous campaign of 1796 Bonaparte relied on three important maxims to which he held fast throughout his career: divide for foraging, concentrate for fighting; unity of command is essential for success; and time is everything. Quickness to divine his enemy's plans; a thorough knowledge of geography which produced combinations that were executed with bewildering audacity; an ability to get a maximum amount of marching and fighting out of an army of young veterans who were poorly shod and clad and ill-fed; and the loyal support of his subordinates, Augereau, Masséna, Joubert, Lannes, Marmont, Victor, Murat, and Junot, combined to enable Bonaparte to conquer Northern Italy for France. The campaign of 1797 was an act of colossal audacity. With less than 50,000 men Bonaparte drove the Archduke Charles and the Austrians from Italy, forced the passes of the Alps in March, and pressed on directly for Vienna without waiting for Moreau (q.v.) to coöperate. At Leoben, within one hundred miles of Vienna, he signed preliminaries of peace with Austria on April 18th.

Bonaparte the conqueror began to take wider views of the part he was to play, and played it with a boldness and a skill that dazzled France into complaisancy. He organized the Italian conquests into the Cisalpine Republic and constituted the Genoese dominions into the Ligurian Republic; he sent Augereau as his secret agent to conduct the military operations of the coup d'état of the 18th Fructidor (see FRENCH REVOLUTION); he lived and acted like a monarch in Northern Italy; and finally, disregarding the express orders of the Directors, he negotiated with Austria the Treaty of Campo Formio (October 17, 1797). Austria gave up her former Belgian possessions and Lombardy, and received most of the territories of the extinguished Republic of Venice. Bonaparte now returned to France, but the Directors were afraid of him and sought to rid themselves of him by dispatching him on some out-of-the-way or hazardous enterprise. It was evident to him that a direct attack upon France's one remaining foe, England, could not succeed, and he suggested instead the campaign in Egypt. The Oriental dream was always before his eyes, and throughout life influenced his policy. He saw in India the source of England's power, and he determined to attack India. He negotiated with Tipu Sultan, a determined foe of the English, and, as the easiest route to India was by the Red Sea, he proposed to conquer Egypt as a stepping-stone to India. An expedition was fitted out with the utmost secrecy at Toulon, and on May 19, 1798, he set sail with a large fleet carrying 35,000 men. He stopped on the way to capture Malta. On July 1st he landed in Egypt and occupied Alexandria on the next day. Advancing into the desert, he encountered and defeated the famous Mameluke cavalry in the battle of the Pyramids on July 21st, and three days later entered Cairo. Desaix was detached to conquer Upper Egypt, and Bonaparte devoted himself to consolidate his conquests. On August 1st-2d, however, Nelson destroyed his fleet in Abukir Bay, and Turkey declared war and planned to recover Egypt. Taking the offensive at the beginning of 1799, Bonaparte invaded Syria, captured Jaffa, and laid siege to Acre. Junot fought an engagement with the Turks near Nazareth, and Kléber found himself attacked by thirty thousand of them at the foot of Mount Tabor on April 15th, but was rescued by the opportune arrival of Bonaparte. Returning to Acre, Bonaparte found that he was unable to take the place by storm, and having lost five thousand men in fighting or from the plague, he ordered a retreat. Arriving in Egypt, he met another Turkish force, which had landed near Alexandria, and defeated it on July 25th. News from France told of the infidelity of Josephine, and of the evil plight of France under the decadent Directory, which was being attacked by the newly formed Second Coalition of the Powers of Europe against France. On the night of August 22d-23d, leaving Kléber in command, Bonaparte escaped from Alexandria, and evading the English ships, landed at Fréjus on October 9, 1799.

On reaching Paris he speedily took council with the members of his family and after a scene with Josephine forgave her, though he did not forget her offense. Councils with Talleyrand, Sieyès, and other important men of affairs followed, but most of all with his brother Lucien, who was now president of the Council of Five Hundred. Plans were speedily devised, and on November 9, 1799, the famous coup d'état of the 18th Brumaire took place. The Directory was overthrown, the Council of Five Hundred dispersed, and a provisional government composed of Bonaparte and two of the late Directors, Sieyès and Roger Ducos, installed. Sieyès (q.v.) expected to be the managing head of the new combination, but at the first meeting found that Bonaparte had everything in his own hands. In a few weeks the Provisional Government drew up and promulgated the Constitution of the Year VIII., which, in spite of its elaborate provisions for the Legislature and the other parts of the Government, really intrusted all power to Bonaparte, who became First Consul (December 24, 1799). Having arranged the more important details of the administration and restored internal peace by the pacification of the Vendée, he turned his attention to the military situation. The victory of Masséna at Zurich on September 25-26, 1799, had freed France from the danger of invasion by the Second Coalition, but Italy and Southern Germany were once more in the hands of the Austrians, and Masséna with a French army was shut up in Genoa. Bonaparte suddenly and with the utmost secrecy gathered a new army for the invasion of Italy. Instead of taking the expected course of advancing along the Riviera as in 1796 and raising the siege of Genoa, he took his army, whose existence was unknown to the Austrians, across the Great Saint Bernard Pass and occupied Milan on June 2, 1800. The surprised Austrian General Melas endeavored to gather his forces and save himself. A detachment under Lannes defeated an Austrian detachment at Montebello on June 9th, but on the 14th Bonaparte found himself forced to face the main Austrian army of 31,000 men at Marengo with only 18,000, and with difficulty saved himself from complete defeat. The opportune arrival of Desaix after the battle was really over led to a renewal of the fight, to the astonishment of the Austrians, who were driven from the field. The campaign of Marengo was a masterpiece, but the honors of the victory itself belong to Desaix, who bought it with his life, and to Lannes, Bessières, and the younger Kellermann. Melas evacuated all of Italy west of Mantua, but Austria was not ready to make peace until she had been defeated by Moreau at Hohenlinden (q.v.) on December 3d, and Macdonald had crossed the Splügen and threatened Vienna. Negotiations were then opened between Cobenzl and Joseph Bonaparte, and on February 9, 1801, the Treaty of Lunéville was signed. England was now the only remaining foe of France. England forced the French to evacuate Egypt and captured Malta; while Bonaparte forced Naples and Portugal to abandon the English alliance. The faint-hearted Addington Ministry in England signed preliminaries of peace with France on October 1, 1801, and on March 27, 1802, Cornwallis and Joseph Bonaparte signed the Treaty of Amiens, which gave France complete peace for the first time in ten years. The diplomatic genius of Bonaparte shines brightly in these treaties, which enabled him to make real gains for France such as all the wars of Louis XIV. had failed to obtain. He carefully hid many things in these treaties for future use, which enabled him to appear as the pacificator and reorganizer not only of France, but of Europe, and as the founder of a great colonial empire. Seeds for future war were as carefully sown, which were to bring forth fruit at the appropriate season.

Bonaparte had shown himself the greatest master of the art of war, and one of the shrewdest of diplomats, when at thirty years of age he undertook the duties of a ruler, law-giver, and administrator. His greatness lay in the universality of his genius and in his inordinate capacity for hard work. Further, he was able to command the services of many men of extraordinary ability, and to make their work his own. His reorganization of the Government of France was accomplished in a few months and comprised enough achievements of the first order to have established the enduring fame of several statesmen. This tremendous activity so stirred and inspired his officials that they said "the gigantic entered into our very habits of thought." With Gaudin he reorganized the treasury department, regulated the assessment and collection of the taxes, and organized the Bank of France. With Chaptal he reorganized the local administration with the prefects and subprefects responsible to the central authority, the Council of State. The schism between the Catholic Church and the constitutional clergy was healed and the Catholic Church restored to its old-time place in France, by the negotiation of the Concordat (q.v.) with Pius VII. in 1801. The Lutherans, the Calvinists, and ultimately even the Jews were brought into similarly close relations with the State. The educational system was reconstructed, especially in the matter of secondary schools and of technical education. The work was completed by the establishment in 1808 of the University of France, which comprised the whole teaching force of the Empire. The establishment of the Legion of Honor in May, 1802, provided a means of recognizing services to the State. The greatest triumph was the codification of the laws of France. (See CODE NAPOLÉON.) All these acts revealed Bonaparte as a master workman who deftly joined together in a perfect whole the many parts which numerous craftsmen had wrought out with difficulty in the days of the Revolution.

France had lost her colonial empire in the eighteenth century, and it was the fond hope of Bonaparte that he might restore it and thus rival England in commerce and upon the seas. To this end he began a series of enterprises which embraced every quarter of the globe—North and South America, Africa, India and the East, and Australia. He secured the cession of Louisiana from Spain, and sent an army to recover Haiti, where the blacks had successfully risen against their oppressors. In all these schemes he was checkmated by England, but on the Continent of Europe he was hindered by nothing more serious than protests in reaping the fruit of the wars of the French Revolution. He reconstituted upon the new French lines the Batavian Republic, the Cisalpine Republic (which became the Italian Republic), and the Ligurian Republic (1801-02). He extended the bounds of France, which already had the Rhine, the Pyrenees, and the Alps as her frontiers, by the unjustifiable annexation of Piedmont and Parma in 1802. He was actively concerned in the reorganization of Switzerland and of Germany in 1803. The Treaty of Aranjuez (March 21, 1801) bound Spain to France, while Portugal, the faithful ally of England, was humbled by the Treaty of Badajoz (September 29, 1801).

Bonaparte's colonial schemes were frustrated by yellow fever, which destroyed General Leclerc and his army in Haiti and forced the Consul to sacrifice Louisiana to the United States (1803) and abandon his dream of empire beyond the seas. Pique at this disappointment hastened Bonaparte into the predetermined rupture with England. A *casus belli* was found in the question of Malta, which England refused to surrender in accordance with the terms of the Treaty of Amiens. Mortier occupied Hanover, of which George III. was King. Gen. Gouvion Saint-Cyr was ordered to occupy the Kingdom of Naples, an ally of England, to offset the occupation of Malta. The French army was mobilized in six divisions and stationed along the Channel from Ostend to Brest. War existed from May 16, 1803, but actual hostilities did not begin until over two years later. In the meantime England recalled Pitt to office (May, 1804). Pitt's great service consisted in securing allies and in forming the Third Coalition against France. In this work he was aided by Bonaparte's blunders, the most notable of which was the execution of the Duc d'Enghien (March 21, 1804), in retaliation for the Royalist plots of Pichegru and Georges Cadoudal. On the day of Pitt's return to power, Bonaparte was offered the title of Emperor by the French Senate, and on December 2, 1804, he was crowned Emperor as Napoleon I. at Paris in the presence of Pope Pius VII. On May 26th, 1805, he was crowned at Milan King of Italy. A few days later followed the last of his series of aggressions, which provoked Austria and Russia into the alliance with England, the annexation to France of the Ligurian Republic (June 4). A month later Russia and England signed their alliance against Napoleon, and on August 9th they were secretly joined by Austria. Sweden, Portugal, and Naples were practically, though not formally, parties to this coalition.

For two years Napoleon had been dallying with a scheme for the invasion of England. In the camps along the Channel he had organized, equipped, and drilled his famous Grand Army, composed largely of veterans of the wars of the Revolution, and at Boulogne special preparations had long been under way for an attack upon England. The summer of 1805 seemed the propitious time for the attack, and Napoleon made elaborate dispositions for obtaining naval control of the Channel and for the transportation of an army of 160,000 men from Boulogne to the Kentish coast. The French fleet under Villeneuve, however, was outmanœuvred and outfought by the English under Cornwallis, Calder, and Nelson. By the middle of August, 1805, the scheme had become impossible of execution. Napoleon, however, had foreseen this possibility; his other acts had already provided him with another chance to employ his army, and he had worked out in his mind the plan of his most brilliantly successful campaign, that of Austerlitz. On August 29th the Army of England was officially denominated the Grand Army and divided into seven corps under Bernadotte, Marmont, Davout, Soult, Lannes, Ney, and Augereau, with the cavalry under Murat, and the Imperial Guard under Bessières, in all about 220,000 men under the personal command of the Emperor, with Berthier as chief of staff. War was declared against Austria on September 25th, and the next day the movement of the

Grand Army into Southern Germany began. On the part of Austria, the Archduke Charles, with over 90,000 men, the best general and the largest army, were intrusted with operations in Italy, where 50,000 French troops were under the command of Masséna, while the smaller Austrian army under the command of the Archduke Ferdinand and Mack, the quartermaster general, invaded Bavaria and occupied the untenable line of the Danube and the Iller with headquarters at Ulm. This move left Austria almost bare of troops. Making a feint at repeating Moreau's tactics of 1796 in attempting to turn Mack's left, Napoleon ordered the actual attack to be made on the right. Bernadotte and Marmont occupied Munich, Davout and Soult seized Augsburg, while Ney and Lannes occupied Günzburg and operated to the north of Ulm. Mack made three fruitless attempts to extricate himself, but after defeats at Wertingen, Memmingen, and Elchingen (October 14th), he was forced to capitulate with 33,000 men on October 20th. Though the Archduke Ferdinand escaped, Napoleon's forces were thus able to advance directly to Vienna, which he occupied on November 13th. The Russian forces which had been advancing to support Mack were forced to fall back into Bohemia, where the various divisions were united under the command of Kutusoff and joined by part of the Austrian forces. Napoleon marched northward to meet them, and on December 2d won his greatest victory, Austerlitz. The campaign of Ulm and Austerlitz was won by Napoleon's knowledge of the value of time, the whirlwind rapidity of his movements, and the precision of his combinations. The battle of Austerlitz was won by a masterly use of artillery. The vanquished Emperor Francis I. of Austria humbled himself before Napoleon in the Treaty of Pressburg (December 26th) and consented to large cessions of territory, including the former Venetian dominions, Tyrol (which was given to Bavaria), etc. The overthrow of Austria resulted in the formal dissolution of the old Holy Roman Empire (August 6, 1806).

What Austerlitz was for Napoleon on land, Trafalgar was for England on the sea. After a brief rest at home, Nelson had been ordered out to attack Villeneuve, who with the combined French and Spanish fleets sailed out of Cadiz and met Nelson off Cape Trafalgar. England's greatest sea-fighter won the greatest naval battle of the century, but lost his life (October 21, 1805). After this the French were able to do nothing at sea, and the ports of both France and her allies were generally blockaded by the English fleets. England was undisputed mistress of the seas, while Napoleon began to remake the map of Europe as though he were the undisputed master of the Continent. The most important changes during the year 1806 were the formation under his protection of the Confederation of the Rhine, the establishment of his brother Joseph as King of Naples, and of his brother Louis as King of Holland, and the creation of the Grand Duchy of Berg for his brother-in-law Murat. The death of Pitt (January 23, 1806) led to negotiations between Napoleon and Fox, the new Foreign Secretary. These negotiations, as well as those with Russia, came to naught, and to Napoleon's surprise this failure was coupled with the decision on the part of Frederick William III. of Prussia to make war upon him. Single-handed Prussia undertook to meet Napoleon, who, as soon as he foresaw that war was inevitable, acted with the same vigor as in the previous year. The Prussian army under Prince Hohenlohe-Ingelfingen and Charles William Ferdinand, Duke of Brunswick, was drawn out in a line eighty-five miles in length, extending from Gera westward to the borders of Hesse-Cassel with the bulk at Erfurt. Napoleon left Paris on September 25th and assumed charge of the campaign at Würzburg on October 2d. On the 10th Prince Louis Ferdinand was defeated and slain in a skirmish at Saalfeld; on the 14th Napoleon surprised the Prussian army in its attempt to concentrate, and in person defeated Hohenlohe at Jena, while Davout defeated Brunswick at Auerstädt. Murat and Lannes pursued Hohenlohe and forced him to surrender at Prenzlau (October 28th), while the other remnants of the Prussian army and the fortresses surrendered without a blow. Saxony, which had acted as the ally of Prussia, went over to Napoleon, and later received as reward the Duchy of Warsaw. From the Prussian capital Napoleon issued the Berlin Decree, which, with the Milan Decree of 1807 and other decrees, was directed against English commerce. See CONTINENTAL SYSTEM.

Prussia, though vanquished, continued weakly the struggle in her eastern provinces, where Bennigsen and the Russians were ready to join in the contest. Murat occupied Warsaw, then Prussian territory, in November, 1806. In December Napoleon entered the ancient Polish capital and was greeted as the restorer of Polish liberties. The French having gone into winter quarters, Bennigsen hoped to surprise them and destroy them before they could again take the field, and accordingly attacked Ney and Bernadotte, but their successful resistance defeated the plan and Napoleon in person pursued Bennigsen, who retreated toward Königsberg and overtook him at Eylau (q.v.). The ensuing battle (February 7-8, 1807) was a butchery, not a victory. Napoleon hurried up reënforcements to renew the struggle in the spring. Sebastiani, the French Ambassador at Constantinople, persuaded the Sultan to declare war against Russia. Gardane was sent to stir up Persia to like action. Mortier induced the Swedes to treat with France. The campaign for Königsberg began early in June and was marked by the indecisive action of Heilsberg (June 10) and the defeat, four days later, of the Russians under Bennigsen at Friedland (q.v.). On June 25th the Czar and Napoleon held their famous conference of Tilsit (q.v.) on a raft moored in the Niemen. By the Treaty of Tilsit, Prussia was humbled even more than Austria had been at Pressburg, while the Czar became the ally of Napoleon and began to plan with him the division of the world between them.

Though England, under the Ministry of All the Talents, had behaved very badly toward Prussia and Russia, she remained the one steadfast foe of the French Emperor, and pursued without wavering her policy of opposition to Napoleon. At Tilsit Napoleon bound the Czar to enforce the Continental System against England, and then began the task of compelling all the lesser Powers to adhere to the system. There were to be no neutrals. Portugal, the constant ally of England, was the first victim. By the Treaty of Fontainebleau Napoleon joined with Spain to dismember that kingdom, and in November, 1807, a French army under Junot occupied the country with little trouble, the royal family having already started for the New World to establish a temporary capital at Rio de Janeiro. The year 1808 witnessed the unfolding of Napoleon's designs against Spain. Gradually, in spite of all treaties, French troops were sent across the Pyrenees, where they quietly took possession of various fortresses. Spain was suffering from the family troubles of the Bourbon monarch, and it suited Napoleon's purpose to make use of them and to order the advance of a French army under Murat toward Madrid. This movement precipitated the fall of the Bourbons. Charles IV. was compelled by a popular uprising to abdicate in favor of his son, Ferdinand VII. (March), and a little later father and son, at a meeting with Napoleon at Bayonne, were forced to renounce the Spanish throne. On June 6, 1808, Joseph Bonaparte was proclaimed King of Spain. For an account of the struggle in Spain and Portugal, see PENINSULAR WAR.

In Austria Francis I. had called to office as his chief minister Count Philip Stadion, who, with the aid of Archduke Charles, devoted himself to the task of preparing Austria for another struggle with Napoleon. The misfortunes of Napoleon in Spain and the urgency of England, which offered liberal subsidies and active coöperation, determined the Austrians to try their fortunes once more in the spring of 1809. In April Archduke Charles opened the war by invading Bavaria, while another force under Archduke John invaded Italy. Napoleon reached the scene promptly and in the five days' fighting (April 19th-23d) around Ratisbon completely defeated the Austrian plan of campaign and forced Archduke Charles to retreat toward Vienna, which the victorious Emperor entered on May 13th. He then crossed the Danube and attacked the Archduke, who had taken up strong positions in the villages of Aspern and Essling. Two days of hard fighting (May 21st-22d) failed to give Napoleon any decided advantage, and he found himself and his army practically prisoners on the island of Lobau in the Danube. With his accustomed vigor he ordered up reënforcements and reorganized the troops under him. On July 5th Napoleon left the island of Lobau and on the 6th defeated the Archduke Charles in a great battle at Wagram. On October 14th was signed the Treaty of Schönbrunn (q.v.), by which Austria was forced to make large cessions of territory to the overbearing conqueror. From 1809 to 1812 the main strength of the French Empire was devoted to continuing the struggle in the Peninsula. A number of isolated events in other parts of Europe, however, made the period important. In pursuance of the Treaty of Tilsit, the Czar robbed Sweden of Finland (1808), and in the same year the French seized Swedish Pomerania. The next year the Swedish Kingdom was the scene of a revolution. Gustavus IV. was deposed and his uncle placed on the throne as Charles XIII. Marshal Bernadotte, the brother-in-law of Joseph Bonaparte, was elected heir to the childless monarchy and intrusted with the government of the kingdom. (See CHARLES XIV.) Denmark had likewise been marked to suffer on behalf of Napoleon's Continental System; but in this instance he was forestalled by England, which seized the Danish fleet in September, 1807. After the Treaty of Tilsit a kingdom of Westphalia was carved out for Jerome Bonaparte in Germany, and numerous changes made in the Confederation of the Rhine. Napoleon enlarged his own empire by the annexation of Tuscany (1807), the Papal States (1809), Holland (1810), Valais, and the German coastline to Lübeck (1810). He also kept the Illyrian provinces, which had been wrested from Austria, for himself. Naples was transferred to Murat after the choice of Joseph as King of Spain. Pope Pius VII., the same pontiff who had consecrated Napoleon as Emperor in 1804, was carried away as a prisoner and kept in confinement. The new Cæsar must have an heir to his empire, and accordingly Josephine, to whom the Emperor was greatly attached, was divorced and a marriage arranged in 1810 with the Archduchess Maria Louisa of Austria, daughter of the Emperor Francis, who bore Napoleon one son, the King of Rome (1811). From Napoleon's policy England profited as much as did France. for the whole commerce of the seas was under her control and she had seized the colonies of France and all those of the countries under French control or influence that she saw fit. During the years from 1809 to 1815 England furnished the inspiration and the sinews of war for every campaign against Napoleon, but it was only in the Peninsula that she was directly responsible for the conduct of the campaign, which was carried on with desperation on both sides till the French were driven beyond the Pyrenees in 1814.

For three years after Wagram Napoleon did not in person conduct a single military operation. Family affairs and the administration of his great empire occupied all his attention. During these years many changes were taking place which presaged the downfall of the great conqueror. Austria was very cautiously strengthening her position under the skillful direction of Metternich. The regeneration of Prussia under Stein, Scharnhorst, and Hardenberg is one of the most notable events of the nineteenth century. Russia was never content with the French alliance, and the enforcement of the Continental System was causing great suffering and discontent, and the Czar Alexander was beginning to lose his enthusiastic admiration for Napoleon, who had offended him by concluding a matrimonial alliance with Austria without waiting for an answer to his request for the hand of a grand duchess in marriage, and, most of all, by the annexation of Oldenburg to France. The estrangement was increased by the Cæsarism of Napoleon, who could no longer endure the existence of even a friendly rival. Alexander, duly warned of Napoleon's intentions, turned to England and in 1812 entered into a close alliance with her. With Turkey he negotiated the Peace of Bucharest (May 28th), and with Sweden not only peace, but alliance (April 5th). Napoleon left Paris early in May, and went direct to Dresden, where he took care to bind Prussia, Austria, and the other German States more closely to his cause. Then he entered Poland, where he regulated the internal affairs and supervised the mobilization of his army. On June 22d he issued a declaration of war against Russia. The passage of the Niemen was begun on June 24th, and by the end of the month Napoleon had 400,000 men across the Russian frontier. The Czar had between 250,000 and 300,000 men under arms, but only about one-half of this number ready to face Napoleon under Barclay de Tolly and Bagration, who conducted a Fabian campaign. Napoleon found the country devastated and abandoned as he advanced, with no enemy to make a stand against him. Like Charles XII., a century earlier, he was being lured to his ruin. At Smolensk (August 17th-18th) the French encountered the first serious resistance. Napoleon as he advanced had to leave large bodies of troops along his line of march, and he detached a large force to the northward to capture Mitau and Riga and threaten Saint Petersburg. Russian discontent became pronounced as the people saw Barclay de Tolly and Bagration permitting Napoleon to advance unresisted on their ancient capital, Moscow. The two generals allowed themselves to be superseded by Kutusoff, who chose his ground, and on September 7th offered battle to the French at Borodino (q.v.). It was the bloodiest battle of the century, the losses probably aggregating 40,000 on each side. The loss to Napoleon, who could obtain no reënforcements, was fatal, but still he pressed on and entered Moscow (September 14th) only to find himself robbed of the fruit of victory by the terrible conflagration which broke out two days later. With a folly that seemed madness, Napoleon lingered in the city until October 19th before beginning the retreat. The hard-fought drawn battle of Malo-Yaroslavitz (October 24th) compelled Napoleon to retreat by the same desert road on which he had advanced, instead of by a more southerly route through country not yet devastated by war. Sufferings from the cold and from lack of food were intensified by the constant presence of the Russians on the flanks and in the rear. The expected supplies were not found at Smolensk, and the sufferings of the French reached their terrible climax at the crossing of the Beresina (November 26th-28th), where thousands perished in spite of the heroic efforts of Oudinot and Ney. A week later Napoleon turned over the command to Murat and hastened to reach Paris and organize a new army before the news of the great disaster should become known in Western Europe. Ney, the bravest of the brave, in command of the rear-guard, protected the retreat, but only 20,000 out of the 400,000 who had crossed the Niemen in June recrossed it in December. The disaster, however, was greater than the mere loss of an army of 400,000 men. Napoleon had lost his prestige, and henceforth Castlereagh, the English Foreign Minister, and the Czar Alexander supplanted Napoleon as controllers of the destinies of Europe. The Czar advanced into Eastern Prussia, where he installed as Governor the ex-Minister Stein, who placed himself at the head of a great Prussian patriotic rising against Napoleon. Driven by this outburst of national spirit, Frederick William III. signed an alliance with the Czar at Kalisz (February 27, 1813). Austria, under Metternich, hesitated between Napoleon and Alexander and offered to mediate. Napoleon sent into Germany a new army made up of conscripts and of troops withdrawn from Spain, and on April 29th, at Weimar, assumed the direction of the campaign of 1813, which he had decided to fight on the line of the Elbe, where Eugène de Beauharnais and Davout were struggling to check the Russians and repress the Prussians. Successes at Lützen and Gross-Görschen (May 2d) on the great plain around Leipzig enabled Napoleon to occupy Dresden as his base of operations, and advance to Bautzen, where he defeated the Allies on May 20th-21st.

Napoleon should have followed up this movement with vigor, but he hesitated because of the untrained condition of his army and of the attitude of Austria. Bernadotte, after the Treaty of Stockholm with England (March 3d), had landed at Stralsund, prepared to take an active part in the overthrow of Napoleon, whom he had learned to hate bitterly. Moreau, the only surviving French rival of Napoleon, was summoned from America to act as chief adviser of the Allies. England signed new treaties with Prussia and Russia (June 14th-15th), and the Czar and Metternich signed at Reichenbach (June 27th) a secret treaty, by which Austria bound herself to join the Allies if Napoleon did not accept her proposals before the expiration of the truce, on August 10th. This was equivalent to a treaty of alliance, for it was certain that the Congress of Prague would accomplish nothing. On August 10th the Austrian army under Schwarzenberg began operations in Bohemia in concert with the allied army under Blücher in Silesia. The victory of Wellington at Vittoria (June 21, 1813) encouraged the Allies and made a great victory an absolute necessity to Napoleon, who promptly took the offensive and attempted to force a battle with Blücher near Görlitz and crush him and then turn against Schwarzenberg. Blücher evaded battle and Schwarzenberg advanced to attack Dresden. Napoleon reached Dresden just in time, and on August 26th-27th won his last great victory. (See DRESDEN, BATTLE OF.) For the moment Dresden was saved, but the success was more than offset by the defeats inflicted upon his subordinates. Oudinot at Grossbeeren (August 23d), Macdonald on the Katzbach (August 26th), Vandamme at Kulm (August 29th-30th), and Ney at Dennewitz (September 6th). The losses of Napoleon during the ten days' campaign were almost overwhelming and irretrievable, while reënforcements speedily made good the losses of the Allies. Napoleon failed to appreciate that the line of the Elbe had become untenable from the moment that Austria joined the Allies, and instead of falling back of the Rhine and offering to negotiate, he continued to struggle to hold Dresden. Constant rains and bad roads had been an important factor in the August campaigns and prevented Napoleon, in spite of his boundless energy and activity, from accomplishing anything in September. This failure was fatal, for in October the Allies, who had defined their relations in the Treaty of Toplitz (September 19th), took the offensive and developed their campaign with such skill that Napoleon was completely deceived until they had nearly completed their dispositions. Blücher, unperceived, crept around Napoleon's left, got in touch with Bernadotte, and advanced toward Leipzig from the north, while Schwarzenberg was advancing from the south toward the same place. Napoleon left Gouvion Saint-Cyr to hold Dresden and hurriedly concentrated all available forces to protect Leipzig and hold his lines of communication. For three days (October 16th, 18th, and 19th), 'the Battle of the Nations' raged around Leipzig, and on the last day the French were driven out of Leipzig in a disastrous rout. (See LEIPZIG, BATTLES OF.) Napoleon retreated hastily behind the Rhine, stopping only to destroy, at Hanau (October 30th), the army of Bavaria, which had recently joined the Allies. Napoleon made a serious mistake in leaving able lieutenants with large garrisons to hold the great German fortresses, thus depriving himself of the assistance of Rapp, who held Danzig with 8000 men; Davout, who was shut up in Hamburg with 12,000 men, and many others. These places were besieged and captured by the Allies during the ensuing months, but the bulk of the allied army pressed on toward Paris. Blücher with the Prussians and part of the Russians crossed the Rhine at Caub (December 31st) and began the invasion of France; Schwarzenberg, with the Austrians and the rest of the Russians, entered France by the way of Basel. To meet this double invasion, Napoleon could only muster a small army. This he interposed between Blücher and Schwarzenberg, whom he defeated in turn. Blücher's army was dispersed in the battles of Brienne, Champaubert, Montmirail, and Vauchamps, between January 29th and February 14, 1814, while divisions of Schwarzenberg's army were severely worsted at Nangis (February 17th) and Montereau (February 18th).

This first defensive campaign of 1814 is one of the most brilliant defensive fights in military history. The military genius of Napoleon never shone more brightly, though the dulling of his political sense made his failure inevitable. With a little army of worn out and defeated men, reënforced by a few hastily collected and untrained conscripts, he thrust himself between two vastly superior forces against which he hurled himself alternately with such swiftness, skill, and violence as to shatter the hostile armies and frustrate the plans of the opposing generals. Finally, worn out, he had to succumb to the overwhelming numbers of the foe and to the inseparable obstacles of time and space.

Napoleon, who had refused to accept the proposals of Frankfort submitted by the Allies on November 9, 1813, now sent Caulaincourt to meet their representatives in the Congress of Châtillon (February 3-March 19, 1814), but with instructions to 'sign nothing.' The Allies once more defined their relations to one another in the Treaty of Chaumont (March 1st), brought up new troops, and prepared to crush Napoleon. Napoleon's second defensive campaign of 1814 was a brilliant failure—a stubborn struggle against the inevitable. The first blows were struck at Blücher on March 7th and 9th at Craonne and Laon, but failed to interrupt Blücher's campaign seriously. An attack upon a part of Schwarzenberg's army at Arcis-sur-Aube met with no better success, and so Napoleon turned to the eastward to threaten Schwarzenberg's line of communication. But the great disparity of forces enabled the Allies to neglect this movement and to concentrate on Paris. Schwarzenberg and Blücher arrived before Paris on March 30th, and after hard fighting with Marmont, Mortier, and Moncey, occupied the French capital. The Emperor arrived just a few hours too late to strike a blow in defense of his capital, and could only make an obstinate attempt to renew the struggle south of Paris, but Ney and the other marshals finally forced him to listen to reason (April 4th) and to bring the campaign to a close. In the southwest, Soult had been driven from position to position and was about to lose his last battle at Toulouse. Suchet had withdrawn from Spain too late to help Soult; Augereau at Lyons had failed to disturb Schwarzenberg's left flank. In Italy Murat had deserted to the enemy, negotiated with Austria, and turned the Neapolitan army against Eugène Beauharnais, the Viceroy of Italy, who faithfully and ably faced the triple danger of Murat's treachery, the invasion of the Austrians, and the occupation of Genoa by an English force under Lord William Bentinck. On April 11th Napoleon, the Emperor of the French, formally abdicated at Fontainebleau in favor of his infant son, the King of Rome.

In the stipulations with the Allies, Napoleon was allowed to retain the title and state of Emperor, but was to be detained as a prisoner on the island of Elba. The relations between the newly restored Bourbons and the Allies were settled by the First Treaty of Paris on May 30th. The changes which had taken place in Europe since the outbreak of war in 1792 had been such that the old order could not be restored, and accordingly a Congress of the Powers was summoned to meet at Vienna to make the necessary new arrangements. These were completed on June 9, 1815. But in the meantime Napoleon had left Elba, landed in France on March 1st, made his way to Paris, reëstablished his power, gathered a new army and advanced to attack the Allies, whose representatives at Vienna planned at once to place new armies in the field and overthrow him a second time. (See HUNDRED DAYS.) The campaign, which lasted only a week, included Napoleon's defeat of Blücher at Ligny (q.v.) on June 16th, Ney's fight with Wellington at Quatre-Bras on the same day, and the final overthrow of Napoleon on the field of Waterloo (q.v.) by Wellington and Blücher on June 18, 1815. After this last battle Napoleon fled to Paris, where he abdicated a second time on June 22d. For a few days he hesitated between dreams of again playing a part in France and plans for an escape to America. The first was preposterous, the second impossible, and on July 15th he surrendered himself to Captain Maitland on board the English ship *Bellerophon*. The Allies under Blücher had entered Paris a second time on July 7th and made the final adjustments for the settlement of Europe in the Second Treaty of Paris on November 20th. Napoleon was taken to England, and after some deliberation his request to be permitted to settle in England was refused. He was transferred to the ship *Northumberland* and on October 16th landed on the island of Saint Helena. In his captivity he was accompanied by his faithful friend Bertrand, and by Gourgaud, Montholon, Las Cases, and a number of other individuals of minor importance. In 1816 Sir Hudson Lowe, a British soldier, arrived as Governor of the island. Napoleon's chief occupations as a captive were his quarrels with Lowe, and his monologues with Gourgaud and Montholon, which they wrote out and submitted for correction to the Emperor. These documents form a partial autobiography, valuable not for its facts, but for the light which it sheds upon Napoleon's character. Napoleon gave himself up to long periods of gloom and humored himself in the most inexcusable obstinacies when a more rational behavior would have improved his health and rendered his surroundings more agreeable socially. Cancer of the stomach, which had carried off his father, and which was to cause the death of two of his sisters, was slowly undermining his health, and on May 5, 1821, he breathed his last at the set of sun. He was buried with military honors upon the island, but in accord with his own request, his remains were in 1840 taken from the island, attended by the faithful Bertrand, and under the direction of Louis Philippe placed in a magnificent sarcophagus beneath the Dome of the Hôtel des Invalides in Paris.

John Holland Rose has perhaps given the most correct summary of the qualities which made Napoleon great: "He was superlatively great in all that pertains to government, the quickening of human energies, and the art of war. His greatness lies, not only in the abiding importance of his best undertakings, but still more in the Titanic force that he threw into the inception and accomplishment of all of them—a force which invests the storm-blasted monoliths strewn along the latter portion of his career with a majesty unapproachable by a tamer race of toilers. After all, the verdict of mankind awards the highest distinction, not to prudent mediocrity that shuns the chance of failure and leaves no lasting mark behind, but to the eager soul that grandly dares, mightily achieves, and holds the hearts of millions even amidst his ruin and theirs. Such a wonder-worker was Napoleon. The man who bridled the Revolution and remolded the life of France, who laid broad and deep the foundations of a new life in Italy, Switzerland, and Germany, who rolled the West in on the East in the greatest movement known since the Crusades, and finally drew the yearning thoughts of myriads to that solitary rock in the South Atlantic, must ever stand in the very forefront of the immortals of human story."

Bibliography. An excellent *Life* in English is Rose, *Life of Napoleon I.* (New York, 1901). Of the numerous other works on the life and times of Napoleon, the more important are: Bignon, *Histoire de France sous Napoléon* (14 vols., Paris, 1829-50); Thibaudeau, *Le Consulat et l'Empire* (10 vols., ib., 1834-35); Thiers, **Histoire de la Révolution francaise* (10 vols., ib., 1823-27); **Histoire du Consulat et de l'Empire* (21 vols., ib., 1845-61); Lanfrey, **Histoire de Napoléon* (5 vols., ib., 1869-75), which ends at 1811; Fournier, †*Napoleon I., eine Biographie* (Leipzig, 1886-89). For the early life of Bonaparte: Iung, *Bonaparte et son temps* (Paris, 1880-81), and Chuquet, *La jeunesse de Napoléon* (ib., 1897-99), are the most important. For the personal life of Napoleon, Lévy, *Napoléon intime* (Paris, 1892); Masson, **Napoléon et les femmes* (ib., 1893): *Napoléon et sa famille* (6 vols., ib., 1897-1903); *Napoléon chez lui* (ib., 1893); and *Napoléon inconnu* (ib., 1895), are the most valuable. On the military genius of Napoleon the most accessible are: Ropes, *The First Napoleon* (Boston, 1885) and *Campaign of Waterloo* (New York, 1893); Sargent, *Napoleon Bonaparte's First Campaign* (Chicago, 1894) and *Campaign of Marengo* (ib., 1897); Houssaye, *1814* (Paris, 1888) and *1815* (ib., 1894-99); and York von Wartenburg,*†*Napoleon als Feldherr* (Berlin, 1885-86). For naval affairs: Mahan, *Influence of Sea Power Upon the French Revolution and Empire* (London, 1893). For ecclesiastical affairs: Haussonville, *L'Eglise romaine et le premier empire, 1800-14* (Paris, 1868-70), may be cited. For the relations with the Germanic States the most notable works are Oncken, *Das Zeitalter der Revolution, des Kaiserreichs und der Befreiungskriege* (Berlin, 1884-86); Bailleu, *Preussen und Frankreich, 1795-1807* (Leipzig, 1887); Beer, †*Zehn Jahre österreichischer Politik, 1801-10* (ib., 1887); Wertheimer, *Geschichte Oesterreichs und Ungarns im ersten Jahrzehnt des neunzehnten Jahrhunderts* (ib., 1884-90). For relations with Russia, Bogdanovitch, *Histoire du règne d'Alexandre Ier* (Paris, 1869-71); Tatisheff, *Napoléon et le Tsar Alexandre* (ib., 1891). For relations with Spain, Gomez de Arteche, *Guerra della Independiencia* (1868 et seq.). For relations with Italy, Tivaroni, *Storia critica del risorgimento italiano,* vols. i.-iii. (Turin, 1889-91). For relations with England and the United States, Adams, *History of the United States, 1801-17* (9 vols., New York, 1889-91). For original documents consult the files of the *Moniteur;* the volumes of the *Archives parlementaires; Napoléon I., Correspondance* (32 vols., Paris, 1858-70); and the new volumes of Napoleon's correspondence published recently by Lecestre and by Brotonne. Of great value are many of the writings by and on the contemporaries of Napoleon, such as his marshals, notably Davout, Marmont, and Soult; his ministers, notably Talleyrand, Savary, and Chaptal; his generals and subordinates, espepecially Dumas, Foy, *Jomini, *Marbot, Ségur, *Thiébault, and Vandamme; his brothers Joseph, Lucien, Louis, and Jerome, and his stepson Eugène de Beauharnais; personal attendants like Bourrienne, *Meneval, Las Cases, and Montholon; minor officials and others, notably *Miot de Melito. *Pasquier, Roederer, Ouvrard, Lavalette, Vitrolles, and Mme. de Rémusat. Of great value are also similar works by or on the Prussians, Hardenberg, Stein, Scharnhorst, Gneisenau, and Clausewitz; the Austrians, Metternich, Gentz, and the Archduke Charles; the English, Castlereagh, Canning, Nelson, Wellington, and Napier; and the Russian, Barclay de Tolly.

NAPOLEON II. Son of Napoleon I. See Reichstadt, Duke of.

NAPOLEON III., Charles Louis Napoleon Bonaparte (1808-73). Emperor of the French. He was the third son of Louis Bonaparte, King of Holland, and of Hortense Beauharnais. (See Bonaparte.) The law of succession enacted under the First Empire gave the crown, in default of direct descendants of the Emperor, to the sons of either Joseph or Louis Bonaparte. Joseph being childless, the sons of Louis became heirs apparent of the Napoleonic pretensions. Louis Napoleon was born April 20, 1808, in Paris. He spent his boyhood with his mother at her Château of Arenenberg in Switzerland, and at Augsburg, where he studied in the gymnasium. After the death of the elder of his brothers he returned to France with his mother, but they were expelled by Louis Philippe, went to England, and thence returned to Switzerland. The death of the Duke of Reichstadt (July 22, 1832), only son of the first Napoleon, left Louis Napoleon the representative of his family, and thereafter the restoration of the Napoleonic Empire became his fixed idea. During the next four years his published works kept him before the French people. Among them were: *Réveries politiques; Project de constitution; Deux mots*

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*These are also in English translations.
†These are also in French translations.

à M. de Chateaubriand sur la duchesse de Berri (in verse); and *Considérations politiques et militaires sur la Suisse.* In 1836, believing in the weakness of the July monarchy, he undertook at Strassburg a *coup* which was so absurd a failure that it covered him with ridicule. He was sent to America, but returned to Europe on account of his mother's illness. She died October 3, 1837, and soon afterwards the French Government asked for his expulsion by Switzerland. He went to London, where, in 1838, he published the *Idées Napoléoniennes,* which had considerable circulation in France. In 1840 he made at Boulogne his second attempt to bring about a military uprising in his favor, but this was as complete a failure as its predecessor. He was imprisoned in the fortress of Ham, where he wrote several works, some political articles, and had a share in editing the *Dictionnaire de la conversation.* He escaped from Ham, May 25, 1846, and made his way to the Belgian frontier and thence to England. He hastened back to France when the Revolution of 1848 broke out, but, although he professed devotion to the Provisional Government, he was distrusted and asked to leave the country. Notwithstanding his promise to do this, he obtained an election to the National Assembly for Paris and three other departments. He took his seat on June 13, 1848, but resigned on the 15th, after a stormy debate, and left France. He was, however, elected from five departments in September, and returning became a candidate for the Presidency. He received 5,500,000 votes in the election of December 10, 1848, his closest opponent, General Cavaignac (q.v.), having 1,500,000. He entered upon his office on December 20th. His Presidency was a continuous contest with the majority in the Assembly, who continued to doubt the sincerity of the President's devotion to the Republic. This disturbed condition was ended by the coup d'état of December 2, 1851, a thoroughly Napoleonic stroke, carried out with blunt disregard for law or political honesty, by the President himself, assisted by Morny, Maupas, and Saint-Arnaud. The cost of success was the establishment of a repressive tyranny maintained by military force. France submitted to the new ruler, who promised to restore the glories of the past. On December 20th-21st the President was reëlected for ten years by more than seven million votes, practically without opposition. He had revived the plebiscite, used with such effect by his uncle—a plebiscite so managed that the issue was a foregone conclusion. In the same way, when he had himself proclaimed Emperor, as Napoleon III., just a year after the coup d'état (December 2, 1852), it was made to appear that this also was in accordance with the popular will. The new Emperor had studied his uncle's methods and attempted to imitate him as far as circumstances and his own ability would permit, but he only won for himself the name of Napoleon the Little. He possessed ability, but it was that of the politician rather than of the statesman. He lacked the dash and rapidity of decision which were the chief elements in accomplishing the vast schemes of the first Napoleon. Napoleon III. hesitated in deciding upon a policy and in carrying it out when once determined. Conspiracies against him developed as early as 1853 and three attempts were made to assassinate him, by Pianori and Bellamare in 1855, and by Orsini (q.v.) in 1858.

Napoleon III. was looked upon coldly by the 'legitimate' sovereigns of Europe, but the aim of his foreign policy was to make France again dominant in European affairs and himself the general arbiter of the Continent. To check the similar pretensions of Nicholas I. of Russia in Eastern Europe, he joined England in protecting Turkey against Russian aggression, and France took the leading part in the Crimean War (q.v.). The pacification which followed and the adjustment of the Eastern Question (q.v.) were arranged by a congress at Paris. (See PARIS, CONGRESS OF.) The three Eastern Powers, Russia, Prussia, and Austria, which were the strongholds of legitimacy and autocracy, as against the democracy of France and England, were Napoleon's natural opponents. In the Crimean War he administered a lesson to one of them. By befriending Italy, which under the leadership of Sardinia was struggling to free itself from Austrian oppression, he found an opportunity to strike at Austria and to uphold in the most marked manner his favorite political hobby, the principle of nationalities. He encouraged Cavour (q.v.) in the advocacy of Italy's cause at the Congress of Paris, and though the attempt of Orsini upon the Emperor's life almost destroyed the cordial relations that had been cultivated between the Courts of Paris and Turin, under Cavour's shrewd management the Emperor finally became more friendly than ever. The two held a private conference at Plombières, July 20, 1858, at which Napoleon agreed to support Sardinia in case of an attack by Austria. Cavour at once forced Austria into aggressive action, and Napoleon, now half repentant of his engagement, took the field. The Italian campaign of 1859, in which Napoleon showed himself utterly incapable of military leadership, was marked by two great battles, Magenta and Solferino, won by the Allies. Napoleon then selfishly closed the struggle by the preliminaries of Villafranca. (See CAVOUR and ITALY.) He exacted from Victor Emmanuel the cession of Nice and Savoy, although he had failed to deliver Venetia and the duchies. His later relations with Italy were disturbed by the fact that he felt called upon to uphold the Pope in his temporal possessions, and thus clashed with the national ambition of the Italians for complete unity with Rome as the capital. The protection of French troops was only withdrawn from the Papal States when war with Prussia had begun. During the Civil War in the United States (1861-65) Napoleon took an active part with the English Government in the diplomatic intrigues against the United States. He took advantage of the disturbed condition of Mexican affairs and of the preoccupation of the United States to revive his uncle's dream of a Latin-American empire under French protection, by establishing the Archduke Maximilian on the new imperial throne of Mexico by means of French bayonets. Secretary Seward warned the French Emperor that the Government of the United States could only consider this as an infringement of the Monroe Doctrine and an unfriendly act, but no attention was paid to this protest until the termination of the Civil War made it possible to send General Sheridan with an army of seasoned troops to the Mexican frontier, when the French troops were removed and the unstable Mexican Empire collapsed (1867). This struck a great blow at the prestige of the Emperor. In 1863-64, when the Schleswig-Holstein (q.v.) question engaged the attention of the Powers, Napoleon refused to aid Denmark in her fight for the duchies and advocated the recognition of the principle of nationalities through the union of the German portion of the duchies to Germany. On the eve of the war of 1866 Napoleon entered into negotiations with both Prussia and Austria, with respect to an alliance, but he was foiled by Bismarck's diplomacy and the swift issue of the Seven Weeks' War (q.v.) revealed to Napoleon a new military power under masterful guidance, threatening his schemes for European control. Austria ceded Venetia to Napoleon with the understanding that it was to be made over to Italy. This was his last appearance in the rôle of an arbiter in the affairs of Europe.

The internal history of the Empire divides itself into two periods, that of the autocratic and that of the liberal Empire. Napoleon, the man of progressive and liberal ideas, believed that a permanent political edifice could be erected only by the exercise of absolute power. At the outset he brought under his own control the finances and public enterprises; public liberty was restricted, and a thorough system of police espionage was organized. Napoleon married, January 30, 1853, Eugénie de Montijo, a young Spanish countess, and gratified his own ambitions and her tastes with a brilliant, extravagant, and frivolous court. The Empress Eugénie's influence was always exerted in the interest of the Ultramontane Party. In these days of his absolute power Napoleon pushed public improvements with great energy. Philanthropic institutions were multiplied in France; industrial development was encouraged; and an era of great material prosperity followed, degenerating into one of speculation and luxurious living in which were the seeds of decadence. Railroads and highways were constructed and lines of steamships were established and subsidized. Canals were built and harbors improved. Manufactures, agriculture, and forestry were all fostered by the State. Stock companies were created, and the *crédit foncier* and the *crédit mobilier* stimulated these enterprises with financial support. Paris, under the Prefect Haussmann, was transformed. As early as the exposition of 1855 Paris was able to show a new city to its visitors, and at the brilliant exposition of 1867 this development was still more marked. Politically, there were three parties in opposition—Legitimists, Orleanists, and Republicans. Of these the Legitimists were almost lost sight of, with the exception of a few irreconcilable leaders. The Orleanists were stronger in numbers and in the quality of their adherents, and gave the Emperor more anxiety. The great literary leaders were found in their camp, and the French Academy was their stronghold. The really active opposition, however, lay with the Republicans. None of these parties had any legal means of expression or action. In 1858, after the Orsini attempt, the General Security Act was forced through the Corps Législatif, giving the Government power to exile or transport without trial any person convicted of a political offense. Wholesale arrests were made under this act for the purpose of intimidating the Republicans. Having alienated the Ultramontanes, upon whose support he had hitherto depended, by the Italian War, Napoleon relaxed some of his repressive measures to gain the support of the Liberals. In 1859 an amnesty decree allowed the return of the exiles of 1851. This was followed by a grant of more freedom of action to the Corps Législatif. The commercial treaty of 1860 with England abolished the prohibitions and lowered many of the high protective duties which had formed a part of the Emperor's commercial system. The restrictions upon the freedom of the press were partially removed. A Liberal opposition now began to organize through a coalition of the opposition parties, and after 1863 there was real parliamentary activity in France. A section known as Liberal Imperialists supported the Emperor, but opposed his reactionary ministers. The Ministry, headed by Rouher, and with Drouyn de Lhuys in charge of foreign affairs, favored a vigorous attitude of opposition to Prussia. The Emperor was broken in health, and after the Prussian triumph over Austria had demoralized his plans and left him discredited with his own ministers, he turned for support to the constitutionalists in the Corps Législatif. The liberties of that body and of the press were much extended, and the right to hold public political meetings was conceded. In 1869 a responsible Ministry was granted.

In 1870 the following proposition was submitted to a plebiscite: "The French nation approves the liberal reforms made in the Constitution since 1860, and ratifies the Senatorial decree of April 20, 1870." This was opposed by the Republicans, but was carried by a vote of 7,000,000 to 1,500,000. This popular support of the Imperial régime was apparent rather than real. Notwithstanding temporary coalitions, the different parties were still irreconcilable. The autocratic and war party, which had voted in the affirmative on the plebiscite, came again into power in the Corps Législatif, with the Duke of Grammont in charge of foreign affairs. Partly compelled by the diplomacy of Bismarck, and partly actuated by their own aims, the Ministry brought on the war with Prussia, much against the will of the Emperor. (See FRANCO-GERMAN WAR.) The Emperor went to the front, leaving the Empress as Regent, and she constituted a Ministry of the war party under General Palikao. Napoleon was captured at Sedan (September 2, 1870), and on the 4th of September was taken to the Castle of Wilhelmshöhe, near Cassel. In the wild confusion that attended the news of defeat in Paris and the declaration of the Republic, the Empress fled from the city and went to England, taking up her residence at Chiselhurst, Kent, where she was joined by Napoleon in 1871, after the conclusion of peace. He resided there until his death, January 9, 1873.

Napoleon and Eugénie had one child, a son, Eugène Louis Jean Joseph, Prince Imperial of France, born March 16, 1856. See NAPOLEON, EUGÈNE LOUIS JEAN JOSEPH.

A collection of Napoleon's own works was published in five volumes (Paris, 1869). Many of them, including the *History of Julius Cæsar* and *Napoleonic Ideas*, have been translated into English. The *Posthumous Works and Unpublished Autographs of Napoleon III. in Exile* were edited by De la Chapelle and published in 1873. English works on Napoleon III. are those of Forbes (London, 1898); Jerrold (London, 1874); and Frazer (London, 1895). In translation are the works of Imbert de Saint Amand, *Louis Napoleon and Mlle. de Montijo* (Eng. trans. New York, 1897), *Napoleon III. and His Court* (ib., 1898), and *The Court of the Second Empire* (ib., 1898). The leading comprehensive histories of the Second Empire are: De la Gorce, *Histoire du second empire* (4 vols., Paris, 1885-98), which partially supersedes the earlier work by Taxile Delord, *Histoire du second empire* (6 vols., Paris, 1869-76). Consult, also, Thirria, *Napoleon III. avant l'empire* (Paris, 1895); Villefranche, *Napoleon III.* (ib., 1897); Gottschalk, *Napoleon III., eine biographische Studie* (1871); Von Sybel, *Napoleon III.* (1873); Simson, *Die Beziehungen Napoleons III. zu Preussen und Deutschland* (1882); Murdock, *Reconstruction of Europe* (Boston, 1891); Victor Hugo, *Histoire d'un crime* (1877); and id., *Napoleon le petit* (1852).

NAPOLEON, Eugène Louis Jean Joseph (1856-79). The only son of Napoleon III. of France; better known as the Prince Imperial. He was born in the Tuileries in Paris, March 16, 1856. At the outbreak of the Franco-German War of 1870-71 he accompanied his father to the front and was first under fire at Saarbrücken. When the war began to go against the Imperial arms, however, he was sent to England, where he joined his mother after her flight from Paris. Upon the death of his father he took the title of Count of Pierrefonds. In 1874 he reached his majority and was proclaimed as Napoleon IV. by his adherents. Five years later, in order to arouse enthusiasm on his behalf among his countrymen, he joined a British expedition against the Zulus, and while reconnoitring was ambushed and killed (June 1, 1879). Consult: Barlee, *Life of Napoleon, Prince Imperial of France* (London, 1880); Hérisson, *Le prince impérial* (Paris, 1890); and Martinet, *Le prince impérial* (ib., 1895).

NAPOLEON, Joseph Charles Paul, Prince (1822-91). A son of Jerome Bonaparte. See Bonaparte.

NAPOLEON GUN. See Artillery.

NAPOLÉON LE PETIT, l*e* pe-tē′ (Fr., Napoleon the Little). A violent satirical attack on Louis Napoleon by Victor Hugo, written at Brussels in 1852.

NAPOLEON'S TOMB. The magnificent burial place of Napoleon Bonaparte is under the dome of the Invalides, Paris. It was constructed by Visconti and has the form of a circular crypt 20 feet deep and 36 in diameter, open at the top. On the granite walls are ten marble reliefs by Simart. The mosaic pavement, representing a laurel wreath, bears the names of various battles. In the middle rises the red granite sarcophagus, 13 feet long, 6½ wide, and 14½ high, cut from a single block weighing 67 tons, surrounded by 12 victories by Pradier. Above the entrance to the crypt is a sentence from Napoleon's will: "I desire that my ashes shall rest on the banks of the Seine, in the midst of the French people that I have loved so well." On one side is the sarcophagus of the Emperor's friend Duroc, who fell at Bautzen in 1813, on the other that of his faithful companion Bertrand, who shared his captivity. Napoleon's remains were brought from Saint Helena to their present burial place by the Prince de Joinville in 1840.

NAPOLÉON-VENDÉE, väN′dā′. A former name of Roche-sur-Yon (q.v.). A town of France.

NARA, nä′rȧ. The capital of a prefecture of the same name on the island of Hondo, Japan, situated 25 miles by rail southeast of Osaka (Map: Japan, D 6). It was the capital of Japan from 709 to 784. The most interesting temples are the Kasuga, situated in a magnificent park; the Todai-ji with its huge bell, over 13 feet high and more than 9 feet in diameter, and the gigantic statue of Buddha over 53 feet high; and the Kobuku-ji with the modern statues of Brahma and Indra. Of great archæological value is the storehouse in which specimens of articles used in the Imperial household for over a thousand years have been preserved. The local museum is also of considerable archæological interest. The principal manufactures of Nara are Indian ink, fans, and modern toys. Population, in 1898, 30,539.

NARAKA, nä′rȧ-kȧ (Skt., hell). The hell of the Hindus. The doctrine of a place for the bad, though not necessarily a place of torment, is as old as the Veda. This region was one of bottomless darkness beneath the earth. The faith of the Brahmanic period and of the Upanishads had the same belief, and the descriptions of hell-torments became fully developed later. Manu enumerates 21 hells, and gives a general description of the tortures which await the impious there. The Puranas, however, are more systematic. The Vishnu-Purana, for instance, not only names 28 such hells, but distinctly assigns each of them to a particular class of sinners. Besides these hells which the Purana knew by name, there were countless others. Buddhism shares with Brahmanism in the later doctrine of hell-torment and the grades of hell. Consult: Scherman, *Materialien zur Geschichte der indischen Visionslitteratur* (Leipzig, 1892); Hopkins, *Religions of India* (Boston, 1895).

NARBADA, nŭr-bŭd′ȧ. A river of India. See Nerbudda.

NARBONNE, när′bŭn′ (Lat. *Narbo*). A town in the Department of Aude, in Southern France, situated six miles from the Mediterranean, and 93 miles by rail southeast of Toulouse (Map: France, J 8). The streets of this formerly important city present a poor appearance, relieved only by those of the attractive new but small quarter. The Church of Saint Just was in olden times the cathedral. It is an imposing though uncompleted structure, begun in the Middle Ages, and exhibiting many of the most daring ideas of the Gothic. Its choir is 131 feet high; the towers rise 194 feet. The Gothic Hôtel de Dieu is a creation of Viollet-le-Duc. There is a good museum, containing chiefly paintings and ceramics. Narbonne has a hydrographical school and a seminary. Its industries include coopering and distilling establishments. It produces verdigris, candles, tiles, pottery, dyes, and leather. It deals in wine, grain, oil, salt, and sulphur. Its honey is famous, and its red wine is peculiar to the district. It has a Chamber of Agriculture and an œnological station, the latter established in 1894. The town is on a branch of the important Canal du Midi. About 11 miles to the south is the port La Nouvelle, at the end of the Narbonne Canal. It is the harbor for Narbonne, and has some manufactories. Population of Narbonne, in 1901, 28,852, a decrease of 700 since 1891. Narbo became Roman in B.C. 116. It was at the time one of the leading ports of the Mediterranean, and well known for its beauty and attractions as a city. It was the capital of the Provincia Romana, and later of Gallia Narbonensis. In the fifth century it passed under the sway of the Visigoths. About 720 it fell into the hands of the Saracens, from whom it passed into the possession of the Franks in 759. The Viscounts of Narbonne became hereditary feudatories of the French Crown in 1080. In 1447 Viscount William III. sold Narbonne to the House of Foix, and 60 years later the fief was united with the French Crown. Late in the Middle Ages the harbor of Narbonne became practically filled up and the town began to decline.

NARBROUGH, Sir JOHN (1640-88). An English admiral and explorer. In 1670 he made a notable voyage through the Straits of Magellan and up the Chilean coast. He was knighted and made rear-admiral in 1673, and the following year he sailed to the Mediterranean, where he distinguished himself by scattering the pirates of Tripoli and Algiers. In 1687 he sailed to the West Indies in command of a squadron, and he died there of fever while superintending the investigation of a sunken treasure ship, and was buried at sea off Santo Domingo.

NARCIS′SUS (Lat., from Gk. Νάρκισσος, *Narkissos,* from νάρκη, *narkē*, torpor). According to Ovid, the son of the river-god Cephissus and of the nymph Liriope of Thespiæ, in Bœotia. He was a youth of extraordinary beauty, but refused all suitors. They prayed to Nemesis for vengeance, and she caused Narcissus to see his own image in a forest spring. Enamored of this, he pined away in hopeless love beside the stream. From his body sprang the flower Narcissus. The story, which seems to be of Alexandrian origin, is told with variations by other late Greek and Roman writers. The bronze statuette in Naples, commonly called Narcissus, really represents the youthful Dionysus.

NARCISSUS. A genus of beautiful bulbous plants of the natural order Amaryllidaceæ, with narrow leaves and usually white or yellow flowers. The species are natives of Southern Europe, Northern Africa, and the temperate parts of Asia. Many are cultivated in gardens for the sake of their beautiful and often fragrant flowers, which in general appear early in the season. Some of them are known by the names of daffodil and jonquil. The different species are naturally separated into two divisions, those bearing but one flower on a scape and those bearing more than one. The poet's narcissus (*Narcissus poeticus*) is perhaps the best known and most popular species. It is a hardy plant and bears white fragrant flowers. The jonquil (*Narcissus Jonquilla*) bears from two to five very fragrant golden yellow blossoms on a scape. This species is employed in the manufacture of perfumes. *Narcissus Tazetta* is the narcissus of the ancient Greeks and Romans, and is now largely grown as a forcing-house plant. There are numerous varieties of this species with white, yellow, single, and double flowers. *Narcissus Pseudo-Narcissus* is commonly called daffodil or trumpet daffodil. The plants are ordinarily propagated by offset bulbs which are produced on the bulb. These usually flower the second year after planting. See Colored Plate of AMARYLLIDACEÆ.

POET'S NARCISSUS (*Narcissus poeticus*).

NARCOT′ICS (Gk. ναρκοτικός, *narkotikos,* benumbing, from ναρκοῦν, *narkoun,* to benumb, from νάρκη, *narke,* torpor; connected with OHG. *snerhan,* to draw together, AS. *snear,* Eng. *snare*). Remedies which, in moderate doses, lessen the action of the nervous system. Their full operation is sleep or coma. Opium is the type from which most descriptions of this class of medicines have been drawn; but although most narcotics more or less resemble opium in their action, almost every one presents some peculiarity in the way in which it affects the system. These medicines are primarily stimulating, especially when given in small or moderate doses; but this stage of their action is comparatively short, and when the dose is large the excitement is scarcely perceptible. Their power of inducing sleep has procured for them the names of hypnotics and soporifics; while many of them are termed anodynes, from their possessing the property of alleviating pain. Next to opium and the general anæsthetics, hyoscyamus, Indian hemp, and chloral may be regarded as the most important narcotics. Of late years a number of coal-tar derivatives have been introduced, such as sulphonal, trional, acetanilid, and phenacetine, which are taking the place, to some extent, of the older remedies.

It has been already mentioned that there are differences in the mode of operation of the different members of this class. Alcohol, for example, in sufficient doses produces intoxication; belladonna, delirium; opium contracts the pupil of the eye; hyoscyamus dilates it. Each drug affects the organism in its own peculiar way, and it is impossible to give a general description of their minor actions.

Narcotics are usually administered either with the view of inducing sleep or of alleviating pain or spasm. As, however, their action is much modified by a variety of circumstances—such as age, idiosyncrasy, and prolonged use—they should be administered with extreme caution, and, as a general rule, only under competent advice. The various quack medicines for children which are known as *carminatives, soothing syrups*, etc., contain some form of opium, and are a fertile cause of the great mortality that occurs in early life, especially among the poorer classes.

NAR′COTINE, $C_{22}H_{23}NO_7$. One of the organic bases or alkaloids occurring in opium, in which it usually exists in the proportion of 6 to 8 per cent. It is nearly insoluble in water, and but sparingly soluble in alcohol and ether, but dissolves readily in chloroform. Narcotine possesses very slight alkaline properties; its salts do not readily crystallize, and are even more bitter than those of morphine, although the substance itself is almost tasteless. See Alkaloids.

NARD. A fragrant plant. See Spikenard.

NARDÒ, när-dō′ (Lat. *Neretum*). A town in the Province of Lecce, Italy, 34 miles south by east of Brindisi (Map: Italy, N 7). It is the see of a bishop, has a cathedral and an old castle, and manufactures woolen goods and tobacco. The surrounding country abounds in olive plantations and vineyards. Population (commune), in 1881, 10,683; in 1901, 14,387.

NAR′DUS (Lat., nard, from Gk. νάρδος, from Pers. *nard*, from Skt. *nalada*, Indian spikenard). A genus of one species of grass (*Nardus stricta*), often called mat-grass, a purplish perennial growing in tufts characteristic of dry elevated situations in Europe, Australia, etc. It has little or no feeding value.

NARES, nârz, Sir George Strong (1831—). A British Arctic explorer, born at Danestown, Scotland. He entered the navy in 1846, and went with Mecham on the *Resolute* in the Arctic expedition of 1852. In 1872-74 he commanded the famous *Challenger* expedition, engaged in deep-sea exploration. In 1875, in command of the splendidly equipped *Alert* and *Discovery*, he set out on a Polar expedition, and proceeding up Smith Sound, he reached with the *Alert* the parallel of 82° 27′, the farthest north any ship had then gone. Markham, his lieutenant, on sledges went in 1876 as far as 83° 20′, another record at the time. In 1878 Nares surveyed Magellan Straits and many parts of the Pacific. He served in the Harbor Department of the Board of Trade (1879-96), and in 1892 became vice-admiral. He wrote: *Reports on Ocean Soundings and Temperature* (1874-75); *Official Report of the Arctic Expedition* (1876); and *Narrative of a Voyage to the Polar Sea* (1878).

NARES, Robert (1753-1829). An English philologist, born at York. After studying at Christ Church, Oxford, he took orders, and from 1798 until his death was Canon of Lichfield. As critic, essayist, and theologian he held a high rank among the writers of his time. With the Rev. William Beloe he founded the *British Critic* in 1793, and he published: *Elements of Orthoëpy* (1784); *Chronological View of the Prophecies Relating to the Christian Church* (1805); and *A Glossary of Words, Phrases, Names, and Allusions in the Works of English Authors* (1822), which is by far his most important work, contains many excellent criticisms of the text of Shakespeare, and is valuable for all of the Elizabethan literature.

NAREW, nä′rĕv. A river of West Russia, rising in the Government of Grodno. It flows westward, forming part of the boundary of Poland, and joins the Bug 19 miles north of Warsaw. Its length is 271 miles, 212 of which are navigable. The Augustowo Canal connects it with the Niemen.

NARIÑO, ná-rē′nyô, Antonio (1765-1823). A Colombian politician, born in Bogotá. In 1795, on account of his republican views, he was deported to Spain, whence he escaped to France and England. In 1797 he returned to New Granada. In the War of Independence, Nariño took a prominent part as leader of the Centralist Party and withstood the attacks of the Federalists on Bogotá. He had now become dictator and turned his attention to the Spanish forces in the south, by whom he was defeated and captured in 1814. After five years' imprisonment in Spain he returned to Colombia, was acquitted of a charge of embezzlement and malfeasance, and appointed Vice-President by Bolivar.

NARNI, när′nē. A town in the Province of Perugia, Italy, on the Nera, 45 miles north of Rome by rail (Map: Italy, G 5). Ruins of a massive marble bridge built by Augustus and of a very ancient aqueduct are still to be seen. Narni has been the seat of a bishopric since 360. The Cathedral of Saint Juvenalis dates from the thirteenth century. Other buildings of interest are the castle, now used as a prison, and the town hall with a finely sculptured façade. Narni, the ancient *Nequinum*, was colonized by the Romans about B.C. 300. The Emperor Nerva was born here. Population (commune), in 1881, 11,671; in 1901, 12,725.

NARO, nä′rō. A town in the Province of Girgenti, Sicily, situated at an altitude of 1945 feet, 12 miles east of Girgenti (Map: Italy, H 10). It has a sixteenth-century castle of the Chiaramonti, and remains of catacombs, grottoes, aqueducts, and other antiquities. The brimstone pits in the vicinity yield large quantities of sulphur. Population (commune), in 1881, 10,395; in 1901, 12,866.

NAR′RAGAN′SET. A former leading Algonquian tribe of New England, occupying most of the territory along the western shore of the bay of the same name, in Rhode Island, and claiming dominion over several smaller tribes of the interior and the islands, including Long Island. They seem to have been of more ancient occupancy than the neighboring Mohegan and Pequot. They escaped the pestilence which had desolated the southern New England coast in 1617, and being joined by many of the fugitive survivors, soon became a strong tribe, so that it is certain that they numbered several thousands when first known to the whites. They befriended Roger Williams, and through his influence refused to join in the Pequot War. In King Philip's War the Narraganset took a leading part under their chief Canonicus. In the celebrated 'Swamp Fight' they lost nearly 1000 in killed and prisoners. Canonicus himself was killed soon afterwards. Those who surrendered at the close of the war were settled among their former tributaries, the Niantic (q.v.), the whole body thenceforth being known as Narraganset. They were assigned a tract of land near Charlestown, on the southwestern coast of Rhode Island, where they have gradually decreased by emigration and decay, until they are now reduced to a mongrel remnant of mixed Indian, negro, and Portuguese blood.

NARRAGANSETT BAY. An inlet of the Atlantic Ocean, extending into Rhode Island (Map: Rhode Island, C 3). It is 28 miles long, from 3 to 12 miles broad, and receives the waters of several small rivers, the principal one being the Providence. It contains a number of islands of which Rhode Island, Prudence, and Conanicut are the largest. At the head of the bay lies the city of Providence, and Newport is situated at its entrance.

NARRAGANSETT PIER. A noted watering place in Washington County, R. I., nine miles from Kingston Station, where a branch line connects with the New York, New Haven and Hartford Railroad (Map: Rhode Island, C 4). It is delightfully situated near the mouth of Narragansett Bay, and has a fine beach and splendid drives. Among other attractions of the resort are its scenery, Narragansett Heights in particular commanding an extended view, and the beautifully colored rocks in the vicinity, which are picturesque also in form. There are a number of handsome summer residences and many hotels. Population (Narragansett District), in 1890, 1408; in 1900, 1523. The first settler came to this neighborhood about 1675, and in 1815 the pier from which the place takes its name was built. It was not until after 1876, when a railroad was completed to this point, that 'The Pier' became a favorite summer resort. Near by in December, 1675, General Winslow, at the head of 1000 colonists, defeated the Narraganset Indians, of whom 300 were killed and about 600 captured, while the whites lost 80 killed and 150 wounded.

NARRENSCHIFF, när′ren-shĭf, Das (Ger., The Ship of Fools). The most celebrated work of Sebastian Brant (q.v.).

NARSES, när′sēs (?-568). A celebrated eunuch statesman and general of the Byzantine Empire. He was an Armenian by birth, and was probably sold as a slave in childhood. He rose by successive steps to the post of grand chamberlain to the Emperor Justinian. In 532 he aided in suppressing the 'Nika' rebellion (q.v.). In 538 he was sent to Italy to act in concert with Belisarius (q.v.) in the war against the Goths. After gaining some successes, Narses came into conflict with Belisarius and was recalled to Constantinople in 539. After Belisarius had been recalled, Narses was appointed to the chief command in Italy. Near Tagina in 552, after a desperate engagement, the Goths were totally defeated, and their King, Totila, slain. In the following year Teja (q.v.) was defeated near Sorrento. Narses took possession of Rome, and completely extinguished the Gothic power in Italy. He was appointed exarch of Italy in 553. He fixed his court at Ravenna, and continued till the death of Justinian in 565 to administer the affairs of Italy with vigor and ability. The only blot on the character of his administration is the avarice with which he is charged by his contemporaries. His exactions pressed heavily on the exhausted resources of the population, though their severity may be in some degree palliated by the splendor and utility of the public works on which he partly expended the public resources. The Romans, on the accession of Justin, complained of the exactions of Narses, and that Emperor is said to have deprived him of his office. He is accused of secretly intriguing with Alboin, King of the Lombards, to incite a new invasion of Italy, at the same time submissively offering his services to the Emperor for the purpose of repelling the invasion. This account, however, seems improbable; and as Narses died at Rome in 568, just on the eve of the Lombard invasion, no light is thrown upon this story by the actual events of the war. Consult: Bury, *Later Roman Empire*, vol. i. (London and New York, 1889); Hodgkin, *Italy and Her Invaders*, vols. iv. and v. (Oxford, 1885 and 1895); Gibbon, *Decline and Fall*, edited by Bury (London, 1896-1900). See Goths; Justinian.

NAR′THEX (Lat., from Gk. νάρθηξ, *narthēx*, casket, a sort of tall, hollow-stalked, pithy, umbelliferous plant). A part of Early Christian and mediæval churches, situated at the opposite end from the altar and choir, and either just inside or outside the entrance and façade. It had in most cases the same width as the entire church (nave and aisles), but was usually rather short. The term is used especially of Byzantine architecture, the corresponding part in the West being usually called portico or porch. There were two main divisions: (1) the *inner* narthex, which was an integral portion of the interior, within the main façade, and (2) the *outer* narthex, a closed porch attached to the outside of the façade, or with a separate façade.

NARUSZEWICZ, nä′rōō-shā′vĭch, Adam Stanislaw (1733-96.) A Polish historian and poet, born at Pinsk, Lithuania. He joined the Jesuits in 1748, and was sent by them to France to complete his education. On his return he became professor of Latin at the Vilna Academy. A second journey through France, Germany, and Italy secured for him the directorship of the Collegium Nobilium at Warsaw. Prince Czartoryski introduced him to King Stanislas Augustus, and the two became inseparable. After the suppression of the Jesuit Order, he became bishop, first, of Smolensk, and then of Lutsk. He died at Janow, Galicia. His chief work, the *History of the Polish Nation* (1780-86, new ed., 1859-60), was the first scientific treatise of its kind. It is the result of a critical collation of original documents in the Polish archives, and deals with the period previous to 1386. A democrat in his ideals, he aimed in his history to warn his countrymen against their narrow-minded egotism and the lawlessness and arbitrariness of the nobility. He also wrote a *Life of Chodkiewicz* (q.v., new ed., Warsaw, 1805), and a *History of the Crimea* (1787). The *Idylls* (highly sentimental) and *Satires* are the best known of his poetic productions, collected as *Lyrica* (Warsaw, 1778, and repeatedly).

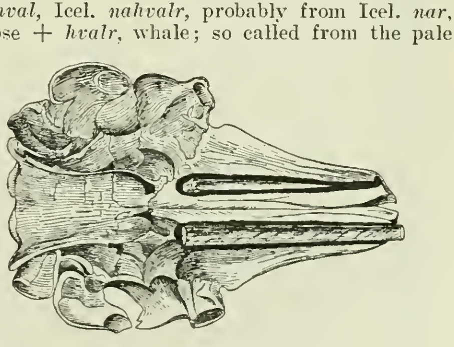
NARVA, när′vȧ. A town in the Government of Saint Petersburg, Russia, situated on the river Narova, about 100 miles west-southwest of Saint Petersburg (Map: Russia, C 3). The cathedral (formerly a Lutheran church) contains a fine collection of crosses and crucifixes. The town has a seventeenth-century town hall, an old castle, two gymnasia, a theatre, and a number of technical schools attached to the extensive cotton and woolen mills in the vicinity. There is a considerable trade in cotton and lumber. Population, in 1897, 16,577—Germans, Esths, and Russians. The town was founded by the Danes in the thirteenth century, and, after being held for a short time by the Russians, passed to Sweden in 1581. Here, on November 30, 1700, an army of about 40,000 Russians under Peter the Great was completely defeated by some 8000 Swedes under Charles XII. In 1704 Peter the Great made himself master of the town.

NARVACÁN, när′vȧ-kän′. A town of Northern Luzon, Philippines, in the Province of Ilocos Sur. It is situated on the main road, and on the proposed northern railroad, a short distance from the coast and about 13 miles southeast of Vigan. It has a population of 16,500, being next to the capital the largest town of the province.

NARVAEZ, när-vä′āth, PÁNFILO DE (1470?-1528). A Spanish soldier and 'conquistador.' He was born in Valladolid, and came to America about 1498, and became lieutenant to the Governor of Cuba, Velasquez. In 1520 Narvaez was sent with a body of soldiers to reduce Cortés, then in Mexico, to submission. Landing at San Juan de Ulua, he was surprised one dark night (May, 1520), and seized in his camp by a party under Cortés himself, who then persuaded the soldiers to join in the conquest of Mexico. After about two years of imprisonment at Vera Cruz, Narvaez was permitted to return to Spain. There he secured permission to conquer and govern the territory from Florida to the Rio de Palmas, which is now known as the Rio Grande. He sailed from San Lucas, June 17, 1527, with a fleet carrying six hundred colonists and soldiers, priests, and negro slaves, with a few women. Stopping at Santo Domingo for horses and supplies, about a quarter of his men deserted in order to join in the exodus toward Mexico and Peru. Thence he went to Santiago de Cuba, where he passed the winter, and toward the end of February or early in March, 1528, he finally started toward Florida. After many mischances, on April 14th he anchored near a bay which he named Bahia de la Cruz, and which has been identified with Apalachee Bay and Tampa Bay. Finding little hereabouts to justify settlement, on May 1st the company, now numbering three hundred, started to march through the country, while the vessels were to follow the shore as far as the harbor of Panuco. Hopelessly misled by Indian guides, lost in the tangled morasses, hungry and footsore, helpless against the harrying, pestering attacks of unseen natives, the Spaniards struggled along across the country until September 22d, when, at a point named by Narvaez Bahia de Cavallos, two hundred and forty survivors embarked in five boats which they had built with such rude tools as could be fashioned from their weapons. They followed the coast until (October 31st) they reached the mouth of a mighty river, whose stream carried them out to sea. This was the Mississippi. Here two of the boats, in one of which was Narvaez, disappeared. The others made their way toward the shore, but a storm separated them once more. Only one reached the land. For the fate of the survivors, see NUÑEZ CABEZA DE VACA, ALVAR.

NARVAEZ, RAMÓN MARIA, Duke of Valencia (1800-68). A Spanish general and statesman, born at Loja, in Andalusia. In early youth he fought in the war of liberation against the French. In 1822 Narvaez acted with the Liberals and contributed to the suppression of the revolt in the Royal Guards. He withdrew to Loja in 1823 upon the triumph of the Reactionary Party, and lived there in retirement until the death of Ferdinand VII. in 1833. He was engaged in the Basque provinces in 1834, then commanded a division under Espartero, and in November, 1836, routed the Carlist leader, Gomez, near Arcos. He won popularity in these campaigns, and was regarded as the rival of Espartero (q.v.). In 1838, by acts of great severity, he cleared the District of La Mancha of brigands, and was appointed, in 1840, Captain-General of Old Castile, and general-in-chief of the army of reserve. He took part in the insurrection against Espartero that broke out at Seville in 1840, but was compelled to flee to France. He succeeded in 1843 in bringing about the overthrow of the Government of Espartero, and was made president of the Council and created Duke of Valencia in 1844. He entered upon a thoroughly reactionary policy and revised the Liberal Constitution of 1837. Petty insurrections broke out, which the rigorous soldier-statesman repressed with an iron hand. But his dictatorial manners alienated even his personal friends, and his Ministry was overthrown (February 10, 1846). After serving as special Ambassador at the French Court, he returned to power in 1847, but soon afterwards quarreled with Queen Christina, and retired from office in 1851. In 1856, on the overthrow of the O'Donnell Ministry, he again became president of the Council. Intrigues of the Court compelled his resignation in 1857. Once more in power in 1864, he was succeeded in the following year by O'Donnell, with whom he suppressed, in 1866, a military revolt in Madrid. He supplanted O'Donnell in the same year, and, despite the efforts of O'Donnell and Prim, retained power until his death, April 23, 1868. See Mazade, *Les révolutions d'Espagne* (Paris, 1869).

NARWHAL, när′wal (from Swed., Dan. *narhval*, Icel. *nahvalr*, probably from Icel. *nar*, corpse + *hvalr*, whale; so called from the pale color of the skin). A cetacean of the family Belugidæ, resembling the white whale in form and in the want of a dorsal fin, but remarkably characterized by having no teeth at all, except



SKULL OF NARWHAL.

The lower jaw has been removed, and the view is of the roof of the mouth, which has been partly cut away to show the deep insertion of the root of the tusk (on the left-hand side) and the abortive tooth on the right-hand side of the upper jaw.

two in the upper jaw, supposed to be canines, one and occasionally both of which (in the male) develop into spirally twisted straight tusks, passing through the upper lip, and projecting like horns in front. When, as usually, only one is so produced, it is always the left one. Only one species is known (*Monodon monoceros*), of Arctic seas, where narwhals are often seen in great numbers among the ice-fields, and in the creeks and bays, always active and playful. A mature narwhal is generally about 15 feet in length, besides the tusk, which is from 6 to 10 feet long. The tusk is hollow nearly to the point, and is spirally grooved. Its use is rather conjectured than known; it is probably a weapon of defense, but it may also be used for breaking thin ice in order to breathe, and for killing fish. The remains of skates and other flatfish have been found in the stomach of a narwhal, and it is not easy to imagine how a toothless animal, with rather small lips, could capture and swallow such prey unless the formidable tusk were first employed. Cephalopod mollusks, however, are believed to constitute a principal part of the food. The narwhal is pursued by the Eskimos for food, and for the sake of its blubber, with which the whole body is invested to the thickness of about three inches, weighing nearly half a ton and yielding a large amount of excellent oil. The tusks are also valuable, as they are denser, harder, and whiter than ivory. The kings of Denmark have long possessed a magnificent throne of this material, preserved in the Castle of Rosenberg. Great medicinal virtues were formerly ascribed to the tusks. The animal has been called the 'sea-unicorn.'

NASALS (from Lat. *nasus*, nose; connected with Skt. *nāsa*, OChurch Slav. *nosŭ*, Lith. *nosis*, OPrus. *nozy*, OHG. *nasa*, Ger. *Nase*, AS. *nosu*, Eng. *nose*). A name given to sounds, as *m*, *n*, whose quality is affected by the deflection of the breath from the oral to the nasal passages. The voice is made to pass through the nose by lowering the soft palate and sometimes by closing the oral passage.

NAS'BY, Petroleum V(esuvius). The pseudonym of the American humorist David Ross Locke (q.v.).

NASCENT STATE (from Lat. *nascens*, pres. part. of *nasci*, to be born), *status nascendi*. The state in which a chemical element exists at the instant of its liberation from a compound. The reacting capacity of an element in the nascent state is far greater than in the ordinary state, i.e. some time after it has been liberated. For example, in the gaseous state hydrogen has no action upon ordinary aldehyde; but when sodium amalgam is brought in contact with an aqueous solution of aldehyde, the latter combines directly with the nascent hydrogen, yielding ordinary alcohol. According to most authors, nascent hydrogen is made up of single atoms, while gaseous hydrogen is made up of molecules, each of which consists of two atoms. Others believe that nascent hydrogen is nothing but highly compressed gaseous hydrogen; for, as a matter of fact, it has been shown that highly compressed hydrogen is capable of acting in many respects like nascent hydrogen, and it can also be shown that hydrogen is chemically liberated with considerable pressure. Similar remarks apply also to other elements in the nascent state.

NASCIMENTO, näs'sê-män'tô, Manoel do (1734-1819). A Portuguese poet and a secular priest. He was summoned to appear before the Inquisition because of certain heterodox practices. He fled to Holland and then to France, where he spent the rest of his life. While still in Portugal Nascimento formed with some seceders from the Arcadia a counter poetical academy (the *Grupo da Ribeira das Naos*), whose members observed the Arcadian system of taking pseudonyms, so that he is known as *Niceno* and *Filinto Elysio*. At Paris (1817-19) and at Lisbon (1836-40) there appeared two separate editions of his *Obras completas*, neither of which is really complete. Consult Pereira da Silva, *Filinto Elysio e sua epoca* (Rio, 1891).

NASCOPI, nȧ-skō'pê. The most northeasterly tribe of the Algonquian stock (q.v.), occupying the interior highland region of Quebec and Labrador, northward almost to Ungava Bay. They are closely allied by intermarriage with the Montagnais (q.v.), and trade at the same stations along the Saint Lawrence. They depend entirely upon hunting and fishing for subsistence, and are still but little changed from their primitive condition. They are supposed to number altogether about 3200 souls.

NASEBY, nāz'bĭ. A parish of Northamptonshire, England, 12 miles east by north of Rugby. Population, under 750. It gives its name to the decisive action of the Civil War between Charles I. and the Parliamentary army under Fairfax and Cromwell, which took place here, June 14, 1645. It resulted in the total defeat of the Royalists, the King being compelled to flee, after losing his cannon and baggage, and nearly 5000 of his army as prisoners.

NASH, Abner (1716-86). An American official, brother of Gen. Francis Nash (q.v.). He was born in Prince Edward County, Va., but removed to North Carolina, was admitted to the bar, and gained a large practice. He represented Newbern in the First Provincial Congress in 1774, and the next year was a member of the Provincial Council. He was a member of the body which framed the State Constitution in 1776, and was the Speaker of the first House of Commons the next year. In 1780 he was elected the second Governor of the State. His administration was stormy, as the Legislature gave most of his powers to a board of war, and he served but one year. In 1782 and 1785 he represented Jones County in the Legislature, and was elected by that body a delegate to the Continental Congress in 1782-84 and 1785-86.

NASH, Francis (1720-77). An American soldier, born in Prince Edward County, Va. At an early age he removed to Orange County, N. C. In 1771 he served as a captain under Governor Tryon in the campaign against the Regulators (q.v.). He was a member of the Assembly in 1771, and from 1773 to 1775. He was also a member of the Provincial Congress of 1775, and by it was commissioned lieutenant-colonel of the First North Carolina Regiment in September, and promoted to be colonel, April 22, 1776. This regiment became a part of the Continental line, and in February, 1777, he was made brigadier-general. At Germantown his brigade, which was intended to form part of the reserve, participated in some of the hottest fighting of the day. General Nash was mortally wounded by a cannon ball, and was buried at Kulpsville.

NASH, Sir JOHN (1752-1835). An English architect. He was born in London, and was a pupil of Sir Robert Taylor. After qualifying as an architect, he spent many years in building speculations, and did not, until 1792, return to London and architecture, in which he speedily rose to eminence. He designed numerous mansion-houses for the nobility and gentry in England and Ireland, but he is chiefly celebrated in connection with the great street improvements in London, especially in the Marylebone region, which he helped to transform into Regent's Park. Regent Street, Haymarket Theatre, Langham Place Church, Park Square, and the terraces in Regent's Park are specimens of his designs. The pavilion at Brighton is another of his works. He died at East Cowes, Isle of Wight, May 13, 1835. Nash, notwithstanding his many defects, possessed great power of effective grouping, as may be seen in Buckingham Palace.

NASH, JOSEPH (1809-78). An English water-color painter and lithographer, born at Great Marlow, Buckinghamshire. He is principally known by his water-colors and lithographs, illustrating late Gothic architecture and domestic interiors. His publications include *Architecture of the Middle Ages* (1838) and *Mansions of England in the Olden Time* (1839-49). He also did some views of Windsor Castle. There are sketches by him in the Victoria and Albert Museum, South Kensington.

NASH, RICHARD (1674-1762). An English society leader, better known as 'Beau Nash;' born at Swansea. In 1692 he entered Jesus College, Oxford, but he left before finishing his course, and after a very brief career in the army, entered as a student of law at the Inner Temple in 1693. There he quickly became conspicuous for his good manners, his taste in dress, and his high living. His income being insufficient to meet his demands, he eked it out by gambling and by performing for large wagers such *risqué* exploits as riding naked through a village on a cow. It was the former occupation that in 1705 took him to Bath, then newly become a fashionable watering place. Here was his opportunity. Bath was then a rude little village filled to overflowing with fashionable people who were compelled to pay extravagant rates for miserable lodgings, whose only dancing place was the bowling green, and whose card and tea rooms were canvas tents. Nash set himself to change all this, and in a short time he had succeeded not only in building an assembly house, in procuring decent lodgings, and in reducing the insolent sedan-chair men to humility, but also in making himself the social autocrat of the place. He drew up a set of rules which were enforced on high and low; he practically abolished dueling, and he even assumed the duty of improving the country roads in the neighborhood. During these years his income, principally derived from his partnership in gambling houses and his own skill as a gamester, was large, and he lived in a style befitting 'the King of Bath.' But in 1740 gambling came under the ban of the law, and though Nash managed for a time to evade yielding obedience, new regulations in 1745 left him practically without resources. In this plight, the town, which owed so much to him, came to his rescue with a pension of £10 a month, and on this he lived until his death. Nash owed but little of his popularity to physical attraction, for, according to Goldsmith, he was large and clumsy, and his features were "harsh, strong, and peculiarly irregular." But he did have "assiduity, flattery, fine cloths, and as much wit as the ladies he addressed." Consult Goldsmith, *Life of Richard Nash* (London, 1762).

NASH, THOMAS (1567-1601). An English pamphleteer, born at Lowestoft, Suffolk, in 1567. He graduated B.A. from Saint John's College, Cambridge, in 1586; traveled in France and Italy; settled in London as an author in 1588; and died obscurely in 1601. His first publication was a sharp review of the state of letters, prefixed to Greene's *Menaphon* (1589). It was followed by a pamphlet in similar vein entitled *Anatomy of Absurdities* (1589). Nash now entered the Martin Mar-Prelate controversy (q.v.), writing abusive satires on the Puritans. He also violently attacked Gabriel Harvey in *Have With You to Saffron Walden* (1596). Of more general interest are his satirical sketches of contemporary manners: *Pierce Penniless, His Supplications to the Devil* (1592); *The Terrors of the Night* (1594); *Lenten Stuff* (1599); and the picaresque novel called *The Unfortunate Traveler, or Jack Wilton* (1594). This last work was the sternest piece of realism that had yet appeared in English fiction. Nash also wrote a comedy entitled *Summer's Last Will and Testament* (printed 1600), and had a hand with Marlowe in *The Tragedy of Queen Dido* (printed 1594). Nash was given to outright speech and sarcastic mirth. He was well read and avowed himself the disciple of Pietro Aretino (q.v.). He also knew Brant's *Narrenschiff* and the works of Rabelais, as well as English poets, such as Surrey and Spenser. Izaak Walton aptly described Nash as "the master of a scoffing, satirical, and merry pen." Consult his *Complete Works*, ed. by Grosart (6 vols., London, 1883-85).

NASHUA, năsh'ṳ̇-ȧ. An important manufacturing city and one of the county-seats of Hillsboro County, N. H., 40 miles northwest of Boston, Mass.; on the Nashua River, near its junction with the Merrimac, and on several divisions of the Boston and Maine Railroad (Map: New Hampshire, J 10). It has a public library, a United States Fish Hatchery, and Saint Francis Xavier Church (Roman Catholic), one of the finest church edifices in the State. A canal, 3 miles long, 60 feet wide, and 8 feet deep, leading from the Nashua River, furnishes excellent water power for large cotton mills. The manufactures include iron and steel, stationary engines, edge tools, furniture, cotton goods, cards and glazed paper, shoes, refrigerators, ice-cream freezers, registers, sash, doors, and blinds, kits and caskets, boxes, saddlery and hardware, shears and clippers, etc. The government is administered, under the original charter of incorporation (1853), by a mayor, chosen every two years, and a bicameral council, which elects the majority of municipal officers. The school board is independently elected on a general ticket by the people. Population, in 1890, 19,311; in 1900, 23,898. Settled in 1655, Nashua was incorporated as the township of Dunstable by Massachusetts in 1673, was reincorporated by

New Hampshire in 1746, received its present name in 1836, and was chartered as a city in 1853. Consult Parker, *History of the City of Nashua, N. H.* (Nashua, 1897).

NASH'VILLE. A city and the county-seat of Washington County, Ill., 49 miles southeast of Saint Louis, Mo.; on the Louisville and Nashville and the Illinois Southern railroads (Map: Illinois, C 5). It is surrounded by a district interested chiefly in farming, cattle-raising, and coal-mining, and has large flour mills and a coal mine. Population, in 1890, 2084; in 1900, 2184.

NASHVILLE. The capital of Tennessee, and next to Memphis its largest city, and the county-seat of Davidson County, 233 miles east-northeast of Memphis and 186 miles south by west of Louisville, Ky.; on the Cumberland River (mainly on the left bank), and on the Louisville and Nashville and the Nashville, Chattanooga and Saint Louis railroads (Map: Tennessee, E 4). It has an area of about 9½ square miles, and is regularly laid out on gradually rising ground, which reaches an elevation of 550 feet above sea level. Macadam is very largely used in the pavement of streets, about 190 miles being laid with this material. There are a number of handsome structures. The State Capitol, situated on a hill, cost $1,500,000 and is the most imposing building in the city. The grounds contain the tomb of James K. Polk and a statue of Andrew Jackson. Among other notable public edifices are the United States Government building, the court-house, the city hall, the Tennessee School for the Blind, the State penitentiary, and the 'Parthenon.' The Tennessee Industrial School is in Nashville, and about six miles away is the State lunatic asylum. The Hermitage, of historic interest as the home of Andrew Jackson, is some ten miles distant to the east. The national cemetery, a short distance north of the city, has 16,643 graves, 4711 of unknown dead.

Nashville is one of the most prominent educational centres in the South. It is the seat of Vanderbilt University (q.v.); University of Nashville (q.v.), with the Peabody Normal College; Central Tennessee College (Methodist Episcopal), opened in 1866 (colored); Fisk University (q.v.) (colored); Roger Williams University (Baptist), opened in 1865 (colored); Boscobel College for women, opened in 1889; and Ward Seminary for women (Presbyterian), opened in 1865. There are also the medical and dental departments of the University of Tennessee, and numerous secondary institutions, among which are Belmont College and Saint Cecilia's Academy. The State library comprises 40,000 volumes; and Watkins Institute, the repository of the collections of the State Historical Society, has the Howard Library of 10,000 volumes. Nashville is the leading industrial city in the State, its manufactures, according to the census of 1900, having an aggregate capital of $13,173,000, and a production valued at $18,470,000. First in importance is the manufacture of flour and grist-mill products, the city being the chief centre of this industry in Tennessee. Next in rank are lumber and timber products. There are also extensive manufactories of fertilizers, cotton goods, clothing, saddlery and harness, confectionery, tobacco, soap and candles, foundry and machine-shop products, carriages and wagons, etc. Nashville controls a large trade in lumber, cotton, grain, and manufactured goods, and, as the distributing centre for a considerable area, has important wholesale interests in groceries, dry goods, drugs, boots and shoes, etc.

The government, under the charter of 1883, last revised in 1901, is vested in a mayor, elected every two years, and a unicameral council, which confirms the mayor's nominations of boiler inspector and of the boards of education and health. It elects the other administrative officers excepting the city attorney, comptroller, treasurer, tax assessor, city judge, and board of public works, these being chosen by popular vote. Nashville spends annually in maintenance and operation about $1,000,000, the principal items of expenditure being: for schools, $200,000; for interest on debt, $167,000; for the police department (including police courts, jails, etc.), $95,000; for the fire department, $92,000; and for the water-works, $60,000. The water-works are owned by the municipality and were built in 1832. The system now comprises about 80 miles of mains and cost more than $2,000,000. Population, in 1830, 5566; in 1850, 10,165; in 1860, 16,988; in 1870, 25,865; in 1880, 43,350; in 1890, 76,168; in 1900, 80,865, including 3037 persons of foreign birth, and 30,044 of negro descent.

Nashville was first settled in 1780 by a company of pioneers led by James Robertson, and in honor of Governor Abner Nash of North Carolina, was called Nashborough until 1784, when it was incorporated as a town under its present name. Throughout its early years the settlement was almost continually harassed by the Indians, and on April 2, 1783, a large body of Cherokees made a determined but unsuccessful attack. Nashville was chartered as a city in 1806, was the seat of the State Legislature in 1812-15 and again from 1826 to 1843, and became the permanent State capital in 1843. It was occupied by a Federal army in 1862, and in 1864 was the scene of a hotly contested battle. (See NASHVILLE, BATTLE OF.) The centennial of the admission of Tennessee into the Union was celebrated at Nashville in 1896, and the event was further commemorated by a grand exposition opened on May 1, 1897. Many well-known men, including Andrew Jackson, James K. Polk, Gen. Sam Houston, and Thomas H. Benton, made Nashville their home for the whole or a part of their lives. Consult Powell (editor), *Historic Towns of the Southern States* (New York, 1900).

NASHVILLE, BATTLE OF. A battle of the Civil War in America, fought south of Nashville, Tenn., December 15 and 16, 1864, between a Federal army under Gen. George H. Thomas and the Army of the Tennessee under Gen. John B. Hood.

When General Hood evacuated Atlanta early in September he moved west into Alabama, hoping to draw General Sherman after him and carry the war back into Tennessee. General Sherman, however, sent General Thomas and a part of his army to oppose General Hood, while he undertook the 'March to the Sea.' General Thomas proceeded to Nashville and assembled the Fourth Corps of the Army of the Cumberland under General Wood, the Twenty-third Corps, Army of the Ohio, under General Schofield, the First and Third Divisions, Army of the Tennessee, under Gen. A. J. Smith, a provisional division including two brigades of colored troops under Gen.

J. B. Steedman, and the cavalry corps under Gen. James H. Wilson, about 55,000 in all. General Hood advancing northward into Tennessee was repulsed at Franklin, November 30th, by General Schofield, who at once retired within the intrenchments at Nashville. On December 2d General Hood appeared before Nashville and offered battle. General Thomas, feeling that his army was not sufficiently unified, delayed, though ordered to fight at once by the authorities at Washington. On December 15th he advanced from his intrenchments. The cavalry was placed upon the right of a great curve, the Sixteenth Corps next, the Fourth Corps was the centre and the pivot, the Twenty-third Corps, as a reserve, was to the left, and the Provisional Division was at the extreme left. General Steedman attacked Cheatham's corps on the Confederate right, but was repulsed; but Gen. S. D. Lee in the centre and General Stewart on the left were driven back and some unfinished works captured. Late in the day General Schofield with the Twenty-third Corps was moved to the Federal right. During the night General Hood formed Cheatham's corps on the left. No change was made in the Federal arrangement. On the morning of December 16th the Fourth Corps made an unsuccessful attack on Overton's Hill on the Confederate right, but Cleburne's old division was transferred from the left to strengthen the right. General McArthur, of the Sixteenth Corps, assaulted General Bate's division on the Confederate left, and pierced the line. At this moment some of Hatch's cavalry, which had made a long detour, attacked the Confederate rear and soon the retreat became a rout along the whole line. General Forrest with the Confederate cavalry came up and covered the rear. General Hood with the fragments of his army retreated across the Tennessee River, and on January 14, 1865, asked to be relieved from the command. The Federal troops actually engaged numbered about 45,000; the Confederate about 25,000. The Federal forces lost in killed, wounded, and missing 3057. The Confederate losses in killed and wounded were not given, but 4462 were taken prisoners. Consult: Hood, *Advance and Retreat* (New Orleans, 1880); Johnson and Buel (ed.), *Battles and Leaders of the Civil War* (New York, 1887); and Cox, *March to Sea* (New York, 1882).

NASHVILLE, UNIVERSITY OF. An educational institution at Nashville, Tenn., chartered as Davidson Academy in 1785 by the State of North Carolina, and as Cumberland College in 1806 by the State of Tennessee. In 1826 the name was changed to the University of Nashville, and it became in time one of the leading colleges of the Southwest. During the Civil War the institution was closed. In 1875 the trustees of the Peabody Fund and of the university united in establishing a school for the training of teachers. (See PEABODY NORMAL COLLEGE.) The university has a collegiate department with an attendance in 1902 of 577, a medical school with 310 students, and a preparatory department (Montgomery Bell Academy and Winthrop Model School) with 303 students. The faculty numbered 65. The library contained 16,000 volumes. The college buildings and campus of 16 acres were valued at $200,000; the endowment was $106,000, and the gross income was $80,000. At the same time the total value of the university property was $325,000.

NASIK, nä'sĭk, or **NASSICK.** The capital of a district of Bombay, British India, on the Godavari River, 95 miles northeast of Bombay (Map: India, B 5). Owing to its proximity to Trimbak, 19 miles distant, the source of the sacred Godavari, Nasik is one of the holy towns of India, and rivals Benares as a place of pilgrimage. It is the chief seat of Brahmanism in the Deccan. The town is built on both sides of the river, the portion on the right bank divided into the old and new town, being spread over three hills; Panchwati, the quarter on the left bank, contains the principal features of interest. The river is lined with temples, shrines, and ghats for devotional ablutions. Nasik is the chief seat of the copper and brass industry in the province, and is noted for its artistic productions; it has also manufactures of cotton and paper. Four and a half miles to the south are the celebrated Lena Caves, situated in a conical hill, about 450 feet from its base. They were excavated probably in the second or third century A.D., and contain several rudely sculptured figures, the leading ones representing Buddha. The town is the Nasica of Ptolemy. It was long the capital of a Mahratta principality. Population, in 1891, 24,429; in 1901, 21,490.

NASMYTH, nā'smĭth, JAMES (1808-90). A Scotch engineer and inventor. He was born at Edinburgh, where he received his education at the high school, the school of arts, and the university. As a youth he was an expert mechanic and constructed models of steam-engines and other machinery. In 1829 he became assistant to Henry Maudsley, a London engineer, from whom he derived much useful knowledge and experience. In 1834 he began the manufacture of machine tools at Manchester, where his business rapidly increased and developed into the well-known Bridgewater Foundry. In 1839 he invented the steam hammer, which he improved from time to time. He was also the inventor of many important machine tools, including a hydraulic punch and a steam pile-driver, and he was the first to propose the use of a submerged chain for towing boats on rivers and canals, and of chilled cast-iron shot. In addition to his work as a mechanical engineer he was much interested in astronomy and made many observations with reflecting telescopes which were constructed and mounted according to his ideas. His astronomical work includes investigations of the surface of the sun and moon, which form the subjects of several papers, which were published in elaborate form. Consult *James Nasmyth: An Autobiography*, edited by Smiles (London, 1861-62).

NASR ED-DIN, näsr ĕd-dēn' (1829-96). A Shah of Persia. On the death of his father, Mohammed Mirza, September 10, 1848, he ascended the throne. At his accession he found the country in confusion, but by the aid of his Vizier, Mirza Taki Khan, he established himself firmly, and proceeded to carry out numerous reforms. These plans were unfortunately interrupted by the new Vizier, who was an enemy of all progress. Against the Turkomans and other neighboring peoples Nasr ed-Din was successful, but in 1871 the English put a stop to whatever thoughts of further conquest he may have entertained by defining the boundaries between Persia and Afghanistan. The Shah made three tours of Europe, in 1873, 1878, and 1889. Nasr ed-Din introduced many reforms into his kingdom, and his long reign of forty-eight years has but one serious blot on it, the persecution of the Babis. He was assassinated in 1896, and was succeeded by his son, Muzaffar ed-Din.

NASS, näs (properly Nasqa, corruptly Nishgar). A group of tribes related to the Chimesyan, but speaking a distinct language, residing on the Nass River and the adjacent territory in Northwestern British Columbia. They are a maritime people, and their culture is that of the other peoples of the Northwest coast. Their population is 800, in seven villages. Morally and intellectually the Nass are steadily improving, but in numbers they are barely holding their own. About one-half are reported as Christianized.

NASSAU, *Ger. pron.* näs′sou. Formerly a German duchy, now a part of the Prussian Province of Hesse-Nassau (q.v.). The districts now known by the name of Nassau were anciently occupied by the Alemanni (q.v.). They subsequently became a part of the Frankish realm. After the partition of the Carolingian Empire in the Treaty of Verdun (843) the present Nassau was a part of the Kingdom of Germany and was included in the Duchy of Franconia. About 1100 the Count of Laurenburg built the Castle of Nassau, from which his descendant Walram I. took the title of Count of Nassau about 1160. In the middle of the thirteenth century Walram's two grandsons, Walram II. and Otho, became the founders of two separate lines, ruling respectively in the southern and the northern parts of the country. The descendants of Walram II. continued to rule in Nassau until 1866. His son Adolphus was King of Germany from 1292 to 1298. His later descendants established several separate lines, but by the successive extinction of other branches the Nassau-Weilburg family was left as the sole representative in 1816. In 1806 the territories of the line of Nassau-Usingen had been erected into a duchy. In 1835 Nassau joined the Zollverein. Duke Adolphus of Nassau (1839-66) had many difficulties with his subjects, who chafed under his conservative tendencies. He sided with Austria against Prussia in 1866, with the result that Prussia took possession of Nassau. (See Germany.) In 1890 the Grand Duchy of Luxemburg passed to the Duke of Nassau.

The younger line of Nassau was founded by Otho I. (died about 1292), who in the division with his brother received the northern part of the country. From this line have sprung the Stadtholders and royal sovereigns of Holland. This junior branch of the House of Nassau acquired possession in 1544 of the Principality of Orange in the person of William the Silent, the great leader of the Dutch in their struggle for independence, who assumed the title of Prince of Orange. With the death of William III. of England and Holland in 1702 Orange passed out of the House of Nassau, but the princely title derived from the little State was retained by his successors, and the reigning dynasty in the Netherlands is still styled the House of Orange. Consult Schliephake, *Geschichte von Nassau* (7 vols., Wiesbaden, 1864).

NASSAU, năs′sa̤. The capital of the Bahama Islands, situated near the eastern end of the island of New Providence (Map: West Indies, J 2). Owing to its salubrious climate, Nassau is a winter resort for invalids, chiefly from the United States. The town is well laid out, has handsome public buildings, a cathedral, and the only good harbor in the Bahamas. The people are engaged in agriculture, and carry on considerable trade in cotton, fruit, sponges, and salt. Population, 11,000, chiefly negroes. Founded by the English in the seventeenth century, Nassau was destroyed by the French and Spaniards in 1703, but was rebuilt fifteen years later. In 1740 it was made a fortified port, open to free trade.

NASSAU, näs′sou, Joan Maurits van, Count of Nassau-Siegen (1604-79). A Dutch soldier and governor. He early distinguished himself in the service of Holland at the sieges of Breda (1625) and Maastricht (1632). From 1636 to 1642 he was Governor of the Dutch possessions in Brazil. Under his rule the colony was notably prosperous. He defeated the Spanish and Portuguese fleets in 1640, and continued to attack these powers with varying success, until his return to Holland. In 1647 he was made Governor of Cleves, and as Ambassador from Brandenburg arranged the treaty of 1661 with England. Placed at the head of the army of the Netherlands, he repulsed the Bishop of Münster (1665). In 1671 he became field-marshal, took an active part in the war against Louis XIV. in the Spanish Netherlands, and was made Governor of Utrecht (1674).

NASSE, näs′se, Erwin (1829-90). A German economist, one of the most prominent representatives of the 'Socialism of the Chair.' He was born and educated at Bonn, and became professor there in 1860. From 1869 to 1879 he was a member of the Prussian Lower House, and in 1889 was appointed to the House of Peers. One of the founders of the Verein für Socialpolitik, he was its president from its institution until his death. His writings, which were marked by unusual clarity of style, include: *Ueber das preussische Steuersystem* (1861); *Die preussische Bank* (1866); *Ueber die mittelalterliche Feldgemeinschaft in England* (1869; trans. by Ouvry, 1871); and *Agrarische Zustände in England* (1884).

NAS′SICK. A town of India. See Nasik.

NAST, Thomas (1840-1902). An American illustrator. He was born at Landau, Bavaria. His parents emigrated to America in 1846, and when only fourteen years of age he was employed as a draughtsman on *Frank Leslie's Illustrated Newspaper*. He went to England in 1860 and then traveled to Italy to follow Garibaldi, making sketches of the war, which appeared in the *New York Illustrated News*, the *Illustrated London News*, and *Le Monde Illustré*. Returning to America, he formed a connection with *Harper's Weekly*, which was continued for many years. In 1862 his drawings of scenes from the American Civil War, published in Harper's periodicals, attracted wide attention. His caricatures of public men were pointed and severe, and he in his drawings did as much probably as any verbal vituperation of the newspapers to break up the corrupt Tweed 'ring.' He started the publication of *Nast's Illustrated Almanac* in

1872, and illustrated *The Tribute Book*, Nasby's *Swinging 'round the Cerkle*, and other works, including Dickens's *Pickwick Papers* and *Pictures from Italy*. He was also a clever painter in oil and water colors, remarkable for quickness of conception and facility of execution. Though he was not as good a draughtsman as the great French caricaturists, his pictures are fine examples of strong realism. Among his chief oil paintings are: "The Departure of the Seventh Regiment" (1861); "The Civil War;" "The Last Drip." In 1894 he was called to the *Pall Mall Magazine*, London. On May 1, 1902, he was appointed as consul-general to Guyaquil, Ecuador, where he died on December 7th of the same year.

NASTURTIUM. See CRESS, TROPÆOLUM.

NA'SUA. See COATI.

NATAL, nȧ-täl'. A colony of Great Britain on the southeast coast of Africa, bounded by the Transvaal Colony, Portuguese East Africa, the Indian Ocean, Cape Colony, Basutoland, and the Orange River Colony (Map: Orange River Colony, G 8). Its area, including Zululand and the portion of Transvaal annexed in 1902, is 31,307 square miles.

TOPOGRAPHY. Natal occupies a part of the seaward slope of the great South African plateau, which falls in a series of terraced escarpments running parallel with the coast around the southern end of the continent from the mouth of the Orange on the west to that of the Limpopo on the east. The ranges culminate in the Drakensberg (q.v.), which forms the natural boundary of the great inland plateau. The average height of the Drakensberg is 9000 feet, and its highest point in Natal, the Montagne aux Sources, has an altitude of 11,155 feet. Below the last ridge of the escarpment is a low coastal plain which widens northward, where it contains a series of large, shallow lagoons, of which the largest is Lake Saint Lucia, 55 miles long and 10 miles wide. Natal is watered by numerous permanent rivers of great volume, but, owing to the enormous fall of 8000 to 9000 feet in less than 300 miles, they are all violent mountain torrents falling in a series of cataracts to the sea. The largest is the Tugela.

CLIMATE. The warm Mozambique current flowing along the southeast coast of Africa gives off considerable amounts of moisture, which is blown up the mountain slopes, giving the whole of Natal a sufficient rainfall. The annual precipitation along the coast is about 44 inches, while in the elevated interior it is much heavier. In regard to temperature, Natal presents a series of climatic zones, from the subtropical coastal region with a mean temperature of 68° to the frigid highland region. The former, however, is tempered by cool southeast storms, and the latter by the hot winds from the interior.

FLORA. The flora is characterized in general by richness and variety. In the coastal region we find the tropical euphorbias, bamboo, cotton, indigo, sugar-cane, coffee, fig, and cocoanut; in the middle zone the common European cereals, fruits, and vegetables flourish, while higher up are good pasture-lands.

FAUNA. Nearly all the large wild animals which formerly overran the country have disappeared. Snakes are still found near the coast, including the python, the puff-adder, and the venomous cobra.

MINERALS. There are extensive coal measures, especially around the headstreams of the Tugela, the output being considerable. Iron ore abounds in many localities, and valuable deposits of argentiferous lead and copper ores, as well as gold, have been found.

AGRICULTURE. The interior of the colony is well adapted for agricultural and pastoral purposes. The total area under cultivation in 1900 was over 600,000 acres. The principal cereal is corn, which constitutes the staple food of the natives. Tea is extensively cultivated, the annual crop exceeding 1,000,000 pounds. Sugar is also increasing in importance, and tropical fruits are cultivated with success. The live stock of the colony consisted in 1900 of 54,485 horses, 349,607 horned cattle, and 586,489 sheep.

COMMERCE. Natal is as yet without manufacturing industries. Its maritime position in close proximity to the two interior colonies of Orange River and Transvaal, with which it is connected by rail, naturally gives Natal a considerable transit trade. The chief exports are wool, sugar, coal, hides and skins, and gold; principal imports are haberdashery and articles of apparel, metals and metal products, machinery, beverages, and textiles. The total value of the imports and exports amounted in 1901 to $45,855,920 and $23,337,512, respectively. This was somewhat above the normal.

The sea-borne trade passes entirely through Durban (q.v.). The transportation facilities are adequate. The railway lines, all owned, with one exception, by the Government and operated by it, had a total length of over 600 miles in 1901. The cost of the lines up to the end of 1900 was $38,026,012. The net earnings of the Government roads exceed 4 per cent. on the capital invested.

In accordance with the provisions of the present Constitution, dating from 1893, Natal is administered by a Governor, who is appointed by the Crown, and is assisted by a Cabinet of six ministers and a legislative council of twelve members, appointed by the Governor for two years with the advice of the Cabinet. The Legislative Assembly consists of thirty-nine members (including two for Zululand), elected for four years by a restricted suffrage. In 1899-1900 the revenue and the expenditures of the colony amounted to $9,188,278 and $9,693,843, respectively. The chief item of revenue is customs duties. The public debt amounted in 1900 to $43,923,226.

Education is neither compulsory nor free, and a considerable proportion of the European children are educated in private schools. The school attendance of the European children amounts to about 96 per cent. of the total school population. In 1900 there were 186 schools for native children, with a total attendance of over 10,600, and 30 schools for Indian children, with an attendance of about 2900.

The population of the colony increased from 361,587 in 1879 to 543,913 in 1891, and to 929,970 in 1900, the latter gain being due partly to the annexation of Zululand in 1897. The European population increased from 22,654 in 1879 to 64,951 in 1900. Capital, Pietermaritzburg (q.v.).

HISTORY. The coast of Natal was first sighted on Christmas Day, 1497, by Vasco da Gama, who named the country in honor of the day

(Nativity). The first attempt at settlement made by the Dutch about 1720 proved unsuccessful. In 1824 Captain Farewell and his twenty companions concluded a treaty with Chaka, King of the Amazulus, who had overrun the region during the first decade of the century, but in 1828 the English colony was broken up by Dingaan, the successor of Chaka. In 1835 Captain Gardiner obtained a concession of land from Dingaan and established himself with a number of missionaries at Durban. Two years later the Dutch of Cape Colony, who, in disgust with British rule, had set out in 1835 on their great trek northward, entered the confines of Natal. The first band of pioneers, numbering seventy-nine men under Pieter Maurits Retief, were treacherously murdered by Dingaan, but the tide of Boer immigration continued unchecked, the Zulu power was broken in a great battle on the Bloed River, December 16, 1838, and in 1839 the Republic of Natal was organized, comprising the districts of Pietermaritzburg, Weenen, and Durban. Great Britain, however, continued to regard the Afrikanders as her subjects, and annexed the Republic to Cape Colony in 1843. The greater part of the Boer population trekked westward and northward to found the Orange Free State and the Transvaal. In 1856 Natal was made an independent colony. In 1879 war was carried on against Cetewayo, King of the Zulus; his territory was overrun and occupied: and in 1897 Zululand was annexed to Natal. In 1881 the Transvaal Boers entered the extreme northwestern corner of the colony and defeated the British at Majuba Hill (q.v.). In 1899 and 1900 northern Natal was the scene of fierce fighting between the British and the Boers. At Elandslaagte, Glencoe, and Ladysmith, and all along the line of the Tugela, the most obstinate and sanguinary battles of the war occurred.

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NATAL. The capital and chief port of the State of Rio Grande do Norte, Brazil, situated on the Atlantic coast, 140 miles north of Pernambuco (Map: Brazil, K 5). The estuary which forms the harbor is obstructed by sand bars. Still the port is the chief outlet for the products of the State, and it exports cotton, leather, rubber, woods, and sugar. It is the seat of a United States consular agent. Population, about 6000.

NATALIE, nà'tà'lē' (1859—). A Queen of Servia, the daughter of a Russian officer named Keshko. In 1875 she married Prince Milan, afterwards King of Servia, but their married life was unhappy, and in 1888 Milan procured a divorce. After King Milan's abdication in 1889 she returned to Belgrade and remained for some time with her son, King Alexander, but the National Assembly having requested her to leave the country in the interest of internal harmony, she withdrew in 1891, though with the masses of the people she enjoyed immense popularity, owing partly to her beauty. In 1893 she became reconciled to King Milan. In the following year she was restored by royal decree to all her rights as a member of the royal family, and in 1895 she returned to Belgrade and was received with great enthusiasm. Since then she has mainly lived in Biarritz, France. In 1902 she joined the Roman Catholic Church. After the assassination of her son Alexander, in 1903, she was forbidden to enter the Kingdom of Servia.

NA'TANT. A term in heraldry. See Naiant.

NATCHEZ, năch'ĕz (from their native name, *Na'chi*). An interesting tribe, constituting a distinct linguistic stock, originally residing in nine villages in the vicinity of the present city of Natchez, Miss., with a total population of perhaps 2500. Although comparatively a small tribe, they exercised a commanding influence from the Gulf to the Ohio. Their greatest religious rites were connected with the worship of the sun. They were sedentary and agricultural, expert basket-weavers and skillful potters, while their men bore a deserved reputation as proud and determined warriors. In 1716 they quarreled with the French, who had without their consent erected Fort Rosalie in their country. In 1722 a fight occurred at the post, in which several were killed on both sides. Other collisions followed, until the Natchez secretly organized a combination of several neighboring tribes to drive out the white intruders. On November 28, 1729, the Natchez fell upon the garrison and massacred two hundred men, only twenty escaping, besides making prisoners of all the women, children, and negro slaves. The war rapidly spread to the outlying settlements, but after a few weeks the Natchez, unable to oppose the French and their Indian allies, fled across the Mississippi and fortified themselves in stockade forts on Black River, La. Here they were attacked in January, 1731, by a strong French force, which succeeded in taking nearly 450 prisoners, the rest escaping during a storm at night. All the prisoners were sold as slaves in the West Indies. The remnant, made desperate by defeat, continued the war, but were obliged to give way before fresh Spanish reinforcements from the west. This ended the war, in which they had probably lost half their tribal population. The survivors took refuge with other tribes, some with the Chickasaw, others with the Creek and Cherokee. A part of them under the name of 'Notchee' even found their way to South Carolina and were incorporated with the Catawba.

NATCHEZ. A city and the county-seat of Adams County, Miss., 100 miles southwest of Jackson: on the Mississippi River, and on the New Orleans and Northwestern and the Yazoo and Mississippi Valley railroads (Map: Mississippi, C 7). It is built largely on a bluff, 200 feet above the river, the summit of which contains the most costly residences, and the base, or water front, the principal shipping and business houses. Among noteworthy features of the city are the fine Memorial Park, Fisk Library, Stanton College, Natchez Institute, Institute

Hall, Temple Opera House, Pearl and Natchez hotels, and the handsome court house and city hall buildings. A national cemetery, on a bluff adjoining the city, contains 3159 graves, 2780 of unknown dead. In the cemetery is an observatory which commands good views of the vicinity. Natchez has steamboat connection with the whole Mississippi Valley, and is the shipping port of a large cotton region, exporting annually many thousand bales. There are cotton mills, cotton compress, cottonseed oil mills, a foundry, saw and planing mills, an artificial ice plant, etc. The government is administered under a charter of 1877, which provides for a mayor, chosen biennially, and a unicameral council that elects the school trustees. Population, in 1890, 10,101; in 1900, 12,210.

In 1716 Bienville built Fort Rosalie on Natchez Bluff. In November, 1729, the place was destroyed, and most of its inhabitants were massacred by the Natchez Indians. In 1763, according to the terms of the Treaty of Paris, the English took possession and renamed the fort Fort Parmure. From this year dates the real foundation of the village. A Spanish force from New Orleans dispossessed the English in 1779, and in 1798 Spain gave way to the United States. Natchez was incorporated as a city in 1803, and was the capital of Mississippi from 1798 to 1820. It suffered considerable damage from a tornado in 1840. The city was shelled by Commodore Porter in 1862, and in 1863, soon after the fall of Vicksburg, it was occupied by Federal troops, and remained under their control until the close of the war.

NATCHEZ, nȧ′chȧ′, Les. A romance written by Chateaubriand during his exile in England, and printed in 1825-26. It contains the author's impressions of America and views of life, and is pervaded by a morbid psychology.

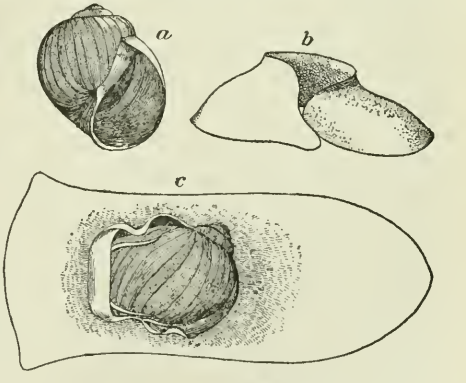
NATCHITOCHES, năch′ĭ-tŏch′ĕz. A tribe of the Caddoan linguistic family of Indians, living formerly on the Red River in Louisiana. Each clan lived apart and they were scattered among the Sioux from Dakota to the Gulf. Their habit of life was partly hunting, partly agricultural. They dwelt in permanent houses covered with sod. In some of their kindred tribes rude pottery was also made. Their religion demanded under certain conditions the sacrifice of human beings.

NATCHITOCHES, năk′ĭ-tŏsh′. A town and the parish seat of Natchitoches Parish, La., 63 miles southeast of Shreveport; on a branch of the Red River, and on the Texas and Pacific Railroad (Map: Louisiana, B 2). It is the seat of a Roman Catholic bishop, and has a State normal school, a State high school, and a Roman Catholic convent. The town is surrounded by a productive district, devoted to stock-breeding and agriculture, its chief products being cotton and sugar-cane. Natchitoches owes its origin to a trading post established in 1714 by the French. Population, in 1890, 1820; in 1900, 2388.

NATHAN′AEL (Heb. *Nĕthan′ēl*, God gives). A man of Cana in Galilee, brought to Jesus by Philip, and declared by Jesus to be a true Israelite and a sincere, open-minded man. He proved this sincerity by coming to meet Jesus, although the fact that Jesus was described as 'of Nazareth' was naturally repugnant to him. He accepted the claims of Jesus as Messiah when those claims were brought clearly before him (John i. 45-51). From this time on nothing more is said of Nathanael in the Gospels, except the mention of him as one of seven to whom Jesus manifested himself after the Resurrection (John xxi. 2). He is not named among the Twelve Apostles. This fact has led many to attempt to identify Nathanael with Bartholomew (q.v.).

NATHAN DER WEISE, nä′tan dĕr vī′ze. A dramatic poem by Lessing, published in 1779, in which the author clothed in poetic form the principles underlying his controversial writings. The interest of the drama concentrates itself in the seventh scene of the third act, in which Nathan, the Jew, summoned by Sultan Saladin, to express his opinion as to which of the three religious creeds professed in Palestine he holds to be the true one, recites the parable of "The Three Rings," purporting to show that the true religion is to be known only by its fruits. The drama is based upon the story of *Melchisedec the Jew*, in Boccaccio's *Decamerone*. The character of Nathan is a monument to Lessing's friend Moses Mendelssohn, the Jewish philosopher.

NAT′ICA (Neo-Lat., from ML. *naticæ*, from Lat. *natis*, buttock). A genus of gastropod mollusks, represented by *Natica heros* (now *Polynices heros*), one of the most common and largest of the univalves, and to be found in abundance along our coast from New Jersey to Maine. The shell is large, composed of several whorls, with a small flattened spire or apex. The aperture is large, lunate in shape, and can be closed by a large horny door or operculum. The animal lives partly buried in the sand, near low-water mark. On taking it up the large, round swollen 'foot' or creeping disk ejects a spray of water as if poured from the 'rose' of a watering-pot. The animal has two short, broad, flattened tentacles, but, owing to its burrowing habits, its eyes are wanting. Its eggs are laid in a large, thin circular mass, like a miniature lamp-shade, which is a curious object and a good deal of a puzzle to young collectors. Another common but much smaller snail (*Polynices triseriata*) is thought to be the young of this species. It is marked with three rows of bluish or chestnut-brown spots. A rather more southern species is *Polynices duplicata*, in which the umbilicus (open in the other species) is closed or nearly so.



WHITE SNAIL (*Natica heros*).

a, The shell; *b*, an egg case; *c*, animal, with distended foot, in the attitude of walking.

Consult Arnold, *The Sea Beach at Ebb-Tide* (New York, 1901).

NATICK, nā′tĭk. A town, including several villages in Middlesex County, Mass., 17 miles west-southwest of Boston; on the Boston and Albany Railroad (Map: Massachusetts, E 3). It has public parks, in one of which is a soldiers' monument, and in another a monument to the memory of John Eliot; the head of Cochituate Lake, one of the sources of Boston's water supply; the Walnut Hill School for young ladies; the Morse Institute (public library and reading room); and the Bacon Public Library. The principal industries are the manufacture of boots, shoes, shirts, clothing, baseballs, boxes, saws, etc. The government is administered by town meetings. There are municipal water-works. Population, in 1890, 9118; in 1900, 9488. Natick was founded by John Eliot, who about 1651 brought hither from Nonantum a company of 'praying Indians,' and for many years it was almost exclusively a settlement of Indian converts. It was incorporated as a town in 1781. Consult: Bacon, *History of Natick* (Boston, 1856); Hurd, *History of Middlesex County, Mass.* (Philadelphia, 1890).

NATIONAL ACADEMY OF DESIGN, The. A society of American painters and sculptors, whose headquarters is in New York City. The first Academy of Arts in New York City was founded in 1802 by prominent citizens, among whom was only one professional artist, Trumbull, but it excited little interest until 1825, when a secession of the younger artists occurred. Dissatisfied with the character of the old society, they formed a new association, called the New York Drawing Association, directed by practical artists. The present name was adopted in 1828, and the society, composed of thirty members, was incorporated. Prof. S. F. B. Morse (q.v.) was the chief organizer of the movement, and was twice president of the National Academy, in 1827-45 and again in 1861-62. In this capacity he delivered the first lecture on the fine arts ever given in America. The Sketch Club, formed by C. C. Ingham, one of the original members of the National Academy of Design, afterwards became the Century Club (1846).

The National Academy is founded on the plan of the Royal Academy of London (q.v.), and its active members are divided into academicians and associates, the number being limited to one hundred, the only qualification that they be professional artists. There are also honorary members and fellows of the Academy who have certain privileges. The society is governed by a council consisting of its officers and six members, and the instructors in the school of design are chosen from among its ranks. The Academy stands for the conservative, traditional element in art, as opposed to the more modern sentiments which were represented in the earlier work of the Society of American Artists (q.v.). It held its seventy-eighth annual exhibition in 1903. At these exhibitions the Clarke prize of $300, and the Hallgarten prizes of $300, $200, and $100, respectively, are distributed, and the Inness gold medal for the best landscape. The school of design connected with the Academy has been in existence since 1825, and the instruction includes classes in the antique, life, still life, anatomy, painting, perspective, composition, etching, and medal and coin engraving. These classes are open from October until May, and are free to students admitted on the evidence of the school committee. The average attendance of pupils is about 300. Consult Cummings, *Historic Annals of the National Academy of Design* (Philadelphia, 1865).

NATIONAL ACADEMY OF SCIENCES. An organization incorporated by act of Congress on March 3, 1863, to investigate, experiment, and report on any subject of science or art, when called upon to do so by any department of the United States Government. The membership was limited to fifty till 1870, since when it has never had more than one hundred members at a time; and at the annual elections no more than five names are considered. The members are grouped into committees on: (1) mathematics and astronomy; (2) physics and engineering; (3) chemistry; (4) geology and paleontology; (5) biology; and (6) anthropology. Admission to the Academy is through the recommendation of the committee on the subject in which the nominee is a specialist. There are also fifty foreign associates. Two annual meetings are held. The Academy has prepared a number of official reports on subjects that call for special scientific advice, among which may be mentioned: On the Protection of the Bottoms of Iron Vessels (1864); On the Preservation of the Writing of the Original Declaration of Independence (1879); On the Forest Policy for the Forested Lands of the United States (1897); and Concerning the Value of the Metric System (1902). Several of the members have left funds to the Academy for use in research in various branches of science, and also for medals, of which there are now four that are awarded at intervals. Of these the Draper medal is awarded every two years for the most important discovery in astronomical physics. The Watson medal is given for any astronomical discovery or any astronomical work worthy of special reward; the J. Lawrence Smith medal is awarded to students of meteoric bodies; the Barnard medal is given for discoveries in physical science. The publications of the Academy include seven quarto volumes of memoirs and four octavo volumes of biological memoirs and annual reports made to the Government. The presidents, who are chosen for the term of six years, have been Alexander Dallas Bache (1863-67), Joseph Henry (1867-78), William B. Rogers (1879-82), O. C. Marsh (1883-95), Wolcott Gibbs (1895-1900), and Alexander Agassiz (1901—).

NATIONAL ARTS CLUB. An organization formed in New York City in 1898 "to promote acquaintance among art lovers and art workers in the United States, and to stimulate the practical expression of the artistic sense of the American people; to provide proper exhibition facilities for such lines of applied and industrial art as shall be unprovided for; and to encourage the publication and circulation of new suggestions and discussions relating to the fine arts." A regular feature of the club programme is the holding of monthly exhibitions of works of art. The membership of the club is large and includes men who have won fame in various walks of art, and who are in constant requisition for advice by various associations to whom are committed public and private enterprises in which art largely enters. The principal executive office, that of managing director, has been filled since the organization of the club by Mr. Charles de Kay.

NATIONAL CHRISTIAN LEAGUE FOR THE PROMOTION OF SOCIAL PURITY. An organization with headquarters in New York City. Its distinctive aim is the prevention of the extension of vice, (1) by the dissemination of wholesome literature, (2) by the supplying of the physical needs of those who are being rescued from or dangerously exposed to vice, (3) by the establishment of homes for working-girls, and such other means as opportunities present. The work is carried on by special committees. The League has established a home for self-supporting women, where nominal rates only are charged. The League has, also, a hospital committee, whose duty it is to visit the hospitals and assist special cases of charity, and an auxiliary, the Social Culture Club, to improve family life by reaching young mothers and girls. Annual conventions are held.

NATIONAL CIVIC FEDERATION. An organization formed of a number of prominent representatives of capital and labor, the direct outgrowth of conventions held in Chicago and New York in 1900-01. The object of these preliminary meetings was to secure the fullest possible information as to the methods and measures of arbitration in labor disputes throughout the world, and to consider the best means of promoting industrial peace. At the New York convention, held December 16, 1901, a commission of thirty-six was created to be known as the "Industrial Department of the National Civic Federation," charged with full authority to endeavor by timely mediation to check labor disputes, and as a last resort to end them by formal arbitration. The commission represented equally the employers, the wage-earners, and the public, and among those selected were ex-President Grover Cleveland, President Eliot of Harvard University, and Archbishop Ireland, representing the public; Mark Hanna and John D. Rockefeller, Jr., representing employers; and Samuel Gompers, John Mitchell, and Frank P. Sargent, representing the laborers. The objects to be kept in view by the commission were the adoption of the best means for the promotion of industrial peace; the establishment and maintenance of proper relations between employers and workers; the prevention of strikes and lockouts; the settlement of labor disputes before an acute stage shall have been reached; and, where a rupture has occurred, the application of the best means for the restoration of friendly relations between both parties. The department assumes no power of arbitration unless when such power is conferred upon it by both parties concerned in the dispute. The commission was instrumental in settling eleven strikes from the date of its organization to the breaking out of the anthracite coal strike in 1902.

NATIONAL CONFERENCE OF CHARITIES AND CORRECTION. A body composed of the State boards of public charities, where they exist; of delegates appointed by the Governors of other States; of charity organization societies and associated charities throughout the country; and of persons connected officially or unofficially with charity work. It holds annual meetings in some city determined upon at a preceding meeting of the Conference. It has no formal constitution.

NATIONAL CONVENTION (in French history). See CONVENTION, NATIONAL.

NATIONAL COVENANT. The league formed by the Scotch Presbyterians in 1638, being one of the famous Covenants (q.v.).

NATIONAL DEBT. See DEBT, PUBLIC.

NATIONAL EDUCATION, SYSTEMS OF. A system of national education may be said to exist wherever the sovereign authority in a nation takes part in the establishment, maintenance, or to any considerable extent the regulation of the agencies for the education of the people. In ancient times and among the antique civilizations that survive to-day State systems of education are found. Such systems are (1) theocratic, where the priesthood, who form a ruling caste or are intimately connected therewith, carry on education; (2) examining, where the State conducts tests for citizenship or official position, thus indirectly determining the character of the instruction; or (3) martial, where the State aims to prepare its youth for citizenship which is practically equivalent to membership in its army. The Roman Government regulated education to some extent, and the emperors endowed many institutions of learning. With the fall of the Roman Empire and the appearance of the mediæval ecclesiastical system, the Church assumed control of education in Europe and resented any encroachment of the State upon its domain. The Reformation, however, by placing wherever it prevailed the control of religion in the hands of the State, transferred to the secular authority the control of education as well. The modern emphasis of the necessity of education for all, not only in religion, but also in letters, led to a broader popular education than had hitherto existed. The multiplication of sects that was an outcome of the Protestant movement brought about so much warfare regarding religious instruction that in most of the advanced nations it has largely or entirely disappeared from the curriculum of the State schools. Thus the modern systems, concerned principally with secular instruction, and controlled by the State, have come to exist.

The development of modern national support and control of education has in general followed this order: first the regulation, then the partial support, and finally the assumption by the State of almost the entire responsibility for the education within its borders. To-day in Prussia 99.5 per cent. of the elementary education is carried on in public schools, and all the secondary and higher institutions are State institutions. Switzerland and Sweden show practically the same conditions. In Italy private elementary schools do 10 per cent. of the work, and in Spain they are a much more significant factor. In England the law of 1902 brings most of the elementary schools of the religious societies under Government control and provides for them a contribution from public funds as liberal as that given to the schools established by the State. Secondary education is also gradually coming under State supervision and provision is being made for national secondary schools. In France the private secondary and elementary schools, the larger part of which were under clerical auspices, have been to a great extent suppressed by the enforcement of the Associations Law of 1901. In the United States 8.1 per cent. of all elementary and secondary school attendance is in private schools.

The result of the vigorous efforts of the most progressive States within the nineteenth century is the almost entire disappearance of illiteracy within their borders. Germany, Switzerland, and Sweden find less than 1 per cent. of their conscripts unable to read and write. In Holland, England, and France the proportion of illiteracy grows greater, 4.9 per cent. of the French recruits in 1897 being ignorant of letters. In Italy the percentage of illiterate conscripts in 1899 was 33.8, and the marriage register shows that 50 per cent. of the women called upon to sign it were unable to do so. In Spain the percentage of illiteracy was estimated as 68 per cent. in 1889, and this proportion has probably not been greatly reduced since that date. In the United States in 1890, 13 per cent. of the population over ten years of age could neither read nor write. This large proportion, however, is due to the enormous negro population and to extensive emigration from Eastern and Southern Europe. At the same date only seven per cent. of the native population over ten years of age was illiterate. Doubtless the proportion of illiterate adults whose parents were native would in America (if we exclude negroes) be about as small as that of illiterate conscripts in the European States having the most effective systems of popular education. To-day the great problem of popular education is not the abolition of illiteracy, but the training in vocations.

In 1899-1900 20.38 per cent. of the population of the United States were enrolled in elementary schools. Prussia and Switzerland show about the same percentages. Then follow England, Sweden, and France. Italy had only 7.36 per cent. of her population in elementary schools in 1898, while in Russia this percentage was in 1896 only about 3. The United States also leads in the amount expended for elementary education, whether we calculate the rate of expenditure per capita on the total population or per pupil on the enrollment in the schools. The average expenditure per pupil in 1899-1900 was $20, about double that of England and France, and nearly three times that of Prussia. Italy and Russia spent in 1900 $5.15 and $5.12 per pupil respectively. The United States spent on elementary education in 1899-1900 $2.83 per capita on the total population. Prussia followed with $1.29 per capita. These comparisons are based on statistics that vary from year to year and are constantly becoming more reliable. In the series *Our European Neighbors* (New York, 1901-03) each volume contains a good brief popular account of the schools of the respective European countries.

FRANCE.

The French system of education affords the best example of centralization and uniformity in educational affairs that the world has seen. It has been built up since the Revolution, and instead of taking charge of existing schools (most of which were clerical) the French Government has established its own system, which has been gradually replacing other educational agencies. The latest act in this drama of rivalry is the active suppression by the State of a large part of the instruction carried on by religious associations. To this reference will be made later. The present system of elementary instruction may be said to have begun with Guizot's law of 1833, by which each commune was required to establish a primary school and each department a normal school. Not until 1878, however, when the central Government began to grant and loan money to communes for the construction of school buildings, did this law become really effective. The present organic law was passed in 1886.

The system of public instruction in France comprises three departments, primary, secondary, and higher. They are all under centralized control. At the head of the system stands the Minister of Public Instruction, who is a Cabinet officer. Each of the great departments has a special director. The central administration includes, in addition, the Superior Council of Public Instruction, and the general inspectors. The Superior Council consists of about 60 members, and has advisory and judicial functions. One-fourth of its members are appointed by the President. Other vacancies are filled by the Council itself. It has a committee to consult with the school authorities regarding school matters. Officials exist for the inspection of every phase of school work.

For convenience in educational administration, France (including Algeria) is organized into 17 academies. Each one comprises a university, associated lycées, and colleges, and the public primary schools within its limits. At the head are a rector, an academic council, composed of professors and officers of education, and an academic inspector. Under the academic inspectors serve the primary inspectors, who come in direct touch with the schools, each one having supervision of about 150. The departments of France, of which there are 90, constitute the next division for school administration. The prefect has the power of appointing elementary teachers, and there is an advisory council for primary schools composed of teachers, school inspectors, and members of the civic council. In the communes the councils and mayors select sites for school buildings, and vote the funds for the communal school expenditures. There are also committees formed to encourage school attendance.

It has been said that the control of schools in France is highly centralized. The President of the Republic appoints the Minister of Instruction, the general inspectors, the professors in the universities, the rectors of the academies, the prefects of the departments. Of these, the general inspectors have passed a special examination, and professors in the universities are chosen from lists submitted by the Superior Council and the university council. The general inspectors and the rectors are appointed on nomination by the Minister of Public Instruction, and his advice is asked regarding the professors. He appoints the rest of the officials of the central department, the central examination boards, the academy inspectors, the primary inspectors, the secondary teachers, the officials in the normal schools, and in the superior elementary schools. Inspectors are drawn only from the ranks of experienced teachers, who have held important positions. They are required to pass a special examination. So, too, are the professors in normal schools. The primary teachers are required to pass an examination or to be graduates of normal schools.

There are three grades of certificates, elementary, superior, and professional. For the last, stress is laid on knowledge of professional matters, and two years' teaching experience is required. The examination includes a test in actual teaching before inspectors. Only such as pass it can become principals. The elementary teachers are appointed at first on probation by the academy inspectors, and if successful are, on his recommendation, appointed by the departmental prefects. The entire body of educational officials is therefore practically in the hands of the President, the Minister of Public Instruction, and the academic inspector.

The Superior Council deals with programmes for instruction, regulations for discipline, teaching, and school management generally, and hears appeals from the lower councils regarding schools that have been suppressed or have not been sanctioned by the lower authorities. It is the high court of appeal in all contentions. The academic council oversees courses of instruction in either higher or secondary schools, judges cases involving discipline of teachers or pupils therein, or the establishment or suppression of secondary schools. The departmental council has similar functions regarding the primary schools and determines their establishment, location, and the number of teachers. It also inspects them.

By the laws of 1890 and 1896 universities have been organized in each academy. Preparatory to them are State lycées, or classical schools, of which there were in 1900 for boys 109, and for girls 40; communal colleges for boys, of which there were 229; and colleges for girls, numbering at that date 28. All these institutions take both boarders and day pupils. Besides these, there are a number of secondary courses for girls. The primary schools may be grouped under five heads: (1) The *maternal schools*, which receive children between two and six years of age. From being schools for taking care of children whose mothers were out at service, they have become part of the educational scheme. They are supplemented by infant classes, which prepare the children for the elementary schools, and take the place of the maternal schools in small communities. To them are admitted children from four to seven years of age. (2) The *elementary primary schools* (*écoles primaires élémentaires*). These take children from six to thirteen, the work being divided into three grades of two years each. (3) The *superior primary schools* (*écoles primaires supérieures*). The place of these may be taken by the 'complementary courses.' The latter are partly review courses, partly advanced with special attention to training for practical life. In them instruction lasts two years. There are two classes of superior primary schools, the professional and the nonprofessional. The first class includes commercial, technical, and industrial schools. The second has an advanced, liberal course for three years, supplementing it by considerable technical and industrial work during the rest of the time. It takes pupils from twelve to eighteen. It was originally designed to prepare for the secondary schools, but having a somewhat similar course, and being less aristocratic, it failed. It was revived with the addition of the vocational training in 1886. (4) The *apprentice schools*, which are sometimes classified as superior primary schools. Their name indicates their function, actual shop work being the centre of the curriculum. (5) The *primary normal schools*. Besides these, there are two higher normal schools, which prepare teachers for the primary normal schools and the superior primary schools. There are eighty-seven primary normal schools for men and eighty-five for women. They give a three years' course. The primary school system is further supplemented by courses for adults offering either elementary, technical, or commercial instruction, or lectures on subjects of general culture.

In the primary schools tuition is free. Moreover, by the law of 1867, a fund to help pupils whose parents cannot supply them with clothes, books, etc., was created. Its establishment in each commune was decreed in 1882, the State agreeing to contribute. It is distributed by local committees, and in many cases children at school are even provided with dinners. In the superior primary schools, bursaries exist to support deserving pupils taking the courses. At the age of sixteen the holders of bursaries may be transferred to secondary schools with a continuation of their stipends. Bursaries also exist in the secondary schools, awarded on examination to students of limited means. Students are admitted to the normal schools on competitive examination. They are supported while there, and, when they graduate, are pledged to teach ten years. They are given positions in the order of merit. Secondary and higher schools charge tuition, but, as they are largely provided for by the State, the amount of this is small.

The salaries of all administrators of schools, inspectors, and, except in the case of the communal colleges and in cities having over 150,000 inhabitants, teachers as well, are paid by the State. This brings about general uniformity. The salaries of primary teachers range from $200 to $560 a year; of normal school teachers from $500 to $1100; of professors in the lycées from $640 to $1800; of professors in the universities from $2400 to $3000. In primary schools of all kinds, the teachers are divided, according to length of service and efficiency, into five grades, and in lycées into four. Salaries are based on this ranking. The teachers may, when they have served thirty years, and have reached the age of sixty, receive a pension which amounts to one-sixtieth of the average salary during the last six years multiplied by the number of years served. To make up for this, they contribute to a pension fund 5 per cent. of their yearly salaries plus one-twelfth of their first year's salary and one-twelfth of each increase in salary for the first year of such increase. In addition to paying salaries and pensions, the State supports the normal schools, the buildings for which are erected and equipped by the departments. The departments also furnish the supplies for them, and pay the office expenses incurred in running the departmental bureaus and the academic bureau of inspection. The communes pay for the supplies of the primary schools and local school officials, for janitors, and for the building and equipping of schools and residences for masters. In the building of primary schools, however, a State loan is available, the amount of which depends on the necessities of the commune, and varies from 15 to 80 per cent. of the total cost of the work. The State also loans money to build normal schools. The universities, since their organization in the academies in 1896, have been thrown somewhat on their own resources and those of their localities. The State no longer equips laboratories or libraries, nor maintains new courses, nor builds new buildings.

The courses of study in the primary schools are in general determined by State laws. In addition, the Minister of Public Instruction, in consultation with the Superior Council, determines the programmes of instruction even in details of considerable minuteness, and also rules for the conduct of the schools. In general, the primary schools give instruction in moral and civic matters, reading, writing, arithmetic (with simple geometry), history and geography (particularly of France), elementary science, drawing, singing, manual work (including needle-work for girls), gymnastic exercises, and for boys, military drill. The superior primary schools have, in addition, algebra and geometry, biological and physical sciences, with applications to agriculture, industries, and hygiene, political economy, the French language and literature, general history, industrial and commercial geography, iron and wood work for boys, and cutting and fitting for girls. One foreign language also is taught. The apprentice, commercial, and technical schools emphasize, of course, work preparing for special vocations. The courses of study for the secondary schools are laid down by law, and were modified in 1890 and 1891 in order to make them conform more completely with modern demands. They were again modified in 1901 and 1902. The entire course occupies eleven years. Four years are spent in the primary department and pupils can take this work in the free primary schools. They will, however, be under the disadvantage of not taking a course of three years in a modern language. The secondary school proper has a course of seven years, divided into two parts. During the first four years the work may be in either of two courses, in one of which Latin is obligatory and Greek optional, and in the other neither is taken. For the last three years there are four courses presented for choice. These courses emphasize respectively Latin-Greek, Latin-modern languages, Latin-science, and science-modern languages. During the last year of the course options in either philosophy or mathematics are offered.

The programmes in all the secondary schools of France are rigidly laid down by statutes and regulations of the central Department of Education, and general uniformity exists.

The system of inspection in France comes in to insure this uniformity in curriculum and methods. It extends to sanitary conditions as well as to instruction, although such inspection is in the hands of the regular medical inspectors of the localities. Uniformity of results is brought about by a regular system of examinations carried on by outside authorities. An examination for a certificate of primary studies may be given to pupils at the age of eleven, and those passing are exempt from further compulsory attendance. It is carried on in the cantons by examiners appointed by the rectors of the academies. A special departmental commission holds yearly an examination for certificates in higher primary studies. The secondary schools also have their final examinations for degrees conducted by outside examiners. Indeed, as the primary schools are the product of the central republican governments of France, so the lycées are part of the imperial scheme of education devised by Napoleon, and both therefore are characterized by the system, uniformity, and dependence on central authority that their origin would insure.

Private schools in France require the sanction of the State, but can receive no support from public funds. The mayor or academic inspector can oppose them in the interests of hygiene, morals, or public order. They are free in regard to their programmes and methods, but their teachers must have received the certificate of capacity. For the most part, they have been under the control of religious Orders or congregations, and their large attendance was due to the demand for more religious instruction on the part of some classes. These congregations, however, were alleged to be in many cases hostile to the Republic. The Catholic Orders were particularly aimed at in this charge. The Ministry of Waldeck-Rousseau attacked their independence in the 'law of associations' that became a law July 1, 1901. By it all congregations are required to obtain official authorization in order to get legal recognition as such. All unauthorized congregations are absolutely forbidden to give instruction. By this means a careful scrutiny of the conduct of the affairs of such bodies is made possible, and the character of their instruction inspected. The law contemplates the suppression of all congregations that shall resist such scrutiny. During the year 1901-02 the Ministry presided over by Premier Combes compelled many thousands of unauthorized clerical schools to close their doors. In 1903 supplementary legislation to the Association Bill resulted in practically closing all the clerical schools both authorized and unauthorized.

The universities of France are discussed more at length under UNIVERSITY.

GREAT BRITAIN.

The foundation of the present system is the Elementary Education Act of 1870. It declared that each district where sufficient facilities for elementary instruction were not in existence should provide them. Schools requiring denominational instruction or charging more than ninepence a week for tuition were not regarded as providing sufficient means for this purpose. The Education Department was required to make a statement of what was in each case demanded. In case voluntary provision to meet these demands was not forthcoming, a school board was to be elected in the district, which was to provide, to maintain, and to keep efficient the requisite elementary schools. Children attending board schools were to pay a weekly fee determined by the board, with the consent of the department, but this was to be omitted where parents were regarded as unable to pay. School boards were permitted to make provision for the compulsory attendance of children between five and thirteen years of age, who were not elsewhere receiving efficient instruction, unless these children had attained the requisite standard of scholarship, or were exempt under the Factory Acts. The board schools were to give no denominational instruction. The funds for the support of elementary schools were to be at the disposal of the boards, and were to be derived from Parliamentary grants, loans, fees, and local rates.

The school boards were given power to fix the amount of the local contribution for school purposes. Voluntary schools, wherever they existed, were recognized as before, and, in case they remained properly public and elementary, were to receive grants not greater than the amount contributed from other sources. Local rates were not to be levied for voluntary schools. In 1876 the age of compulsory education was extended to 14 years, and provision was made for the more effective enforcement of the last by punishing delinquents. This law was also made to apply to districts where there were no school boards, and it was enacted that children under ten years of age should not be regularly employed at labor. In 1880 boards were required to make attendance compulsory. Subsequent legislation has improved the evening schools (q.v.), turning their attention to technical and industrial education, has started undenominational day training colleges, and has greatly developed technical instruction. The poorer rural elementary schools have also received especial help. In 1890 the payment of tuition fees in elementary schools was abolished. In 1899 the Education Department was replaced by a Board of Education for England and Wales consisting of a president, the Lord President of the Council, the principal Secretaries of State, and the Chancellor of the Exchequer. In December, 1902, a far more important measure for the unification of school administration was passed. The occasion for this act was the complaint on the part of the voluntary schools that, while they gave instruction to more children than the board schools (in 1898 about 20 per cent. more), they received no aid from the local rate. The amount that they received from voluntary subscriptions was not sufficiently great to enable them to keep pace with the board schools, a large portion of the support of which was derived from local taxes. The act of 1902, which applies everywhere except to London, changes this condition by sweeping away the old school boards and attendance committees, and replacing them by education authorities, which are empowered to provide for all the schools in their respective districts out of the local rates. Whatever schools receive such support are under the general supervision of the local education authority. This authority is the council of the county or the county borough. It retains the right of levying the local rate and of borrowing money for school purposes, but hands over to a committee all other educational functions. The Education Committee is appointed according to a scheme determined by the local authority and approved by the Board of Education. A majority of its members are in most cases appointed by the council from its own number. Some of the others must be persons of experience in education, and the committee must include women. The Education Committee has power to determine the secular education to be given in the public elementary schools, and to fix the number and educational qualifications of the teachers. Its consent is necessary to the appointment or dismissal of teachers except where religious considerations are involved.

Each school is under a board of managers, who elect teachers, control the school property, etc. The schools provided for wholly by the education authority are governed by managers appointed by it and by local authorities. Moreover, the denominational schools have on their managerial boards appointees from both these sources. No school that does not comply with the requirements of the Education Committee can receive even a Government grant.

Parliament grants to all schools a sum equal to four shillings per scholar, and an additional halfpenny per scholar for every complete twopence per scholar by which the amount which would be produced by a penny rate in the area of the authority falls short of ten shillings a scholar. Whatever tuition fees are paid to schools maintained by an education authority are turned over to it, but a certain portion of these, such as may be agreed upon, is returned to the managers of the school. The proceeds of school endowments for the aid of elementary education are primarily devoted to the care of the school property. Whatever surplus there may be is turned over to the education authority.

The managers of denominational schools are allowed to determine the religious instruction given therein and the religious qualifications of the teachers. But a pupil need not attend such instruction, and cannot be excluded from the school for religious reasons.

The act of 1902 is bitterly opposed by the Non-Conformists. The voluntary schools are largely under the control of the Church of England, and the use of a local rate for their support was regarded as taxing Non-Conformists for the benefit of the institutions of the Established Church. Moreover, it was feared that the new education committees would be more favorable to the Church of England than the old school boards. The schemes of the councils for the appointment of the committees, however, give, in general, far less representation to the Established Church than was commonly expected.

For the training of elementary teachers in 1898 there were forty-four residential and fourteen day training colleges. The latter are attached to some university or college of university rank. Teachers are appointed by the school boards. The average annual salary of certificated masters is about £121 and of mistresses about £80. In 1898 provision was made for pensioning teachers who have reached the age of sixty-five or have become disabled. The amount is estimated on the basis of length of service, and is possibly made up by an annual contribution on the part of men of £3 and of women £2. Inspectors are appointed by the Crown on recommendation of the Education Council. There are for elementary education twelve chief inspectors, two being for training colleges, one senior chief inspector, ninety subordinate inspectors, and a number of sub-inspectors. The pupil teachers constitute a large proportion of the teaching staff, the law allowing three for the principal teacher in each school, and one for every certificated assistant teacher. The system of grants in aid of their training still prevails.

For secondary education England has schools under a variety of authorities. They may be classed, according to method of control, as private enterprise schools, subscribers' schools, companies' schools, endowed schools, and schools under local authorities. There were 6209 such schools in England in 1897. They are not organized under any system, except that the Charity and other commissions have been revising the courses of study in the endowed schools. (See ENDOWED SCHOOLS ACTS.) The Public Schools Act of 1868 revised the control and organization of seven great public boarding schools of England. In 1894 a commission was appointed which in the following year reported an elaborate scheme for the national organization of secondary instruction, but so far no legislation has taken place as a result of this. Wales and Monmouthshire have a system of inspection of secondary schools. One of the main purposes of the act of 1902 was the support of secondary education by public money. The education authorities are authorized to consider within their areas the needs of secondary education and to take such steps as seem to them desirable, after consulting the Board of Education, to supply or aid in the supply of such instruction. For this purpose the county authorities are empowered to raise a county rate of twopence in the pound, a sum that may be increased with the consent of the Local Government Board. This measure is calculated to render far more effective and comprehensive the secondary schools under Government control that were initiated by the science and art department.

The Scotch have had a public elementary system since 1696, when it was ordained that a school should be established in every parish where one was not in existence. The masters were elected by the landowners and the ministers, and held their places for life or good behavior. The act was amended in 1803 so as to require the salaries of masters to be raised, and in 1861 their examination for the right to teach was transferred from the control of the presbyteries to that of the universities. In the meantime considerable support was granted to the schools from the Government. Among other changes, the English School Code of 1861 was applied in Scotland, but was withdrawn. In 1872 an elementary education act like the English one was passed. The Scotch law is the better of the two, however, school boards being created in every parish, and the practical control of all elementary schools being given to them. In 1893, after several movements in that direction, all children between three and fifteen years of age were freed from school fees in the public elementary schools. Education is compulsory for children between five and fourteen years of age.

The Government grants to Scotch voluntary and board schools are, in general, similar to those in England, but only about one-eighth of the elementary schools are voluntary. For the training of elementary teachers, denominational colleges had made their appearance before 1839. These have been aided by Government grants, and at present over four-fifths of the male and two-thirds of the female teachers have graduated therefrom. The English pension act of 1898 was extended to Scotland.

The secondary instruction in Scotland is in the hands of five classes of schools: burgh schools, academies, parochial schools, mixed burgh and parochial schools, and four public boarding schools like those of England. The burgh schools are supported either by endowment or by burgh funds. They are under the control of the authorities of the burgh and open to the community. Until 1861 the presbyteries controlled them, but at that date this power was transferred to the town councils, and in 1872 to the school boards. These bodies fix the fees. The academies arose in the middle of the eighteenth century as a result of a demand for more economical and scientific instruction. In most cases they came ultimately under the joint control of town councils and proprietors. In 1892 Government grants were made to secondary schools, and their inspection was provided for. For the universities of Great Britain, see UNIVERSITY.

For the earlier development of the English educational system, see GREAT BRITAIN, section on *Education.*

HOLLAND.

The State school system in Holland includes public primary schools, normal schools and courses, burgher schools, higher burgher schools, or secondary schools proper, agricultural schools, and various professional institutions, together with gymnasia, and three State universities. A few of the primary schools are maintained solely by the general Government. Most of them are communal, but a considerable portion of the fund for their support comes from the State. Private primary schools are also subsidized by the Government, in case they maintain proper standards. The primary school system includes, in addition, repetition and evening schools, and both types are maintained by the same agencies and methods as the primary schools in general. So, too, the normal schools are either Government schools, or communal schools with subsidies, or private schools with similar support. The State normal schools, however, give instruction to the majority of the students taking such courses. The higher burgher schools were, in 1894-95, 61 in number. Of these 20 were maintained by the Government, 28 were subsidized communal schools, 12 were communal schools without subsidies, and one a Roman Catholic institution. Of the 29 city gymnasia, 25 are subsidized by the State. It will be seen, therefore, that the policy of Holland is to subsidize such private and local schools as conform to their requirements in character of instruction and qualifications of teachers, and to found State schools only to supplement and complete the work of these agencies.

The history of this school system will serve to explain these peculiarities, and also to make somewhat clearer the complexities of the system itself. In 1784, a 'Society of Public Good' was founded at Groningen by John Nieurenhuysen. Its object was to promote elementary education; and in this it was successful, receiving help from the Government. In 1806 an education law of great importance was passed. It consisted essentially of provisions for inspecting schools and examining and certificating teachers. School districts were organized, over each of which an inspector was placed, whose consent was requisite before any one could teach or be a member of a school committee. The inspectors received for their services only an allowance for their expenses. A principal duty was that of examining teachers for certificates. The provincial and communal administrations were urged by the Government to provide the means of instruction in their localities, to insure a comfortable subsistence for teachers, and to obtain a regular attendance of children in the schools. Free schools for the poor were, as a result, established in the towns and in the villages, schools to which the poor were admitted gratuitously. The authorities made great and successful efforts to gain a large attendance, and teachers were paid better salaries than elsewhere in Europe. In 1811 M. Cuvier found 4511 primary schools in existence, and one in each ten of the population in school.

Up to 1848 only two important steps had been taken in the further development of the system. Normal schools were established in 1816, and the free schools for the poor were supplemented by institutions of a somewhat higher grade where a small tuition fee was required. Since the free schools could be entered only by those who possessed a certificate of poverty, the children of people with moderate means were excluded from them. The private schools for such children were fast becoming inferior to the free schools which were under public patronage, and it was to supply this want that the towns established intermediate schools (*tusschen schoolen*). In addition, French schools, which emphasized modern languages and commercial branches, and Latin schools, preparing for the universities, were founded. These higher schools, however, did not compare so favorably with those of other countries as did the primary ones.

The Constitution of 1848 established liberty of instruction. This conflicted with the provision of the law of 1806 that the authorizations of the municipal council and of the inspector were necessary for even the teacher in a private school. In 1857 this requirement was removed, only the general admission certificate being demanded in such cases. The Constitution of 1848, also, by placing all religious denominations on a footing of equality, gave to the Catholics and liberals a chance to attack the religious instruction in the schools, which according to the law of 1806 was to have been Christian but undenominational. Their agitation led to a strict enforcement of the law, which in turn roused the antagonism of the orthodox Protestants. The result of a bitter contest was the law of 1857, which reaffirmed that of 1806, making more explicit its provision that religious instruction, while undenominational, should yet inculcate Christian virtues. It was also provided that the schoolrooms should at special hours be put at the disposal of religious communions for purposes of instruction. This attitude has been confirmed by the law of 1878.

The law of 1857 also made definite regulations regarding the number and support of schools, the salary and number of teachers, school fees, the primary curriculum, the selection of teachers and school inspectors. Each commune was required to maintain at its own charge what in the opinion of the State's deputies and the supreme Government was a sufficient number of primary schools. If this task was too heavy, the State and the province were to share equally in a grant of aid. It was provided that pupil teachers should aid in the work of instruction. School fees were to be exacted only of those who could afford to pay them. The subjects of primary instruction were defined to be reading, writing, arithmetic, the elements of geometry, of Dutch grammar, of geography, of history, of the natural sciences, and singing. The public schoolmaster was to be selected by the communal council from a list of those who had acquitted themselves best in a competitive examination. A salaried provincial inspector was substituted for the provincial commission of district inspectors. The Minister of the Home Department, assisted by a referendary, was made the supreme authority in matters connected with education.

In 1863 a law was passed organizing secondary instruction as consisting of burgher, higher burgher, agricultural, polytechnical, and industrial schools. This law was amended in 1876 and 1879. The secondary schools are under special commissions and inspectors, and teachers in them are required to have special diplomas, and, except in a few cases, to be university graduates.

The law of 1857 has been twice amended, in 1878 and 1889. In 1878 the school authorities were empowered to increase the curriculum as laid down in 1857, by French, German, English, general history, mathematics, drawing, agriculture, and gymnastics whenever they deemed it expedient. It was also provided that each commune should support the necessary number of unsectarian schools; but 30 per cent. of its educational expenditures were to be contributed by the State, which also undertook to subsidize private schools under certain conditions. An enormous increase in the State contribution to popular education was thus brought about. In 1889 the method of granting the State subsidy was modified. If the school applying for one is found on inspection to conform to the State regulations it will be granted an amount dependent on the attendance, the number of teachers, and extent of the curriculum. All schools having more than forty-one pupils must have at least two teachers, and an additional teacher is required for an average addition of about fifty pupils. When schools have more than the minimum requirement of teachers, and when they cover more than the required curriculum, additional grants are given. The State also furnishes 25 per cent. of the amount necessary to establish a school, and regulates the character and hygienic conditions of the buildings and premises. The law of 1878 instituted a system of pensions for teachers who had reached the age of sixty-five. The annual amount is one-sixtieth of the annual salary for each year of service. The teachers contribute 2 per cent. of their yearly salaries to a pension fund.

The Dutch classify their gymnasia together with their universities under the head of superior instruction. Such instruction is organized into a system by the law of 1876. The three State universities are supported and controlled by the national Government. See UNIVERSITY.

PRUSSIA.

The school system of Prussia may be divided into three departments, elementary, secondary, and higher. The elementary system is designed to educate children of the lower classes whose school training is completed with them. The secondary schools are intended to prepare pupils for the universities or professional schools, which are for the most part classed as superior schools. The elementary schools may be grouped under five classes: (1) *The infant schools.* These are not supported by State funds, nor are the teachers required to have State certificates of capacity. They are, however, under the supervision of local school boards. Their purpose is to care for children whose parents are obliged to go out to work. Children are admitted ordinarily only in their third year, but in some cases even younger children are cared for. (2) The *Volks-*

schule. This takes children between the ages of six and fourteen, and during this period attendance is compulsory for all whose education is not otherwise provided. In the larger communities the sexes are taught separately, but in the country districts this is usually impossible, on account of the lack of teachers and facilities. The school work occupies six hours a day and about forty-two weeks a year. There are three grades and six classes, though the work occupies eight years. The subjects of study are, in the lowest grade, religion, German, arithmetic, singing, gymnastics, and needle-work; in the middle grade, drawing, science, history, and geography are added; and in the upper grade, geometry. This course is prescribed by law, but within its limits selection and arrangement are left to the school board of the district, subject to the approval of the general board of the royal Government. (3) *The continuation schools.* These are usually evening schools, giving instruction to pupils between the ages of fourteen and eighteen. They review the work of the Volksschule, and give some additional work with special reference to trade or industry, or, in the country districts, agriculture. Tuition is charged, but provision is made for those who cannot pay. With the continuation schools may be classed various industrial and trade schools which are day schools, and devote more time and effort to prepare for specific vocations. (4) *Middle schools.* These sprang from the old burgher schools of the Middle Ages. They aim to prepare the children of people with more means for a commercial life, although sometimes they are attended by pupils preparing for the secondary schools. Tuition is charged. Nearly twice as many of these schools as are public are private. A considerable proportion of them are mixed schools. They take the place of the Volksschule, but sometimes continue instruction until the seventeenth year. (5) *Normal schools.* In these there is a preparatory course of three years to which children of fourteen are admitted. This is followed by a two years' course in the women's normals, and a three years' course in men's normals and the one for governesses. In 1900 there were 126 of these institutions, of which all but about twelve were for men exclusively. Students are admitted on examination and the attendance is limited to from thirty to thirty-six in each class. While in the school students are given their support. On graduation, they are placed on the list of available teachers, and required to take what is given them, or pay back the expenses of their education. Before receiving permanent appointment, however, a probation of from two to five years is required, and an additional examination on educational matters must be passed. The normal school course consists of pedagogics, religion, German, history, arithmetic, geometry, geography, drawing, writing, music, and a foreign language.

The secondary schools in Prussia, as in Germany generally, are the various classes of gymnasia and Realschulen. The gymnasia are the classical schools, and have their origin far back in the Middle Ages. They have been modernized within the present century by the introduction of science and modern languages, although they have always retained the humanistic quality as against the Realschulen, that emphasize the scientific studies and modern languages, and omit the classical languages altogether. The gymnasium has a nine years' course. To enter it the pupil must be nine years of age, and have had three years of elementary instruction. The pro-gymnasia give a somewhat shorter course, usually only the six years necessary to gain for their graduates exemption from one year of the voluntary service in the army. Occupying a position between the gymnasium and the Realschule is the Realgymnasium, which omits Greek and gives more attention to sciences, etc. There are also real pro-gymnasia. The Realschule proper gives only a six years' course, but the higher Realschulen have nine years of work. As a result of a conference on secondary schools that met at Berlin in 1900, the three classes of schools having a nine years' course are declared to be equal from the point of view of general culture, and Greek was made optional in the gymnasia. The programme of studies was somewhat revised, and greater latitude allowed the masters in adapting their work to particular needs. For the professional training of secondary teachers there are twelve State seminaries, which admit only a few candidates. There are also connected with many of the gymnasia seminaries conducted by the principals and leading teachers. These institutions all give a one year's course. There are also a number of higher schools giving instruction to girls from six to fifteen years of age. They are supplemented by gymnasia having a four years' course. These institutions, however, are not recognized as preparing for the universities, and the higher schools are controlled by the department for primary education.

The higher education of Prussia is given in the universities, with their four faculties of philosophy, theology, law, and medicine. They are discussed in the article on UNIVERSITY. There are also various polytechnic and agricultural schools that may be included with the schools for higher education.

At the head of the Prussian school system is the Minister for Religious, Educational, and Medicinal Affairs. As Minister of Education alone, his department is subdivided into two parts. The first has control of superior and secondary instruction, and the second of the elementary schools. The Minister of Education represents the schools in the Prussian Parliament, and plans and oversees legislation or school matters, including finance. He distributes the State school money, appoints the members of provincial school boards, confers titles on school officers, judges on appeal all cases involving dismissal from office or other contentions in school matters, besides fixing the normal course of study. Each of the thirteen provinces of Prussia constitutes a division for school administration. The immediate superintendence of secondary schools is in charge of the provincial school boards, consisting of from three to five members and a chairman, who is the president of the province. One of these men inspects the gymnasia, another the Realschulen, and a third the Volksschulen. This board has the power of appointing and dismissing teachers in secondary schools, except in such as are supported wholly or partly by private funds, where the selection is made by a local board from a list furnished by the provincial school board. The appointment of directors of the schools requires the confirmation of the Minister. To the provincial school boards also fall the control of the seminaries for the training of secondary teachers, and the regulation, for all the schools of the province, of the school programmes, regulations, leaving examinations, and of text-books for the higher schools. In each province the general superintendent of the Evangelical Church has the function of inspecting the Protestant religious instruction in the secondary schools, and a Catholic bishop has a similar right regarding Catholic instruction. The provinces of Prussia are divided into thirty-six governments, each of which has a school board consisting of two men appointed by the King for life, four appointed by the provincial school board for six years, and the president of the royal Government. In such schools as are supported largely by the State, this board appoints the teachers. Wherever, on account of extensive local support or private patronage, local authorities are given the naming of teachers, the school board of the Government confirms their appointment or nominates a list from which the selection must be made. It also oversees the conduct and work of the teachers, superintends the elementary schools generally, settles upon new districts and text-books for local schools. The governments are divided into districts, some of which have inspectors, whom the Minister on examination appoints for life, and who devote their whole time to the schools. Other districts have a number of local inspectors, who are clergymen or have some other occupation besides that of school inspection. The district has a school board composed variously in different localities of inspectors, members of local councils, and representatives of religious denominations. This board has the power of erecting and organizing schools, determining teachers' salaries (the minimum being fixed by the Government), increasing pensions, and deciding on property liable to a school tax. Each school has a local school board chosen in cities by the central school board. Sometimes, however, it is elected by the citizens of a community or by a church organization or by a patron, depending largely on the source whence the school derives the larger part of its income. The local board looks out for repairs, supplies, and attendance, but cannot interfere with the internal management of the school. In many cases it has a voice in electing the teacher or fixing his salary. Many cities have established secondary schools, the funds for which are largely contributed by them. Here the local boards have charge of financial matters, choice of teachers, etc., but the work of the school itself is under the supervision of the provincial boards. The most extreme cases of local control arise in connection with the country Volksschulen, under the patronage of the nobility. Here the patron names the teacher, and sometimes even interferes with the course of study and school hours.

Private schools in Prussia are required to conform to State regulations, as to minimum course of study, school methods, etc. They are under State inspection, and can employ none but regularly certificated teachers. The number of private elementary schools is insignificant, but the pupils in middle schools are one-third in private institutions.

Teachers in Prussian elementary schools are ordinarily graduates of teachers' seminaries or training colleges. At the end of each year these institutions hold an examination at which the school inspectors and superintendents of the district and a commission from the provincial school board are present. Practical tests in teaching power are required as well as those on theory. The successful candidate gets a privilege to teach for three years. After two years of satisfactory work a teacher may take a second examination, the passing of which gives him a right to a permanent position and a pension. This examination is largely on educational matters and includes a practical test. Candidates who are not graduates of teachers' seminaries may be admitted to it, and on passing are allowed to teach. The director of the seminary oversees the work of its graduates, and can require them to supply defects by additional work. Those who wish to teach in the higher classes of the middle schools must pass an additional examination given by a special commission, and the same body gives a still further examination to those who aspire to rectorships. To gain the right to teach in the secondary schools a candidate, who is usually from a university, often with a degree, must pass a State examination given by one of the ten examining boards appointed annually by the Minister. Those who pass may receive, according to the character of their papers, any of three grades of certificates in the various subjects, and these entitle them to teach such subjects in the lower three, the lower six, or all the grades of the gymnasia. After passing this examination, a candidate enters either a State seminary (where he receives a valuable stipend) or a gymnasial seminar. Here he is under practical instruction for a year, entering at its successful conclusion on a year of probationary teaching, for which he receives no remuneration. He is then, provided his work is satisfactory, eligible to a permanent appointment.

Elementary teachers receive free rent and fuel, and often a garden. Their annual salaries range from 450 marks (in a few cases even less) to as much as 3800 marks in Berlin, or in the case of rectors even 6000 marks. The average is, however, about 1200 marks, and is smaller in the country than in the cities. Salaries usually are regularly graded, according to time of service, up to a maximum. Women are paid somewhat less than men, and they constitute about 12 per cent. of the total teaching force in elementary schools. After ten years of service the teacher can, if disabled or sixty-five years old, retire on a pension of one-fourth of his salary. This amount increases by one-sixtieth for each additional year of service up to three-fourths of the salary. The pension fund is derived from a State and local contribution, together with a small deduction from the salary of the successor. The annual salaries of secondary school teachers range from 1500 to 5100 marks, and in the case of rectors to 7200 marks. In addition, they receive an allowance for house rent. The same regulations as to pensions that apply to primary teachers apply also to secondary ones, and in fact to most State officials, an exception being professors in the universities.

For the support of schools in Prussia, there are five sources of income. The most important of these is the State itself, which pays about one-half of the total required for teachers' salaries. The other sources are school societies, income from inherited property, Church funds, local taxes, and tuition. In the city schools the local taxes supply the larger part of the income; in secondary schools the tuition furnishes nearly one-half the sum required for support. The country schools, however, receive over two-thirds of their income from the State, the amount being a fixed contribution of 100 marks for each head teacher, 200 marks for each additional regular male teacher, and 150 marks for each female teacher, with 100 marks for each assistant teacher who is in the probation year. The normal schools are supported by the Government, as are also the universities. In the latter tuition is a considerable item. For their organization, see the article on UNIVERSITY.

For the development of the German public educational system, of which the Prussian system is taken as a type, see GERMANY, section on *Education*.

SWITZERLAND.

Each of the twenty-five cantons of Switzerland has its own separate and independent school organization, and there are very few federal regulations on the subject. The Federal Constitution of 1874 empowers the Bund to establish and maintain or assist a university or other institution for 'higher education.' This power has not been used except to continue the support of the Federal Polytechnic at Zurich, and to subsidize various cantonal higher institutions. The Constitution further states that all education, whether public or private, must be under the control of the cantons. They must provide for it, and make it compulsory and gratuitous. That they do this well is evident from the fact that in 1898-99 the ratio of attendance to population was greater there than in any other country in the world, while of the recruits in 1899 only .23 per cent. could not read. All attempts to establish anything like a centralized system have met with determined opposition by those who feared interference with linguistic or religious instruction in the schools. Indeed, the problems of education in Switzerland are more complex than in most countries. Some cantons are predominantly French, others are German, others Italian, and there is still a fourth vernacular, Romansch, extensively spoken. In cantons where one language predominates, another is usually the sole one spoken by a considerable part of the people. Moreover, Catholicism and Protestantism are face to face everywhere, and both fear that the free-thinkers might endeavor to exclude religious instruction from the schools if their control was centralized. The Constitution provides, however, that "it must be possible for the public schools to be attended by the adherents of all beliefs without hurting their freedom of belief or conscience." That not more than 3 per cent. of the attendance is in private schools, which are, moreover, patronized almost entirely by children of non-Swiss parentage, attests the satisfactory nature of the religious instruction in the public schools. A few cantons, as Geneva, exclude it entirely from the public system. Three additional Federal regulations affect education. The first forbids the labor in factories of children under fourteen, and limits that of those under sixteen. The second prescribes an examination for every recruit on entering the army at his twentieth year. The results of this are made known, and it stimulates educational effort, besides bringing into existence improving schools for recruits, and increasing the attendance at continuation schools. The final regulation concerns military drill, which by the acts of 1874, 1877, and 1883 is made a required part of every school programme, to be given to children between ten and fifteen years of age.

At the foundation of the school system of Switzerland we have at present the communal primary schools taking children from six to eleven years of age. After this they go either to the cantonal secondary schools proper, or to the advanced elementary schools, the so-called 'secondary' schools, the district for one of which embraces several communes, or to the communal continuation schools, usually held in the evening. There are also courses for adults given in the communes. The secondary schools are maintained by the cantons, and include professional and technical schools, with others variously styled middle schools, gymnasia, or pro-gymnasia. These are supplemented by cantonal universities and a Federal polytechnic. The teachers are licensed by cantonal governments on examination, or in some cantons on a diploma from a normal school. For the higher grades of work, an additional examination is required. There were in 1900 thirty-eight normal schools in Switzerland, most of them public institutions maintained by the cantons. In most cantons teachers are elected for life, either by a school board or at a general election. They are also usually pensioned at the end of their term of service. This is, in general, partly provided for by a fund to which they make regular contributions.

At the head of education in each canton there is either (1) an educational council, or, (2) an education ministry, headed by a director of education, who is a member of the Executive Council of the canton, or (3) a permanent education council, presided over by a director of education who is a political officer. The Canton of Bern belongs to the second type, and in the control of its schools it represents the extreme of centralization in Switzerland. The Director of Education controls the inspectors and frames the educational budget. His department determines, on consultation with certain authorities, the curriculum and methods of instruction in all public schools. Private schools must receive his authorization and that of the local school inspectors. The communal council votes the money for its primary schools, and nominates a school board to control the expenditure of this and the details of local school management. Several communes combine to form a secondary school, the control of which is in the hands of a commission, whose members are appointed by the various communal councils and the Director of Education. The middle or higher schools are usually cantonal schools, and are controlled by a commission appointed by the Educational Department. On the other hand, the Canton of Zurich has the least centralized of all the Swiss systems. Its central government is of the third type above mentioned. The Educational Council is composed of six men, four of whom are chosen by the Cantonal Council, and the other two by the whole body of teachers. It controls the organization of education in the canton. The commissions that direct the cantonal schools, i.e. the gymnasium, middle schools, higher schools, technical institutes, and training colleges, are appointed by the Cantonal Council on nomination by the Educational Council and Director of Education. For local organization and control of education there are provinces, districts, and communes. Each province has a committee, elected partly by the teachers alone, partly by the rest of the voters. Its function is to visit the schools and supervise their general conduct. There is a district committee elected by the voters to control the secondary school of the district, and determine the amount to be raised from local taxation for its support. For the primary school also there is a district organization, including usually several communes, the voters of which have a general assembly to determine school measures. The communal primary school is controlled by its local board. In Zurich alone of all the Swiss cantons, there are no school inspectors. In these two cantons, Zurich and Bern, we have illustrated the extremes between which the systems of the other cantons fall.

In Switzerland, generally, the support of all universities and higher secondary schools is by cantonal funds, aided occasionally by the cities in which such schools may be situated. The district and communal schools are supported by local taxes with cantonal aid. There exist for such support permanent communal funds made up of fees and gifts, and in all Switzerland they amount to over 58,000,000 francs. Moreover, twelve cantons have a permanent cantonal fund for Volksschule purposes. This does not, however, by any means provide for the support of the schools. Of the total expenditure on primary education, it is estimated that the local authorities furnish about two-thirds, the rest coming from the cantons; but in Geneva, where the French ideas prevail, the canton furnishes 74 per cent. of such funds. In general, in the wealthier cantons the canton furnishes more and the commune less of the total raised. The cantonal grants are made either in proportion to the total expense of the commune, or to its poverty and need for aid, or, as is more commonly the case, according to both these principles. The cantonal money goes largely as a contribution for teachers' salaries, the school equipment being left mainly to the communes. The canton usually contributes a greater proportion of the amount necessary to support the district secondary schools than of that for the communal primary schools. In the raising of school funds the general legislative bodies of communes and cantons usually fix the total amounts, and the distribution of expenditures is left in the hands of the school authorities. In some cases, however, as in Zurich, the communal school board can levy the local school taxes. Of the amount for the support of schools generally, the primary, higher primary, district, and continuation schools get nearly three-fourths; higher secondary and technical education receives less. For the organization of Swiss universities, see UNIVERSITY.

OTHER EUROPEAN SYSTEMS.

The systems already described offer examples that are typical of the education in other European States. In Sweden, elementary and secondary schools are supported by State subsidies and local taxes. Many schools and universities have in addition to such support the income from endowments. Control of schools is in the hands of local boards, but the central Government maintains a system of inspection and requires teachers to be graduates of normal schools. Public elementary education is gratuitous and compulsory between the ages of seven and fourteen. In Austria the ideals and methods of Prussian education prevail. The Italian system has the same general features of State subsidies and local and provincial taxes for the support of both elementary and secondary education. The minimum number of schools, the curricula, and the qualifications of teachers are also laid down by the State. Public elementary education is gratuitous and compulsory between the ages of six and nine. The State inspects all public schools, and private schools must receive authorization by the Government.

In Spain attempts have been made to establish a complete and efficient system of elementary education. The Government determines programmes and inspects schools, but furnishes little assistance to their support. The municipalities bear most of the burden and the compulsory law is not enforced. For most of the children education is free. In Russia about one third of the elementary education is carried on by the Church. Nearly all the rest is controlled and supported by the central Government acting under the Ministry of Public Instruction. The Church also takes part in secondary education, but here the Ministry bears most of the responsibility. There are a small number of locally supported schools and foundation schools.

UNITED STATES.

In the United States, the control and support of the education of the people have been left practically to the several State governments. The central Government has, however, dealt with the matter in a few cases. The Ordinance of 1787 provided that one section of each township in the Northwest Territory should be designated as school land, and that the proceeds of its sale should go to the support of public schools. After States were organized in this region, the funds derived from these lands were turned over to them for educational purposes. Similar grants of land were made to other new States, notably in 1841, in 1849, and in 1860. Up to 1900 about 86,000,000 acres had been devoted to this purpose. These grants were supplemented in 1836 by a gift to the several States of surplus funds in the National Treasury, the sums thus given being by most of them devoted to the support of education. In 1862 the Morrill Act set aside additional lands for the maintenance of colleges, in which agricultural and mechanical arts and military tactics were to be taught, and the State universities generally have been the recipients of these gifts. The central Government established, in 1867, the Bureau of Education, the main objects of which are the collection of statistics and the preparation of reports.

Each of the several States maintains a system of free public schools, including elementary, secondary or high schools, and, in the case of twenty-nine of them, universities as well. The older States, where great colleges and universities on private foundations have for a long time existed, have not in most cases added such institutions.

For the elementary schools three systems of control exist. The first of these is the district system, according to which the control of each school is left in the hands of a board elected by the people of the district in which it is placed. Under the township system all schools that are located within the region of a township are placed under one board. According to the county system, the schools of a whole county are under the control of county boards or school commissions. The district system was developed in New England after the scattering of the population, due to the cessation of the early Indian wars. It spread to the States of the West. Later, owing largely to the opposition of reformers, like Horace Mann, who maintained that the district system meant insufficient support and inexpert supervision for the common schools, New England came to adopt the township system. The county system has been peculiar to the Southern States from the first, and to-day it exists in nine States, all of which except Utah are Southern. The township system exists wholly or partially in eighteen States, and the district system in thirty-three.

With the development of more elaborate school systems, the supervision of the State became a more and more prominent feature. New York, in 1812, created a superintendent of common schools. This example was followed by others, and to-day there are State superintendents in all States. In most of them there is also a State board of education, which usually manages State school funds, and either directly or indirectly determines the qualifications of teachers. For more minute supervision, there is inspection either by a county superintendent or by the township or district committees. In thirty-five States the county supervision prevails. In New England the township school committees do the supervising. In addition, at least 835 cities have superintendents for their public schools. The demand for greater uniformity and effectiveness in the schools, as a whole, has led not only to the creation of larger units for the control or supervision of schools, but also to the establishment of State funds, and the levying of State taxes to supplement local contributions to the cause of education. The State taxes are relied on to raise as much as three-fourths of the school money in some States, and the amount is largest in the Southern States and those of the far West. The North Central and North Atlantic States generally rely more on local taxes, Massachusetts having no regular State tax. The local taxes are raised either in the township or, as in the far West and South, in the county. Where there is a county tax, this may usually be supplemented by a district tax levied by local vote. The levying of this tax is in the hands of the legislative bodies of State, county, or local division, although sometimes the educational bodies have the power of determining the amount to be raised. Frequently State law determines the minimum amount to be raised by local taxation.

In the earlier colonial period secondary instruction was given in what were called grammar schools. These institutions admitted children who had mastered merely the rudiments of English, and prepared them for college. The high schools were, however, preceded by academies. They were introduced into the United States as a substitute for both the grammar schools and the colleges. Many of these academies received, in addition to private endowments, large grants from the States. Some of them grew into colleges and later into universities. Academies for girls were established, and thus the way was paved for the higher education of women. The academies offered a somewhat wider and more liberal course of study than the older grammar schools and colleges, which were concerned mainly with the classics. In this way they led to the more liberal high schools and to the extension of the college curriculum.

The high school sprang up in response to a demand felt in the early part of the nineteenth century for the secularization and State control of secondary education. The English Classical School, later called the English High School, was founded in Boston in 1821. To-day a free public high school has to be maintained in every township in Massachusetts. New York, Maryland, Wisconsin, Minnesota, California, and other States have elaborate State laws governing high schools. In a great number of States their creation and control is left to localities, the actions of which in the matter are not regulated by the State. They are found, however, in all important cities.

The free elementary school may be said to exist in every locality of the United States, however sparsely inhabited. In the Western and Southern States the remoter districts are greatly helped by the contributions from the State funds, which are distributed in such a manner as to favor especially the smaller schools. The high schools, on the other hand, the existence of which is left almost universally to local initiative, are dependent largely on local support. Outlying districts are, in consequence, frequently without them, and when they exist there, the territory that they supply includes ordinarily a number of elementary school districts. Such divisions are either townships, as in New England, or counties, as in Maryland, the South, and occasionally in the West, or simply a convenient grouping of districts into what is called a union high school district. The board governing such schools is usually a specially created one, except where the township or county system prevails. In these cases, as with the district high school, the elementary and secondary schools are both managed by the same board.

The teachers in elementary schools (q.v.), up to the time of the establishment of county and State supervision, were selected by the school boards at their discretion. To-day, licenses or certificates are universally required before one can be elected to a teacher's position. In New England, however, these are granted by the school committees of the township, and so teachers are licensed by the same board by which they are elected to office. Elsewhere, throughout the Union, the certification is in the hands of city or county superintendents or boards of education, or State superintendents or boards of education. Certificates of various grades are issued in the several States. High school certificates are universally distinct from those for elementary teaching. All are granted either upon examination or upon credentials. Local certificates are valid only in the specific division where they are granted, but are frequently accepted as adequate credentials in other localities. State certificates are for longer periods, or even for life, while the local certificates expire after a few years.

The qualifications required of teachers in both elementary and secondary schools are being made continually higher, and this is true not only in regard to scholarship, but also to professional training. Three State normal schools were established in Massachusetts under the influence of Horace Mann in 1839-40. Since then these institutions have spread all over the Union. In addition, teachers' institutes and university summer schools and extension courses furnish professional training, while the leading colleges and universities have departments of education. In general, the tendency is for a continually greater proportion of elementary teachers to have at least a normal school training, and for high school teachers to be college graduates, who have done special work in the educational departments. Indeed, movements are on foot in several States, as California, to abolish the system of certification or examination altogether, and to grant certificates only to those who are graduates of normal schools or of colleges having professional courses.

The ideal course of study in the modern primary school in the United States, as outlined by the 'Committee of Fifteen' in 1894, includes reading, writing, spelling, composition, arithmetic, geography, simple lessons in natural science and general history, vocal music, drawing, with physical culture, and manual training. In many schools such a programme exists, and in most an effort is made to approximate it. The greatest difficulty arises in the ungraded country schools, where a single teacher is called upon to teach children from five to eighteen years of age, and representing, of course, all or most of the grades of the elementary school. The ideal grammar school course, as outlined by the same committee, in addition to the subjects of the primary grades, consists of English grammar, algebra, and United States history in the last two years, and either Latin, French, or German in the last year. Only in a few cases, however, are the foreign languages actually to be found in the grammar grades of the elementary school.

The course of study in the high schools is usually arranged with a view to presenting to the pupil from one to four different groups of subjects, any one of which he is at liberty to choose. The first of these groups constitutes the old classical course, but includes, besides Greek and Latin, modern languages or English, or both, algebra, geometry, and some history and natural science. What is commonly called the literary course drops the Greek and substitutes therefor more English, modern languages, or history. The scientific course drops Greek and sometimes Latin, laying stress on the sciences and mathematics instead. In some cases the classical languages are abandoned for the sake of English, history, civics, political economy, etc. Another course, which emphasizes preparation for business, and gives instruction in book-keeping, stenography, typewriting, commercial arithmetic, and law and business methods, is frequently found. The tendency is, however, to hand over such a course to a commercial high school or business college. It is a favorite line of work for evening high schools. Practically, all courses embrace algebra, geometry, civics, English, United States history, and physics. The sciences taught in the scientific course include chemistry, and often botany and zoölogy. Courses in solid geometry, higher algebra, and trigonometry are often offered in high schools.

Besides the ordinary and the commercial high schools, there have grown up numerous schools of the high school grade, offering instruction in mechanical and industrial lines, and extensive practice in manual training. They represent a demand that existed at the time of the establishment of the high schools, and is to-day extensive and growing. It is that secondary education should be an immediate preparation for life instead of merely for college. The 'accrediting' system, which prevails in Michigan and California, and by which high schools desiring to pass students without examination into the colleges are inspected by the faculties of the State universities, has been criticised for tending to reduce the high schools to mere 'feeders' for the universities. On the other hand, it must be said that the colleges have very extensively modified and enlarged the curriculum of the old days of purely classical instruction, so that each of the courses offered in high schools, except perhaps the commercial one, prepares for some line of collegiate work. Moreover, the 'accrediting' system has been the only system of effective inspection to which the high schools have been subjected, if we do not regard the college entrance examinations as attaining this end. The method of judging school work by the examination of pupils is, however, sometimes used even in elementary schools, where examinations for promotion or graduation are given by county authorities for all the schools of the county.

No effective system of pensioning teachers exists in the United States, although some laws have been passed aiming at this. They have relied on the contributions of teachers, who may join in or not as they choose, and consequently they have never amounted to anything of importance. On the other hand, the salaries of teachers in the elementary schools compare favorably with those abroad, averaging $58.59 a month for men and $50.92 for women in the West, where they are highest, and $31.21 per month for men and $31.45 for women in the South, where they are lowest.

Thirty of the States have compulsory education laws. The common period during which some instruction must be given is from the eighth to the fourteenth year. These laws, though not rigidly enforced, are nevertheless fairly effective, and attendance for at least part of the year is nearly universal for children of school age.

The evolution and present status of higher education in the United States, the most notable features of which have been the development of the State universities and the transformation of the colleges into universities, are dealt with in the article on UNIVERSITY. For some account of the characteristic features of the American schools, see the article on SCHOOLS.

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NATIONAL GALLERY. An important picture gallery in London, situated on the north side of Trafalgar Square. It was erected from designs by Wilkins between 1832 and 1838, and originally cost £96,000. It was enlarged in 1860, 1876, and 1886. The gallery, formed in 1824, was rapidly increased and has received important collections of paintings, presented or bequeathed by Vernon in 1847, Turner in 1856, and Ellis in 1876. The Peel collection was purchased in 1871. It has a valuable series of the older Italian artists, and contains the most costly single painting in the world, Raphael's "Madonna degli Ansidei," purchased from the Duke of Marlborough in 1884 for £70,000.

NATIONAL GUARD (Fr. *Garde Nationale*). From 1789 to 1871 the name of the French militia under municipal control, recruited from the burgher class. The French Revolution really brought about the creation of the National Guard, though guards of a like nature had existed in some towns previous to 1789. In that year, however, they were instituted in Paris, on the suggestion of Mirabeau, by the Revolutionary Committee, as a check on the Royalists. The National Guard thus constituted numbered 48,000 men, and Lafayette was given the command. Other battalions were organized in the provinces, and very soon, on paper, the total strength of the National Guard of France was 4,000,000—though the actual available force was not more than 300,000. In 1795, after the National Guard had gone through many of the most eventful scenes of the Revolution, it was reorganized on a less democratic basis. The result was that it showed Royalist leanings. It rose against the Convention shortly before the dissolution of that body, but the movement was promptly suppressed by Bonaparte with grape-shot. This was the insurrection of the 13th Vendémiaire (October 5th). For a time the National Guard ceased practically to exist. In 1805, however, the Emperor Napoleon reorganized it and it rendered him good and efficient service, particularly in the disastrous years 1813-14. After 1815 the National Guard was still maintained, but in 1827 it was dissolved by Charles X. Its members were allowed, however, to retain their arms, and many of them participated in the July Revolution of 1830, at which time the National Guard, as an institution, was revived. During the reign of Louis Philippe it was prominent. In 1848 it helped do away with the monarchy and establish the Republic. After undergoing various reorganizations in 1848, 1852, and 1855 it again became firmly established. The National Guard fought in the Franco-Prussian War in 1870, and at the capitulation of Paris its members were allowed to retain their arms. The result was that during the Commune of 1871 numbers of National Guardsmen went over to the Communists. (See COMMUNE.) After the establishment of the third French Republic the National Guard was abolished—its place being taken by the system of universal military conscription. Consult: Poisson, *L'armée et la garde nationale* (Paris, 1858-62); Thoumas, *Les anciennes armées françaises des origines à 1870* (Paris, 1890). For the National Guard of the United States, see MILITIA.

NATIONAL HYMNS. It is only within comparatively modern times that patriotism has found expression through the medium of a *national* song. In the few cases where a national hymn dates back several hundred years, it will be found to have assumed its representative character recently. National music is inseparably connected with folk-music (q.v.), but is a later development, and instead of representing the work of individuals (influenced by similar conditions and surroundings) it embodies the feelings, tendencies, and ideas of a people. In other words, folk-music is individual in its character rather than national. Needless to say, however, it is the forerunner and basis of national music, which often reaches its culmination in the national hymn. The following list of national hymns covers the most important ones. It is compiled largely from Sousa's *Airs of All Lands* (Philadelphia, 1890):

Argentine Republic—"Oid, mortales, el grito sagrado" (1810) (Hear, oh Mortals, the Sacred Call). Music by D. V. Lopez.

Austria—"Gott erhalte unsern Kaiser" (1797). Words by L. L. Haschka; music by J. Haydn.

Belgium—"La Brabançonne" (national air); by F. Campenhout.

Bohemia—"War-song of the Hussites."

Brazil—"Hymno da Proclamacão da Republica" (1889) (Hymn of the Proclamation of the Republic). Words by Medeiros e Albuquerque; music by Leopoldo Miguez.

Burma—"Kayah Than" (Sound the Trumpet).

Chile—"Dulce Patria" (national air); by Carnicer.

Costa Rica—"De la Patria." Music by M. M. Gutierrez.

Denmark—"King Kristian stod ved hojen

mast" (King Christian stood beside the mast). Words by Ewald; music by Hartman.

Ecuador—"Salve, Oh Patria."

Egypt—"Salaam, Effendina" (March of the Khedive).

Finland—"Vårt land" (Our Land). Words by J. L. Runeberg; music by F. Pacius.

France—"La Marseillaise" (q.v.). Words and music by Rouget de Lisle.

Germany—"Heil dir im Siegerkranz." Words by H. Harries to music of "God Save the King" (q.v.).

Great Britain—"God Save the King" (q.v.).

Holland—"Wien Nierlansch."

Hungary—"Isten áld meg a Magyart" (Lord Bless the Hungarian).

Italy—"Royal March" (national air); by G. Gabetti.

Japan—"Keeme᷍e gajo" (May the Empire Last).

Mexico—"Mexicanos, al grito de guerra" (national air) (Mexicans, at the cry of war); by J. Nunó.

Nicaragua—National air, by Blas Villatas.

Persia—"Salamati Shah." Music by A. Lemaire.

Peru—"Somos libres, seamoslo siempre" (We are free, let us be so ever).

Rumania—"Traeasca Regale" (Long Live the King) (1862). Words by V. Alexandri; music by E. A. Hübsch.

Russia—"Bozhe Zaria chrany" (God Protect the Czar) (1830). Words by Zhukovsky; music by A. Lyoff.

Salvador—"Saludemos la Patria" (Let us Hail our Country). Words by J. J. Canas; music by J. Aberle.

Servia—"God in His Goodness." Music by D. Jenko.

Spain—"Himno de Riego." Music by Herta.

Sweden—"Ur svenska hjertans" (Out of the Swedish Heart).

Switzerland—"Rufst du, mein Vaterland," to music of "God Save the King."

United States—"Star Spangled Banner" (q.v.) and "Hail Columbia" (q.v.). (The former is played in the United States Navy at morning colors; the latter at evening colors.)

Uruguay—"Himmo Nacional de la República Oriental del Uruguay" (National Hymn of the Republic of Uruguay). Music by D. I. Deballi.

Venezuela—"Gloria al bravo pueblo" (1811) (Honor to a Brave Nation). Words by V. Salias; music by J. Sandaeta.

Consult: Engel, *An Introduction to the Study of National Music* (London, 1866); Fitzgerald, *Stories of Famous Songs* (ib., 1898).

NATIONALISM. A term applied to the plan of social reform outlined in Bellamy's *Looking Backward.* The scheme involved the nationalization of the processes of production and distribution. It is a form of socialism which emphasizes the social importance of economic equality.

The first Nationalistic Association was organized by a company of Bellamy's readers in Boston in 1889. A statement of its views condemned the system of competition and expressed the belief that it would gradually be supplanted by a system of universal brotherhood. The movement spread rapidly and by 1891 there were in the United States 162 clubs. In some States, notably California, an active part was taken in politics. In May, 1889, a magazine, the *Nationalist,* was started which existed two years. Its place was then taken by the *New Nation,* founded by Bellamy, which also lasted two years. The Nationalists exercised a considerable influence upon the People's Party, but ceased to play any considerable independent rôle. The movement spread to England, where 'The Nationalization Society' was organized July 3, 1890. See SOCIALISM.

Consult: Bellamy, *Looking Backward* (Boston, 1887); and id., "The Programme of the Nationalists," article in the *Forum* (March, 1894); Ely, *Socialism and Social Reform* (New York, 1894).

NATIONAL MUSEUM. See UNITED STATES NATIONAL MUSEUM.

NATIONAL NICKNAMES (ME. *nekename, ekename,* by faulty liaison or sandhi for *an ekename,* additional name, from *eke* + *name*). National nicknames are as a rule first employed by the people themselves. By the familiar JOHN BULL is meant the English nation. The name was first used in the satire of Dr. John Arbuthnot, *Law is a Bottomless Pit.* The sobriquet of JONATHAN or BROTHER JONATHAN has gone through three distinct phases. First, between 1776 and 1783 it was employed, as a mildly derisive term, by the Loyalists, and applied by them to the Patriots; secondly, between 1783 and 1812 it was adopted by the Americans themselves, who used it to designate a country bumpkin; and thirdly, during the war with England in 1812-15 it came into universal vogue as a national sobriquet. The accepted story, attributing the origin of the term to a remark made by Washington in allusion to Governor Jonathan Trumbull of Connecticut, originated in 1846, and has recently been shown to be without foundation. UNCLE SAM, the familiar sobriquet of the United States government or people, is commonly stated to have originated at the outbreak of the war with England in 1812, when some one, asking what the letters 'U.S.' marked on casks and barrels meant, was facetiously told that they referred to "Uncle Sam" or Samuel Wilson, an obscure citizen of Troy, N. Y., said to have been an inspector or a contractor. This story has not been found earlier than 1842, when it was given in J. Frost's *Book of the Navy,* p. 297. No doubt Frost copied it from some newspaper, but the story lacks proof. The term Uncle Sam has yet to be traced earlier than the fall of 1813, when we read of "Uncle Sam's Men," meaning United States custom house officers, and are told that "*Uncle Sam,* the now popular explication of the U. S., does not pay well." The term appears to have arisen somewhere in the North, perhaps in New York or Vermont; and its origin was presumably merely a jocular extension of the abbreviation U. S., then very common. For three years it ran a career in the newspapers, in 1816 it appeared in a book, and by 1817 its popularity was well established. NICHOLAS FROG, the typical Dutchman, was first used by Arbuthnot in his *Law is a Bottomless Pit.* JEAN CRAPAUD (Toad) is the popular nickname of the French nation, collectively taken, and dates back to the time when the ancient kings of France used for their device in heraldry 'three toads, erect, saltant,' or in a leaping posture, and Paris was called Lutetia, or 'Mudland.' Its streets were so quaggy that the French Court, with a point to its pleasantry, called its inhabitants 'frogs,' since they, like the reptiles, lived in mud. For the French-Canadian we have JEAN BAPTISTE, and the French peasant is facetiously called JACQUES BONHOMME. DEUTSCHER MICHEL is the facetious nickname applied to the German people, and intended particularly to satirize the weaknesses and foibles of the national character, especially their proverbial lethargy, heaviness, and credulity. The name Michael is used in German to designate any simple, uncultured countryman, and it has probably gained this significance by confusion of the Hebrew word with the old German michel-gross. SAWNEY is the sportive designation sometimes applied by the English to the Scotch, and is probably a corruption of Sandy, the abbreviation of Alexander. Sawney has a humor of his own, strong, and irrepressible, that will break out in spite of worldly thrift, kirk-session, cutty-stool, and lectures. It was first given to the Scotch by Coleridge. TAFFY, the Welshman, is a corruption of David, one of the most common of Welsh names. COLIN TAMPON is the reproachful, contemptuous nickname given to the Swiss in ancient times, and supposed to imitate the sound of their guns. PADDY, from Patrick, refers to the Irish. JOHN CHINAMAN is the popular nickname for the Chinese. The first record of this use was in *A Letter to the Committee of Management of Drury Lane Theatre, London, in 1819.* The Russian nickname, IVAN IVANOVITCH, denotes the typical muzhik.

NATIONAL REPUBLICAN PARTY. See WHIG PARTY.

NATIONAL STANDARDS AND EMBLEMS. See STANDARD and *National Coats of Arms* (with Plates), under HERALDRY.

NATIONAL UNION. A fraternal beneficial society organized for purposes of mutual help and improvement, and incorporated in 1881 under the laws of Ohio. The number of members at the close of 1902 was 60,000; the number of councils 850. The insurance in force amounted to $140,000,000, and the death benefits paid since the date of organization to over $15,000,000.

NATIONAL WORKSHOPS, or ATELIERS NATIONAUX, ȧ'te-lyâ nȧ'syō'nō'. A plan of giving public employment attempted in France in 1848. The Provisional Government organized on the overthrow of Louis Philippe by the February Revolution passed a decree (February 25th) defended by its socialist members—Louis Blanc, and a few others—declaring the 'right to work' and pledging the Government to guarantee employment for idle workmen. A few days later 'national workshops' were established. As a matter of fact there were no workshops opened; the work provided was in the open air, and consisted largely in planting trees, digging, and constructing roads—works for which few of the applicants were adapted. Their number, however, increased from day to day and at one time reached 130,000. No work could be found for many of the applicants; these received 30 cents a day, while those actually employed were paid 40 cents, although the work they performed was scarcely worth the additional 10 cents. Under these circumstances many workers who were in private employ demanded higher wages or were content to give up their places and remain idle so long as they might receive 30 cents per day for doing nothing. Several attempts were made to bring the scheme within the range of practical feasibility; but political disturbances and personal jealousies made it impossible to carry them out. After four months' trial and a total expenditure of 14,000,000 francs, the system was abandoned when General Cavaignac became Chief of the Executive.

The national workshops are sometimes erroneously confounded with the *ateliers sociaux* in Louis Blanc's plan of labor organization.

NATIVE (from Lat. *nativus*, natal, inborn, from *nasci*, to be born; connected with Gk. γίγνεσθαι, *gignesthai*, Skt. *jan*, AS. *cennan*, archaic Eng. *ken*, to beget). A term applied in chemistry and mineralogy to elements, especially the metals, when found in nature in a chemically free state.

NATIVE BEAR. The Australian koala (q.v.).

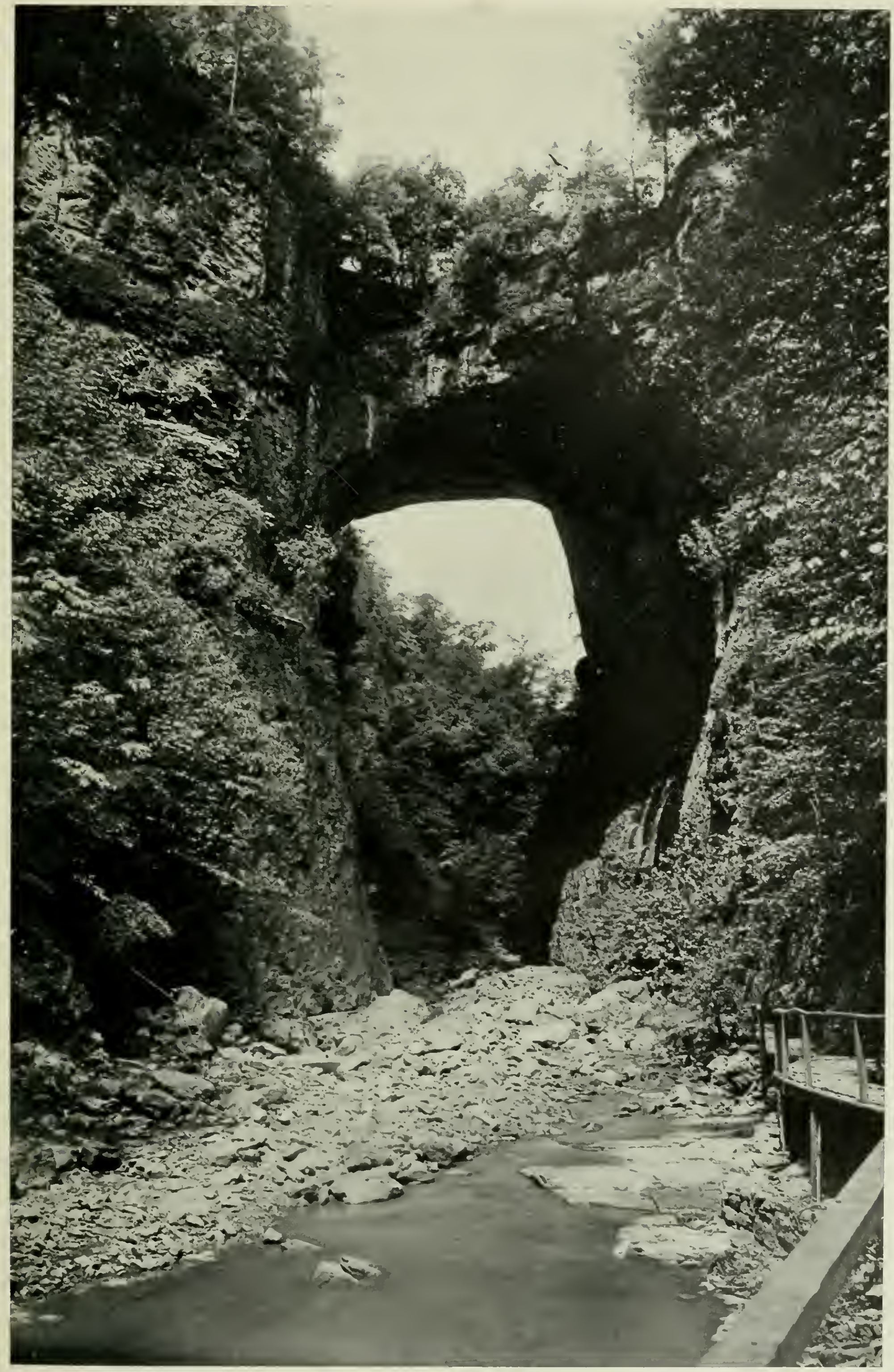
NATIVE COMPANION. An Australian Balearic crane (q.v.).

NATIVITY (Lat. *nativitas*, birth, from *nativus*, natal, inborn), THE. A frequent theme of painters. The most celebrated representation of the subject is the famous picture by Correggio known as "La Notte" (the night), in the Dresden gallery. The whole picture is illuminated by the light proceeding from the body of the beautiful child. Above is a group of angels, while day is just breaking in the sky.

NATORP, nä'tōrp, PAUL GERHARD (1854—). A German philosopher of the Neo-Kantian type. He was born at Düsseldorf; studied in Berlin, Bonn, and Strassburg; and in 1885 became professor at Marburg. His works include: *Descartes's Erkenntnisstheorie* (1882); an edition of Democritus's *Ethics* (1893); *Religion innerhalb der Grenzen der Humanität* (1894); *Platos Staat* (1895); *Socialpädagogik* (1898); and *Platos Ideenlehre* (1903).

NA'TROLITE (from Eng. *natron*, from Ar. *natrūn*, *nitrūn*, native carbonate of soda, from Gk. νίτρον, *nitron*, λίτρον, *litron*, natron, of Semitic origin (cf. Heb. *neter*, from *nātar*, to loose) + Gk. λίθος, *lithos*, stone). A mineral sodium-aluminum silicate of the zeolite group. It crystallizes in the orthorhombic system, has a vitreous, sometimes pearly, lustre, is transparent or translucent, and ranges in color from white or colorless to gray, yellow, and red. Natrolite is found in cavities in basalt and other igneous rocks, at various localities in Bohemia, the Tyrol, Ireland, and Scotland, in Nova Scotia, in the Lake Superior region, and at Bergen Hill, N. J. It is capable of receiving a high polish, and has been used as a gem for rings and other ornaments, especially in the form of the letter N in initial jewelry.

NA'TRON. A hydrous sodium carbonate that crystallizes in the monoclinic system, and is found in nature only in solution, as in the Soda Lakes of Egypt. Of similar character is the *Trona*, an impure hydrogen sodium carbonate, which occurs as thin crusts along the margin of lakes in Egypt, Siberia, Tibet, and on the borders of the Black and Caspian seas. These minerals form the source of the soda salts of the ancient Egyptians, and were used by them in their



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THE NATURAL BRIDGE

arts, especially in embalming. Of like character is the carbonate of soda found at the bottom of the lake at Lagunillas near Mérida, Venezuela, which is called by the Indians *Urao*. Similar efflorescences are found in San Bernardino and Inyo counties, California, where they are formed by the spontaneous evaporation of saline waters.

NATTER, nät'tẽr, Heinrich (1846-92). An Austrian sculptor, born at Graun, Tyrol. He studied at the Polytechnicum in Augsburg and at the Academy in Munich. He lived in Munich and afterwards in Vienna. Besides many portrait busts of celebrities, he produced a number of memorial statues and groups, notably the "Zwingli Monument" (1885) at Zurich; the "Haydn Monument" (1887) in Vienna; "Walther von der Vogelweide" (1889) at Bozen; and the heroic statue of "Andreas Hofer" (1892) on Mount Isel, near Innsbruck, his principal work.

NATTERJACK (from AS. *nædre*, Goth. *nadrō*, Ger. *Natter*, adder + *jack*). A common, light-colored, rather smooth toad (*Bufo calamita*), of Western Europe, found in sandy districts. Its active habits have given it the name 'running toad' in some parts of England.

NATTIER, nå'tyå', Jean Marc (1685-1766). A French portrait painter, born in Paris. He was the son of the painter J. B. Nattier, and a pupil of Jean Jouvenet. He won the Academy prize in 1700, became a member of that body in 1718, and professor in 1752. He went to Amsterdam in 1715 and there painted portraits of Peter the Great, of his wife, Catharine I., and of members of their suite. If Rigaud is the painter par excellence of the men of his time, Nattier has done as much for the women. There are many portraits by him at Versailles, such as those of Marie Leszczynska, Madame Henriette de France (1751-54), Madame Adelaide, Madame Victoire, and Louise Henriette de Bourbon. Madame de Châteauroux as "Dawn," and Madame de Flavacourt as "Silence," are two of his best known works. "Magdalen in a Grotto" is his only work in the Louvre.

NAT TURNER'S INSURRECTION. See Turner, Nat.

NATUNA (nå-tōō'nå) **ISLANDS.** A group of islands in the South China Sea, northwest of Borneo, belonging to Holland (Map: Australasia, C 2). They are for the most part densely wooded and mountainous, but have some cultivated tracts which produce maize, rice, sago, and cocoanuts. The area is estimated at 803 square miles, and the inhabitants, who are chiefly Malay fishermen, number about 8000.

NATURAL (from Lat. *naturalis*, according to nature, from *natura*, nature, from *nasci*, to be born; connected with Gk. *γίγνεσθαι*, *gignesthai*, to become, Skt. *jan*, to beget, AS. *ecunan*, obsolete Eng. *ken*, to beget). In music, the sign ♮, which, placed before a note, counteracts the effect of a previous ♯ or ♭ and restores the note to its normal or natural place. To counteract a double sharp or a double flat (×, ♭♭) a single natural is used, although it was formerly customary to write a double natural (♮♮). This form is superfluous and incorrect. In a key with many sharps or flats a doubly raised or lowered interval is generally restored to the chromatically altered tone required by the key signature. Thus, in G flat a b♭♭ would be restored, not to b, but to b♭, which is indicated by ♮ ♭. Likewise in a signature with sharps the *natural* sign appears as ♮ ♯.

NATURAL BRIDGE. One of the chief natural curiosities in the United States. It is situated in Rockbridge County, Va., 115 miles west of Richmond (Map: Virginia, E 4). The bridge spans a deep chasm, through which a small stream flows. It is composed of a hard siliceous limestone in horizontal strata, and is the remnant of the roof of a great cave which formerly covered the gorge. This remnant now remains in the form of an arch 215 feet high. The span of the arch is from 45 to 60 feet, and the thickness of its crown is about 40 feet, while its average width is 60 feet. A public road passes across it.

NATURAL GAS. See Gas, Natural.

NATURAL HARMONICS. See Harmonics.

NATURAL HISTORY. A term used at different times and by different authors in a variety of senses. It was applied at first to the study of all natural objects, including minerals, rocks, and all living beings. The study of external nature, and of the phenomena or laws governing the movements of natural bodies, was formerly opposed to metaphysics, history, literature, etc. After a while astronomy and chemistry were eliminated from natural history; then natural philosophy, or what is now called physics, was separated from chemistry. But natural science, as distinguished from physical science, has made such progress that we must now know whether our naturalist is a mineralogist, a geologist, a paleontologist, a botanist, a zoölogist, or a specialist in some narrower department of biological study. At present natural history is confined to the study of organic nature, or biology, and students of general physiology and morphology are called biologists. See Biology; Bionomics.

NATURAL HISTORY OF SELBORNE. A work by Rev. Gilbert White (1789). It was produced from letters written by the author to Thomas Pennant and to Daines Barrington on outdoor life in a Hampshire village. Written in a style simple and entirely free from self-consciousness, it shows wonderful observation of nature, with a charm that made it an English classic.

NATURALISM. The name given in philosophy to any system which seeks to explain the order of the universe by efficient causation alone, without calling in the aid of conscious purpose. (See Causality.) The most prevalent forms of naturalism have been mechanistic, i.e. have attempted to reduce efficient causation to mechanical causation. For instance, the systems of Democritus, Epicurus, and Lucretius attempted to account for the universe as we know it by the fall of atoms. A more elaborate form of the same attempt is to be found in modern materialism (q.v.). But naturalism need not be merely mechanistic. It may recognize the fact that psychic phenomena have laws of their own which cannot be deduced from the laws of motion; for the recognition of unique psychological laws may very well go with a refusal to regard the whole course of nature, physical and psychical, as in any way controlled by an overruling purpose. Many so-called materialists, e.g. Feuerbach, are not materialists at all, but naturalists in this sense of the term. Opposed to the naturalists are the teleologists. See TELEOLOGY; LOTZE; and consult: Ward, *Naturalism and Agnosticism* (London, 1899); König, *Die Entwicklung des Causalproblems* (Leipzig, 1888-90); Sigwart, "Der Kampf gegen Zweck," in *Kleine Schriften* (2d ed., Freiburg, 1889); Erhardt, *Mechanismus und Teleologie* (Leipzig, 1890).

NATURALISM (in Literature). See REALISM AND NATURALISM.

NATURALISTS, AMERICAN SOCIETY OF. An association organized in 1883, to exchange ideas relating to the problems of natural history. The society now has an active membership of 230. The meetings of the society are held annually.

NATURALIZATION. The act or process by which in any country an alien acquires citizenship. The process consists of two parts, viz. the formal renunciation of the old allegiance and the assumption of a new allegiance. The rights and privileges of naturalized citizens are enumerated and defined by the municipal law of every State. In few or no cases are they the same as those of native-born citizens. In the United States they enjoy the same civil rights as natural-born citizens, and all of the political rights except eligibility to the offices of President and Vice-President. The right of a subject or citizen to renounce his allegiance with a view to acquiring citizenship in another State is now generally recognized. (See EXPATRIATION.) In order to prevent possible conflicts of jurisdiction growing out of the practice of naturalization and the return of naturalized citizens to their native country, it is customary for States to enter into treaties for the regulation of matters relating thereto. Thus, the United States has entered into eleven treaties with foreign powers, in all of which, except that with Great Britain, it is provided that five years of uninterrupted residence with formal naturalization constitutes citizenship on both sides. A majority of them contain the provision that a naturalized citizen returning to his native State shall, after an uninterrupted residence there of two years, be presumed to have renounced his acquired citizenship. It is also a general principle that naturalization does not release an individual from any obligations to his native State which he may have incurred before emigration, as, for example, military service; and if he returns to such State he may be held to the fulfillment of his obligations without being able to invoke the protection of the United States, unless treaty stipulations provide otherwise.

In the United States, the whole matter of naturalization is subject to the regulation of Congress. This power is held to be exclusive, and cannot, therefore, be exercised by the States. However, it is not construed to deprive the State of the right to restrict the civil and political rights of aliens, nor does it prohibit them from granting the suffrage to aliens, or allowing them to hold office. The statutes of Congress provide that any alien, with certain exceptions, may become a naturalized citizen of the United States by making a declaration on oath, before a circuit or district court of the United States, or a district or supreme court of the Territories, or a court of record of any of the States having common-law jurisdiction, at least two years prior to his admission, that it is his *bona fide* intention to become a citizen of the United States, and to renounce at the same time all allegiance to any foreign State, as well as all hereditary titles of nobility which he may hold. This step is known as the declaration of intention, and after it is made the declarant is perhaps morally entitled to a qualified amount of protection from the United States, although it cannot be claimed as an absolute right. (See KOSZTA AFFAIR.) The full admission to citizenship follows after due proof has been furnished that the declarant has resided in the United States at least five years next preceding his admission, and within the State or Territory where the court sits for one year. By the act of 1790 the term of residence required was two years; in 1795 it was extended to five years; and in 1798 it was raised to fourteen years. Since 1802, however, the term has remained at five years. A minor alien who has resided in the United States for a period of three years next preceding his arrival at the age of twenty-one, and who has continued to reside there up to the time of his application, may be admitted to citizenship without the previous declaration, provided he has resided in the United States for a period of five years. Any alien seaman who has served three years on a merchant vessel of the United States subsequent to the date of his declaration may become a citizen by the production of a certificate of discharge and good conduct. The widow and children of an alien who has declared his intention of becoming a citizen, but dies before completing the final steps of naturalization, are considered as citizens upon taking the oath prescribed by law. An alien woman who marries a citizen of the United States, and who herself might be lawfully naturalized, is considered a citizen. Children born outside of the limits of the United States, but of parents who are citizens, are considered as citizens; but the rights of citizenship in such cases do not descend to children whose parents never resided in the United States. Since 1870 the privilege of naturalization has been extended to aliens of African nativity and of African descent. Chinese aliens are excluded by statute of Congress from the privilege of naturalization.

In Great Britain formerly the naturalization of an individual could be effected only by special act of Parliament. It was not until 1844 that a general naturalization law was enacted. This was followed by the comprehensive act of 1870, which with a few changes is the law now in force. By this act it is provided that an alien who has resided within the United Kingdom for a period of five years, and who intends to continue his residence therein, may apply to one of the principal secretaries of State for a certificate of naturalization, presenting such evidence as to residence and character as may be required. It is wholly within the discretion of the secretary as to whether the certificate shall be granted. A naturalized citizen in Great Britain is entitled to all the civil and political rights and privileges, and subject to all the obligations of natural-born citizens, except that when in his native State he shall not be deemed a British citizen unless he has complied with all the laws of that State regarding expatriation. Consult: Davis, *Elements of International Law* (New York, 1900); Woolsey, *International Law*

(New York, 1899); *Revised Statutes of the United States*, title "Naturalization;" and Moore, *Digest of International Law* (Washington, 1903). See ALIEN; ALLEGIANCE; CITIZEN.

NATURALIZATION. In biology, the establishment of plants and animals in a new region, especially through the agency of man. Primarily, exotic species soon become feral and compete with indigenous species. They frequently never gain a foothold, but if they do they usually spread at first with extraordinary vigor, owing to the absence of their natural enemies. But later an adjustment with the other species in the country occurs, and after that the disproportionate numbers of the introduced form disappear, i.e. the new species becomes adjusted or 'naturalized.' Compare ACCLIMATIZATION.

NATURAL LAW. GREEK PHILOSOPHY. Some of the Greek Sophists, and later the Epicureans, held that law and justice were arbitrary conventions established by the weak for self-defense against the natural right of the strong. Socrates, in this as in other matters, antagonized the theories of the Sophists; but it was Aristotle who formulated the conception of natural justice which has remained dominant to the present day. In his view justice is in part legal, in part natural. Legal justice deals with matters which must be regulated, but which may be variously regulated. Natural justice, on the other hand, is not arbitrary; its rules are everywhere similar. The Stoics went further: they asserted that the rules of natural justice were founded on reason, and were therefore discernible by reason; and the later Stoics termed this rational order natural *law*.

ROMAN JURISPRUDENCE. The Roman lawyers noted the fact that many substantially identical rules were observed by all the Mediterranean nations; and to this common law they gave the name 'law of nations' (*jus gentium*). In the first century before Christ they began to speak of 'natural law.' In the Roman juristic literature the term is used in four different senses: (1) Natural law is identified with universal law (*jus gentium*). This is practically the Aristotelian sense. (2) Natural law is contrasted with the law observed by all nations; e.g. it is said that by nature all men are free, and that slavery has been introduced by the law of nations. This is the Stoic conception of natural law. (3) Sporadically, the Epicurean idea appears, as when it is said that buyers and sellers have a natural right to overreach one another as regards price. (4) Ulpian has a theory which seems to have been peculiarly his own, but to which Justinian gave a factitious importance by including in his Institutes Ulpian's definition: "Natural law is that which nature has taught all living things." The illustrations, which refer to rudimentary family life, are biological rather than legal. Although the Roman jurists referred to the law of nature for the interpretation of their own law, and even drew from it supplementary rules where their own law was silent, they referred far more frequently, and for the same purposes, to 'natural reason' and to 'equity;' and they never ascribed to the law of nature such authority as to question the validity of a Roman rule because it was not in accordance with natural law. See CIVIL LAW; JUS GENTIUM; JUS NATURALE.

MEDIÆVAL THEORIES. The doctrines of Aristotle and of the Roman jurisprudence were generally accepted in the Middle Ages as authoritative, and many attempts were made to reconcile them. There was a marked tendency to identify natural law with the law of God: in the Decretum of Gratian it is declared that natural law is identical with the Golden Rule. Thomas Aquinas divided all law into four classes: eternal, divine, natural, and human. The eternal law is the controlling plan of the universe, existing in the mind of God. A part of this eternal law has been directly revealed to men; this is the divine law. Another part is discerned by human reason; this is natural law. Except in its fundamental principles, natural law is not immutable, for "it seems to be natural to the human reason that it comes gradually from the imperfect to the perfect." Human law is the application of natural law to particular conditions. The practical influence of these theories upon the development of European law during the Middle Ages was slight. In the development of the English common law, as in the development of the Roman Imperial law, appeals to natural reason were far more frequent than appeals to natural law. In England, however, as well as on the Continent, the general law merchant, which was *jus gentium* in the Roman sense, was recognized as natural law.

MODERN THEORIES. NATURAL LAW AS A FACTOR IN LEGAL REFORMS. The general effect of the Protestant Reformation was to free the conception of natural law from ecclesiastical associations and limitations, and to reëmphasize its rational character. Natural-law theories became effective factors in the reform of the law. In the seventeenth century natural law was treated as a source of international law; and many rules which had not yet become rules of international custom attained this position through the writings of Grotius, Pufendorf, and others on 'the law of nature and of nations.' Later, during the eighteenth century and the earlier years of the nineteenth, when the great national codes of civil and criminal law were drawn up in Prussia, Austria, France, and other countries, natural-law theories helped to give the legislators a more independent attitude toward established law and custom. In England utilitarianism played a similar part in facilitating law reform.

NATURAL RIGHTS AS THE BASIS OF POLITICAL REVOLUTION. The theory of Cicero and of Thomas Aquinas, that laws in conflict with natural law are not truly laws, developed its revolutionary (not to say anarchistic) possibilities when the interpretation of natural law passed from secular and ecclesiastical authorities to the people at large. The theory that the popular consciousness is the true interpreter of that natural law by which all rulers are bound, found frequent expression before the close of the Middle Ages; e.g. in the writings of Marsiglio of Padua. With the Protestant Reformation these theories became practical forces in matters religious and political, and the tendencies which they represented first obtained a temporary triumph in England under the Commonwealth. Those legal rights which Englishmen had succeeded, through centuries of conflict, in asserting against the Crown were brought by the Levelers into connection with the natural-law theories of the Continent, and thenceforth the rights of the individual to life, liberty, and property were 'natural' rights. To these were soon added the right to participate in the constitution of government. As formulated by Locke and reformulated by Rousseau, these natural-right theories legitimized the revolutions which established the modern constitutional State.

REACTION AGAINST NATURAL-LAW THEORIES. The first noteworthy philosophical reaction against the revolutionary natural-law theories was that of Hobbes (q.v.). Equally hostile to natural-law theories was, especially at the outset, the historical school of jurisprudence. The conception of law as a product of historical evolution in each nation led to the assertion that there could be no such thing as eternal or universal law. With the development of comparative study, however, it is again perceived that beneath all the diversity of national laws there is a substantially uniform element which may be called human or universal or natural. This natural law, however, is substantially the *jus gentium* of the Romans or the 'natural justice' of Aristotle, and not the natural law of the Stoics or of the Middle Ages; for it is not discerned by reason, it is rather revealed by the conduct of the human race. See JURISPRUDENCE and LAW.

The following are some of the more recent works; in them will be found ample references to the older literature. Ahrens, *Cours de droit naturel* (8th ed., Leipzig, 1892); Anzilotti, *La scuola del diritto naturale* (Florence, 1892); Bergbohm, *Das Naturrecht der Gegenwart* (Leipzig, 1892); Gierke, *Johannes Althusius und die Entwickelung der naturrechtlichen Staatstheorien* (ib., 1880); Lorimer, *Institutes of Law: A Treatise of the Principles of Jurisprudence as Determined by Nature* (2d ed., Edinburgh, 1880); Mendizabal y Martin, *Elementos de derecho natural* (2d ed., Saragossa, 1897-99); Meyer, *Institutiones Iuris Naturalis Secundum Principia S. Thomæ Aquinatis* (Freiburg, 1900); Rothe, *Traité de droit naturel* (Paris, 1884-95).

NATURAL RIGHTS. See NATURAL LAW.

NATURAL SELECTION. The evolution idea is as old as the time of the Greek philosophers, but that form of it called natural selection, or Darwinism, dates from 1858, when the theory was stated by Darwin (q.v.) and also by Wallace (q.v.), each independently of the other. Nearly a century earlier Buffon, and afterwards Erasmus Darwin, had suggested that species were mutable, and that all living beings had descended from some primitive type or germ, the transformation having been effected by changes of climate, food, exercise, and so on. But the real founder of the modern theory of organic evolution was Lamarck (q.v.; see also LAMARCKISM). The chief agents or factors of organic evolution which he proposed were changes of environment, of climate, soil, food, temperature, use, and disuse, while he briefly mentions the agency of competition, the results of geographical isolation, and the swamping effects of crossing, besides use-inheritance. Although supported by a few, though well-selected, facts, Lamarck's views were, owing to the influence of Cuvier, and the deep-seated prejudice of the times, ignored and well-nigh forgotten, except to be called up and ridiculed. Yet between the date of Lamarck's death in 1829 and shortly before 1858 nearly thirty naturalists, most of them of eminence, had publicly enunciated in a tentative way evolutional views—among them Grant, Wells, Naudin, D'Halloy, Schaaffhausen, Wallace in 1855, and others. Meanwhile Hutton and Lyell had advanced uniformitarian views in geology. Progress in the knowledge of the flora and fauna of the earth had greatly increased. The cell doctrine had been advanced; the sciences of paleontology, embryology, and morphology had been founded and were rapidly gaining ground.

As early as March, 1852, Herbert Spencer, in an essay published in the *Leader*, advocated the theory of the modification of species by changes of environment, and a few years later adopted the word 'evolution,' applying it to psychology, and later to sociology and comparative religion.

HISTORY OF THE RISE OF THE SELECTION THEORY. Such was the state of certain isolated scientific and philosophic minds, though the rank and file of naturalists were either indifferent or opposed to the theory of descent, when in 1858 the preliminary essays of Darwin and of Wallace were given to the public. Their views, which were destined to give such a decided impulse to biological inquiry, were independently confirmed by several biological experts after years of experience and research in all parts of the globe. The botanist Sir Joseph D. Hooker, when surgeon and naturalist of the *Erebus* in the Antarctic expedition under Sir John Ross, published a flora of New Zealand, a *Flora Antarctica*, and in 1859 published his *Introduction to the Flora of Australia*, in which he advocated the selection theory. Before this (1858) Wallace had spent four years on the Amazon, and afterwards eight years in the East Indian Archipelago, making large collections and careful observations. Meanwhile Charles Darwin, as the naturalist of the *Beagle* for nearly five years (1831-36) during her voyage around the world, was constantly exercising his marvelous powers as an observer. What chiefly led him, as early as 1839, to begin to favor the theory of descent, were his observations on the fossil mammals, the colossal armadillos and sloths, and the like, of South America, which appeared to be the ancestors of the degenerate forms now living; also the occurrence of local species on each of the Galapagos Islands, which he found to be very similar to those of the South American coast, and yet slightly different. The result was that after twenty years of observations, experiments in his garden, and reflection, he elaborated the theory of natural selection.

On the first of July, 1837, he opened his first note-book to record any facts bearing on the origin of species, but "did not become convinced that species were mutable until two or three years had elapsed." More than a year after (October, 1838), he says: "I happened to read for amusement Malthus on *Population*, and being well prepared to appreciate the struggle for existence which everywhere goes on from long-continued observations of the habits of animals and plants, it at once struck me that under these circumstances favorable variations would tend to be preserved, and unfavorable ones to be destroyed. *The result of this would be the formation of new species.*" It is worthy of notice that Malthus was the father of natural selection, that the *Essay on Population* was the source of inspiration of both Darwin and Wallace, and that to this fact is apparently due the exact similarity in, or coincidence of, their views. Darwin's preliminary essay, together with that of Wallace, who had also read Malthus's *Essay on Population* containing nearly identical selection views, was published in 1858. In the following year appeared Darwin's epoch-making *Origin of Species.* His theory was at once accepted by Canon Tristram, Lyell, Hooker, Bates, Huxley, and others in Great Britain; in the United States of America by Asa Gray and Jeffries Wyman, and in Germany by Haeckel, while Fritz Müller, working on the same lines in Brazil, fully accepted and extended his views. That the time was ripe for the development and growth of the evolutionary idea was proved by its speedy and general acceptance by nearly all working naturalists and thoughtful minds. Moreover, the selection phase was easy to understand by laymen, and soon the multitude accepted the new views.

THE NATURAL SELECTION THEORY EXPLAINED. The theory of natural selection is based on the facts of variation. As to the causes of variation, Darwin does not say much in the *Origin of Species.* Basing his theory on the fact that variations are constantly and spontaneously arising, he claimed that the favorable variations have succeeded in the struggle for existence, while those unfit or unfavorable have perished.

He also remarked that as long as the conditions of life remain the same, we have reason to believe that a modification which has already been inherited for many generations may continue to be inherited for an almost infinite number of generations. We are also told that as each land had undergone great physical changes, we might have expected to find that organic beings have varied under nature in the same way as they have under domestication. "And if there be any variability under Nature, it would be an unaccountable fact if natural selection did not come into play." "If, then," he asks, "animals and plants do vary, let it be ever so little or so slowly, why should we doubt that the variations or individual differences which are in any way beneficial would be preserved and accumulated through natural selection, or the survival of the fittest? If man can by patience select variations useful to him, why, under changing and complex conditions of life, should not variations useful to Nature's living products often arise, and be preserved or selected? What limit can be put to this power, acting during long ages and rigidly scrutinizing the whole constitution, structure, and habits of each creature—favoring the good and rejecting the bad? I can see no limits to this power, in slowly and beautifully adapting each form to the most complex relations of life."

GEOMETRICAL RATIO OF INCREASE OF ORGANISMS. "A struggle for existence," says Darwin, "inevitably follows from the high rate at which all organic beings tend to increase." There is a vast destruction of seeds, eggs, embryos, and young. Were this not the case the earth would soon become covered with the progeny of a single pair. Linné pointed out that an annual plant producing two seeds only—and there is no plant nearly so unproductive as this—and these each producing two in the following year, and so on, would in twenty-one years produce over a million plants. The elephant is regarded as the slowest breeder of all known animals, yet a single pair would become in the course of about seven and a half centuries, if all lived to the close of the breeding age, the ancestors of nearly 19,000,000 elephants.

The rate of increase of an animal, each pair producing ten pairs annually, and each animal living ten years, is shown in the following table, copied from Marshall's Lectures:

YEAR	Pairs produced	Pairs alive at end of year
1	10	11
2	110	121
3	1,210	1,331
4	13,310	14,641
5	146,410	161,051
10	....	25,937,424,600
20	....	Over 700,000,000,000,000,000,000

Immense numbers of eggs are laid by certain animals, and yet there are probably no more individuals now than centuries ago, the number of individuals remaining as a whole stationary. The queen bee lays during her whole life a million eggs, the conger eel is estimated to deposit 15,000,000, the oyster from 500,000 to 16,000,000, and a very large oyster may produce even 60,000,000 of eggs. "Supposing," says Marshall, "we start with one oyster and let it produce 16,000,000 eggs, the average American yield, and let half, or 8,000,000, be females and go on increasing at the same rate; in the second generation we shall have sixty-four millions of millions of female oysters. In the fifth generation—i.e. the great-great-grandchildren of our first oyster—we should have thirty-three millions of millions of millions of millions of millions of female oysters. If we add the same number of males we should have in all 66 + 33 naughts. If we estimate these as oyster-shells, we should have a mass more than eight times the size of the world."

Darwin also claimed that natural selection "acts solely by accumulating slight, successive, favorable variation," and can produce no great or sudden modification. It can act only by short and slow steps, hence "the canon of *Natura non facit saltum,* which every fresh addition to our knowledge tends to make truer, is on this theory intelligible."

USE AND DISUSE. Darwin in some cases admits the action of use and disuse. In both varieties and species, he says, use and disuse seem to have produced a considerable effect. His examples are blind cave animals, the burrowing South American 'tucutucu,' which is occasionally blind, and certain moles; also the logger-headed duck, which has wings incapable of flight, in nearly the same condition as in the domestic duck. Instincts he regards as having been slowly acquired through natural selection. See USE-INHERITANCE.

THE GEOLOGICAL RECORD. He then dwells on the geological record, which, although it is very imperfect, yet the facts strongly, he claims, support the theory of descent with modification. The extinction of species and of whole groups of species almost inevitably follows from the principle of natural selection; for old forms are supplanted by new and improved forms. The fact, he says, that the fossil remains of each formation are in some degree intermediate in character between those in the strata above and below, is simply explained by their intermediate position in the chain of descent. The grand fact that all extinct beings can be classed with all recent beings naturally follows from the living and the extinct being the offspring of common parents. Species have generally diverged in character during their long course of descent and modification, and thus the more ancient types are in some degree intermediate between existing groups. Recent forms are more improved and generally more specialized than the earlier ones. Yet certain forms have retrograded, while others have retained 'simple and little improved structures,' being what are called 'persistent types.'

GEOGRAPHICAL DISTRIBUTION. The facts of geographical distribution are also utilized by Darwin, who calls attention to the past migrations of animals from one part of the world to another owing to former climatic and geographical changes. They also explain why on the same continent under the most diverse conditions most of the inhabitants within each great class are plainly related, the reason being that they are the descendants of the same progenitors and early colonists. They explain why oceanic islands are inhabited by only few species, most of these, as those of Madagascar, being peculiar or endemic species. Moreover, the existence of closely allied or representative species in any two areas, as Europe and North America, implies that the same parent forms formerly inhabited both areas. It is also the rule that nearly all the inhabitants of islands have been derived from ancestors which lived on the nearest mainland. Thus the plants and animals of the Galapagos Archipelago, of Juan Fernandez and the other American islands, are closely related to those of the neighboring American mainland, while those of the Cape de Verde Archipelago and other African islands were derived from the opposite African coast.

FACTS OF MORPHOLOGY, EMBRYOLOGY, THE DOCTRINE OF HOMOLOGIES. These were also drawn upon by Darwin. He maintained that adaptive characters, though of paramount importance to the beings, are of hardly any importance in classification, while vestigial characters are often of high classificatory value, the most valuable of all often being embryological characters. "The real affinities of all organic beings, in contradistinction to their adaptive resemblances, are due to inheritance or community of descent."

NATURAL SELECTION NOT THE EXCLUSIVE MEANS OF MODIFICATION. It should be observed that Darwin frankly expressed the conviction that natural selection, though the most important, has not been the exclusive means of modification. He allowed that the absence of eyes in cave animals is not the result of natural selection, saying: "I attribute their loss wholly to disuse."

THE CAUSES OF VARIATION. In the first edition of his *Variation of Animals and Plants Under Domestication*, Darwin, after defining the definite action of the environment, added: "A new sub-variety would thus be produced without the aid of natural selection," but this passage was omitted from the second edition. Besides the *Origin of Species* Darwin published a number of other works, the most important of which was *The Variation of Animals and Plants Under Domestication* (1868). Toward the end of his life he gave more attention to the causes of variation, which at first he said were unknown, and in the work just cited he says: "Changes of any kind in the conditions of life, even extremely slight changes, often suffice to cause variability" (2 ed., ii., p. 258); and again: "Variations of all kinds and degrees are directly or indirectly caused by the conditions of life to which each being, and more especially its ancestors, have been exposed," adding: "To put the case under another point of view, if it were possible to expose all the individuals of a species during many generations to absolutely uniform conditions of life, there would be no variability" (ii., pp. 253, 255-256). He attributes the differences in races of cats living in Paraguay, Mombasa, East Africa, and in Antigua, "to the direct action of different conditions of life" (i., p. 49); so with the horses of the South American pampas and of Puno. He refers to Dr. J. A. Allen's conclusions relative to the direct action of the climate in producing geographical varieties of birds, and concludes that "these differences must be attributed to the direct action of temperature" (ii., p. 271). So also, accepting the results of Meehan's comparisons on the leaves of 29 kinds of American trees with their nearest European allies, Darwin candidly admits that "such difference cannot have been gained through natural selection, and must be attributed to the long continued action of a different climate" (ii., p. 271).

The objections to his theory raised by Darwin himself he discusses with his usual candor. Of these the most important is the absence, to use his own words, of the "interminable number of intermediate forms," which must have existed, "linking together all the species in each group by gradations as fine as are our present varieties." He says he can only answer this objection "on the supposition that the geological record is far more imperfect than most geologists believe." The other objection is the existence of two or three castes of worker or sterile ants in the same community.

STATUS OF DARWINISM AT THE PRESENT DAY. Such are the views of Darwin, as published in his *Origin of Species*. Although he pushed the special form of evolution to what one would suppose to be its furthest limits, yet as we have seen he somewhat modified his views later in life. The views of probably a large proportion of the moderate Darwinians at the present time have been expressed in a broad and candid way by Romanes, an able and careful commentator and expounder of the doctrine of natural selection. In his *Darwin and After Darwin* (1892), the most clear and readable exposé of the doctrine, the doctrine is thus stated. All plants and animals are perpetually engaged in the struggle for existence. This strife consists in the fact that in every generation of every species a great many more individuals are born than can possibly survive. Now nature "selects the best individuals out of each generation to live." "And not only so, but as these favored individuals transmit their favorable qualities to their offspring according to the fixed laws of heredity, it further follows that the individuals composing each successive generation have a general tendency to be better suited to their surroundings than were their forefathers. . . . And this follows not merely because in every generation it is only the 'flower of the flock' that is allowed to breed, but also because, if in any generations some new and beneficial qualities happen to arise as slight variations from the ancestral type, they will (other things permitting) be seized upon by natural selection, and, being transmitted by heredity to subsequent generations, will be added to the previously existing type." At the present day an increasing number of evolutionists do not regard natural selection as an active cause, but rather as the result of the action of a number of other agents, comprising the Lamarckian factors of change of environment, use, disuse, isolation, and so on. Undoubtedly, as the result of competition, animals have been driven to migrate, to adopt new habits, and thus to undergo modification. Many agree with Herbert Spencer as to the inadequacy of natural selection to account for the origination of new forms. For probably a third to nearly one-half of the species of plants and animals now existing are climatic, local forms, resulting from the direct action of changes in the conditions of life, such as climate, soil, food, and the like. The great number of species of parasitic animals are the result of the young adopting a fixed or a more or less stationary mode of life. Natural selection is inoperative in the case of blind or eyeless cave and deep-sea animals.

OBJECTIONS TO NATURAL SELECTION. The objections now being urged to the special doctrine of natural selection are that, (1) to use Herbert Spencer's words, it is 'inadequate'; (2) the favorable variation may be destroyed by the swamping effects of crossing; (3) natural selection is not analogous to artificial selection; nature is continually eliminating monstrosities, sports, variations, instead of preserving them; they are constantly being bred out in wild plants and animals, or those living under natural conditions of existence. The otter or ancon sheep, which under the breeder's care and watchfulness became a peculiar variety, when permitted to mingle or cross with normal sheep became extinct. Natural selection accounts for the preservation rather than the origination of new or incipient forms and structures. For the causes of variation, it is maintained, we must look to the action of the primary factors of organic evolution, namely to the effects of changes in light, temperature, heat, moisture, dryness, altitude, food, and so on.

(4) It is not necessarily the fittest or most useful structures or individuals which survive. Carnivorous animals in seizing or swallowing immense numbers of eggs, embryos, and adult animals do not select this or that individual, but, on the contrary, old and young, the fit and the unfit, weak and strong, are engulfed in the maw of the whale as it swims through a shoal of minute crustacea; or hundreds of small fishes are indiscriminately, without reference to their fitness, swallowed by sharks. So with aphides existing in hundreds of thousands on some tree, the birds, like old Time of the New England Primer, indiscriminately pick off "all, both great and small." This matter of the survival of the fittest and the extinction of the unfit has perhaps been somewhat exaggerated, although it is granted that competition acts unceasingly in the biological environment.

(5) Darwinians acknowledge, as does Wallace in his *Darwinism*, that no one ever saw a species originated by natural selection; Weismann has frankly affirmed that "it is really very difficult to imagine this process of natural selection in its details; and to this day it is impossible to demonstrate it in any one point" (*Contemporary Review*, 1893, p. 322). Yet a number of temperature species, races, or breeds have been experimentally produced by changes of temperature. The cases of seasonal dimorphism existing in nature have been exactly paralleled by variations in moths and butterflies subjected in the pupa state to cold, or extreme heat; and dry-season and wet-season as well as summer and winter forms have been produced artificially, besides other variations supposed to be extinct phylogenetic species.

(6) The view peculiar to Darwinism is that some individual variation was nursed and preserved, while all the others less favorable died. Some naturalists claim that the better-founded view is that of Lamarck, that the changes of environment simultaneously affected great numbers of individuals in a given region, which became modified by changes of climate, and so on, *en masse*. This certainly appears to be the case in local, insular, or geographical races, varieties, or species. What affects one affects all the individuals in a given area isolated by mountain barriers or other natural boundaries. Where natural selection appears to act is in the case of protective mimicry. The initial causes are changes in the amount of light, of shade, heat, and other physical agents, yet natural selection appears to be operative in bringing out the wonderful cases of mimicry so well known. (See MIMICRY.) While therefore the Neo-Lamarckian readily acknowledges that natural selection results after new variations have arisen, there are those who, like the Rev. Mr. Henslow, maintain that in the case of seedlings natural selection is not concerned in bringing about the survival of the fittest, adding: "*A seedling survives among others solely because it is vigorous.*" He claims that as soon as a large number of seedlings appear above ground, "natural selection at once steps in, so to say, with the result that all those with too weak a constitution to maintain themselves fail to withstand the struggle for existence and to come to maturity, the stronger plants only proving themselves the best fitted to survive. This process of selection, however, is quite independent of any modifications in morphological structure, by which 'varieties' or subspecies are alone recognized." The fact that the majority of offspring always perish in infancy he calls 'constitutional selection.'

(7) Darwin expressly regarded most variations as indefinite, chance, fortuitous, spontaneous or promiscuous, 'survival of the fittest,' as Romanes expressed it, "becoming the winnowing fan, whose function it is to eliminate all the less fit in each generation, in order to preserve the good grain, out of which to constitute the next generation. And as this process is supposed to be continuous through successive generations, its action is supposed to be cumulative, till from the eye of a worm there is gradually developed the eye of an eagle." Other variations Darwin called 'definite.' In the chapter of his *Variation of Animals and Plants Under Domestication*, entitled "Direct and Definite Action of the External Conditions of Life," he says: "By the term definite action, as used in this chapter, I mean an action of such a nature that, when many individuals of the same variety are exposed during several generations to any particular change in their conditions of life or nearly all the individuals are modified in the same manner."

This appears to be practically the same view as that advanced by Lamarck, and which is called by Eimer 'orthogenesis' (q.v.).

Variation as the result of changed conditions is in nearly every case—perhaps four-fifths of all that occur, thus leaving very little scope for the play of chance or fortuitous variations—due to causes of which we are ignorant. Fortuitous variations, in fact, are an almost negligible quantity. Hence the primary postulate of natural selection that variations are in general fortuitous is in the nature of an assumption, and not based on observed facts. As the result of recent investigation we are coming more and more to the view that variation in general is the result of the action of changed conditions of life, conditions both physical and biological, and that natural selection is not an active agent.

(8) Since Darwin called attention to the lack of long series of intermediate links between species, naturalists have been more and more inclined to the belief that such series of connecting variations have never existed, but that nature makes leaps, that species often arise by sudden or 'quick' or saltatorial evolution. Certainly neither in the Paleozoic or later strata, nor at the present time, do we observe these series of minutely graduated numberless annectent forms postulated by Darwin, there still being gaps between the known connecting links. Hyatt, W. H. Dall, Galton, De Vries, and many others, have advocated the view of the rapid or sudden modification of structure involving the sudden appearance of species, especially in Paleozoic times. This is seen by the results of the examination of the Steinheim forms of Planorbis, and of the Tertiary forms of Austrian Paludina, where there are often wide gaps even between the connecting links. The new species of evening primrose raised by De Vries originated suddenly, without preparation or intermediate forms. Even in the great variations observed by C. C. Adams in the forms of the fresh-water snail Io, peculiar to the upper tributaries of the Tennessee River above Chattanooga, the variations are evidently due to the varying nature of the bottoms of the streams, the rapidity of the current, and the forced isolation of the varieties, the different forms, from smooth to very spiny, being closely correlated to the varying nature of each stream, and different sections of each stream from the headwaters to the mouth. In this case there is apparently no action of natural selection, but a direct response to the environment, and the gaps may thus be either marked or slight. In the hundreds of sub-varieties of *Helix nemoralis*, the gaps or intervals between such forms are distinct and well marked.

(9) Natural selection is manifestly inadequate to account for the origin of the principal types or classes of plants and animals. They must have appeared with comparative suddenness, as the result of changes of the conditions of life, inducing new needs, new habits, and the origin by exercise of new organs. Thus the types of cœlenterates, echinoderms, crustacea, flying insects, amphibia, reptiles, birds, and mammals were the result of the action of the changed environment, of effort, use, isolation, and heredity, at a time when the ancestral forms were more plastic than their descendants.

(10) Natural selection, it has been claimed, could not have begun to act until the earth had become sufficiently well stocked with plant and animal life to afford materials for competition and survival of the fittest. The first forms of life must have arisen through the operation of the Lamarckian factors. In conclusion it may be said that it still remains an open question whether natural selection is an active or by any means universal agent in evolution. Finally it may be observed that the processes of evolution are in kind like those of simple growth of the individual organism, and due to the same factors, and as in ontogenesis there is no one predominant factor, so in phycogenesis there is no one predominant factor, no preponderating mechanism such as has been ascribed to natural selection. In the opinion of some expert working naturalists, the greater number of known species have been produced without its aid. It is not of the same nature as artificial selection. Yet the theory is widely accepted, and by its aid Darwin converted the world to a belief in evolution in general.

The views 'widely accepted' as to the relation of natural selection to the other factors of organic evolution may be tabulated thus:

I. Primary factors.

Direct.—Changes of cosmical environment, changes of climate, light, darkness, temperature, dryness, and humidity, physical and chemical constitution of the soil and of waters, mechanical state of the *milieu*, winds, currents of water, biological environment, food, competition, parasitism, symbiosis.

Indirect.—Reaction against cosmical environmental conditions; adaptation, convergence, reaction against biological conditions, mimicry.

II. Secondary factors.

Heredity, vital concurrence, natural and sexual selection, segregation, geographical isolation, amixia, hybridity.

For bibliography, see EVOLUTION.

GERMINAL SELECTION. This doctrine, founded by Weismann, is an extension of the general idea ordinary 'individual' or 'personal' selection, of natural selection. To 'superorganic' selection, Roux's theory of histological ('histonal') or intracellular struggle for existence, Weismann has added the idea of a struggle among the hypothetical 'determinants' within the germ, or germinal selection. J. A. Thompson has indicated the importance of a form of struggle lying between Roux's histonal selection and Weismann's germinal selection, namely, the struggle between gametes or potential gametes, e.g. between young ova, between sperms, even between ova and sperms. "A vivid realization of this visible struggle," says Thompson, "and the sometimes discriminate selection which it implies, may lead naturally to an appreciation of germinal selection, which deals with the wholly invisible." Although opinions may differ as to the existence of this hypothetical phase of selection, the writer just quoted claims that the theory "justifies itself provisionally as a formula unifying a large number of otherwise unrelated facts of inheritance." See WEISMANNISM.

NATURAL THEOLOGY. The systematic arrangement of that knowledge as to God and man and their mutual relations which can be gained from the study of nature to the exclusion of revelation. Such, at least, is the ideal of natural theology and its effort, as it was pursued for a large part of the last century. But it never maintained the actual independence of revelation which it was supposed to maintain. The proofs for the existence of God (q.v.) really presuppose the idea of a holy first cause, and this idea is historically derived from the Christian revelation. Without this suggestion the proofs are inconclusive. But with this allowance to revelation, natural theology has a place and a work in the development and defense of Christian doctrine. It exhibits the conformity of the idea of God to the highest reason of man. The proper founder of the discipline among English-speaking theologians was Archdeacon Paley, who published his *Natural Theology* in 1802. The merits of this work have been lately overlooked, and it has been the fashion with many who never read him to sneer at Paley's arguments. In fact, the book was a very able one, and anticipated the lines of reply by which the first attacks of the more recent propounders of evolution upon the existence of God have been met. In America the rationalizing spirit of the New England Theology (q.v.) led it to lay much weight upon natural theology, and it was generally ostensibly made the basis of the system of theology by theologians of this school, and by most others, during a large part of the century. The arrangement of topics in the best forms of the science were somewhat as follows: Beginning was made with the principle of causation, which was established as a necessary truth, or primal intuition of the human mind. Then came the arguments for the existence of God, predominantly or exclusively the *a posteriori* arguments, for a contriver, governor, creator, preserver, and moral governor. Then followed the natural attributes of God. In making the transition to the moral attributes, it was sometimes the custom to interpose the doctrine of the immortality of the soul, and discussions as to the consistency of the existence of sin in the world with the divine goodness, in order antecedently to remove the most difficult objections to the divine benevolence. Where the moral attributes of God were reduced to the one attribute of benevolence, it was next customary to introduce the theory of human virtue, and to argue from benevolence as the ultimate object of the obligation of the human conscience to the nature of the divine virtue, since man is made in the image of God. Finally, the benevolence of God having been proved, the argument could advance to the Scriptures, the inspiration of which was proved by the need of man for revelation, and the certainty that a benevolent God would supply so grievous a need. This line of discussion was largely broken up at the end of the century by influences emanating from the more subjective schools of German theology, especially from Frank and Ritschl. Besides Paley, consult: Chadbourne, *Natural Theology* (Boston, 1867); Flint, *Theism* (Edinburgh, 1878); id., *Anti-Theistic Theories* (ib., 1879); Janet, *Final Causes* (Eng. trans., ib., 1878); Browne, *Studies in Theism* (New York, 1879); id., *Philosophy of Theism* (ib., 1887); Harris, *The Philosophical Basis of Theism* (ib., 1883); Fisher, *Grounds of Theistic and Christian Belief* (ib., 1883).

NATURAL TONES. A musical term applied to those tones of wind instruments that are produced, without altering the length of the tube (by valves or slides), by increased or diminished force of the air-current. The tones thus produced are always overtones of the fundamental tone. But this fundamental tone can be produced only upon instruments having a wide bore in proportion to their length, like the tuba or trombone; whereas the fundamental cannot be produced upon the trumpet, which, consequently, yields only the higher overtones as natural tones. See HARMONICS.

NATURE PRINTING. A process by which engravings or plates were produced by taking direct impressions of the objects themselves, and printing from them. The process was invented in 1849 by Alois Auer, director of the State printing establishment of the Austrian Empire, and though very simple, it cannot be applied to any objects except those with tolerably flat surfaces, such as dried and pressed plants, embroidery and lace, and a very few animal productions. The object is placed between a plate of steel and another of lead, both of which are smooth, and polished. They are then drawn through a pair of rollers under considerable pressure, and when the plates are separated it is found that a most beautiful and perfect impression of the object has been made in the leaden plate. This may be used directly as an engraved plate, if only a very few impressions are wanted; but it is too soft to resist the action of the presses for practical purposes; a fac-simile to be used as the printing plate is made in copper by the electrotype process. The inventor published a description of his work in 1854 at Vienna, in which is given a detailed account of the method.

NATURE-STUDY. A modern development of the movement of elementary education toward the study of real objects rather than symbols. It arose in response to a demand voiced as early as the year 1845 in this country by Horace Mann (q.v.) for early training in the inductive method of thought and in the field of nature.

According to generally accepted ideas on nature-study, it must concern itself with the common objects of the child's environment. These the child must be led to examine, to work with himself. The work must be carried on, so far as possible, to strengthen independence of thought and judgment. The beginnings of the study must be based upon the immediate surroundings of the child, and the field of inquiry may be extended further abroad as the later years of the school are approached. The tasks in the earlier years should be chiefly observational. Nevertheless, the experimental method of study should not be neglected. As far as possible, organic forms should be regarded as living things capable of activity and change; the point of view should therefore be dynamic, a matter of great pedagogic importance. The plan of the work may properly be made out so as to include the commoner animals and plants, and the everyday phenomena of inorganic nature. Duplication of work should be avoided by increasing the difficulty of the problems and basing them on different material. It is better to study the materials comparatively as far as possible, so that pupils may learn to discriminate and to form general notions. The exhaustive study of one type is of much less value. Outdoor work should be done; in addition to gardening, studies of the habits and haunts of animals, the appearance and disappearance of the birds, the relations of insects to plant life, the appearance of trees in summer and winter dress, and numerous other similar topics may form the basis of study. It is highly important that the materials should be abundant, that the teacher be not too closely tied to a detailed plan of work, and that he be resourceful in the matter of making the most of what is available. It is important, too, that the pupils should provide their own material, and to this end both the excursion and the garden should be turned to account. It would seem best, on the whole, to devote, at any rate, two periods (one to two hours) a week, or its equivalent, throughout the course. The school garden has in some cases been provided for after-school hours, and this seems to be a reasonable adjustment of the matter.

Consult: Carss, *Course in Nature Study* (in the Horace Mann School); *Teachers College Record*, vol. i., No. 2, for March, 1900 (New York, with an extensive bibliography); Miller, *Course in Nature Study for Public Schools* (Ithaca, 1900, to be obtained through the State Secretary); Hodge, *Nature Study and Life* (New York, 1902); Jackman, *Nature Study for the Common Schools* (ib., 1894); id., *Nature Study for the Grades* (ib., 1899); Lange, *Handbook of Nature Study* (ib., 1899); Scott, *Nature Study and the Child* (Boston, 1901); Wilson, *Nature Study in the Elementary School* (New York, 1899); Bailey, *Garden Making* (ib., 1901).

NATURE-WORSHIP. The worship of all objective phenomena which man regards as liable to hurt or help him, and which even when lifeless are deprecated or invoked as powers having volition. Nature-worship is based on spiritism, but this, not being in itself a religion, but a philosophy, does not imply worship. In many cases the savage simply regards rocks and trees as volitive powers only when they act in a way suggesting volition. So long as a stone, for example, does not interfere with him, he is apt to disregard it altogether; but when it injures him, or he wishes to use it, he assumes, like a child, that it possesses spiritual power expressed by will. Whether then the savage deprecates or placates, the cult of such an object is a religious phase. Even in the lowest stages of human evolution, it may happen that some one object, like the village tree of the Aryan, or the clan mountain of the Munda, or the family snake of some Dravidians, is regarded as tutelary, and offerings and prayers are made to it, although other natural phenomena are either ignored or treated only as inimical spirits. This may be said to be a stage between demonolatry and nature-worship, though a more general cult of phenomena usually accompanies the worship of any one side of nature. Nature-worship, manifold as nature, shows aspects which may be grouped in categories, but in no classification can a sharp line be drawn between the different divisions. In arranging the objects of worship only a rough classification, therefore, will here be attempted. As parts of objective nature on a par with others must be included both man and animals, though these are often put into special categories.

Worship of Elements. As constituents of all nature the elements are worshiped by philosophers, but it is quite doubtful whether, as has often been claimed, the elements were ever worshiped as such by savages, or even by more advanced people till a late period in their development. Mother Earth is a very early divinity, but in this case she is not the element, but a local ground, generally a hill. Water is certainly not worshiped as divine till long after the local stream or spring is, or contains, a divinity. Thus the American Indians worshiped Niagara as a spirit, but did not regard water as a divinity. Ganges and Tiber were local tutelary gods long before abstract (elemental) water was revered. So air is unknown as an early divinity, but as wind personified it was worshiped as Huracan in America and as Wodan in Germany. East Wind is a modern malevolent Hindu god, while to the Mexicans the East Wind was a a beneficent deity. Even fire is revered as a local form before fire in general is regarded as divine. Of all the elements, fire has been most universally worshiped, partly on account of its force and mystery of birth in threefold form, on earth, in the sky, and in the air (lightning), and partly because of its purificatory nature. The cult of this element became the chief religious observance of Mazdeism. Mystic association between mental and physical attributes helped to increase the reverence for elemental gods. Fire and force were associated, water and wisdom, etc. The fish god of Babylonia and the fish god of Polynesia both typify the union of water and wisdom, found also in the worship of the Hindu Varuna. See *Astrolatry*, below.

Litholatry. There are in all four forms of litholatry or stone-worship, the stone appearing to be in general one of the earliest forms of divinity. (1) Of these the most primitive, judging by the fact that it is found among the lowest savages, is the worship expressed by showing religious (superstitious) awe for any remarkable stone. There are three varieties: (a) the worship of a huge rock, scarcely to be differentiated from the worship of a mountain (see below); (b) the worship of a stone peculiar in shape, especially if it suggests a resemblance to the shape of an animal or of man; (c) the worship of a heavenly stone. All three varieties are found among the Finns and Lapps, among the negroes of Africa, and among the South Sea Islanders. To a less degree this form of worship is shared by the Peruvians, but with them it has been overlaid with later forms. In antiquity, remarkable stones, especially aërolites, were worshiped by the Greeks and Romans, and they are to-day an object of reverence to all savages—as, for example, the Eskimo—while even among civilized people the 'Thunder-stone' is regarded with more or less superstitious awe. Any strangely shaped stone is reverenced by the Hindus, especially those in South India, by the inhabitants of the Hebrides, of the Pyrenees, and by the redskins, to mention only a few of the races that worship stones. The Semites, Greeks, and Romans in antiquity, and the Teutons in the Middle Ages, all worshiped stones by anointing them, making offerings (sometimes human sacrifices), and saying prayers to them. (2) By imperceptible degrees the plain stone becomes an idol; that is, it represents a divinity or a divine power. Two forms may be distinguished: (a) when a fetish-stone is discarded from personal use, but is preserved as imbued with divine (mysterious) power in an African 'god-hut.' This shapeless effigy leads to (b) pure idol-worship; that is, where the effigy is due to an attempt to shape the stone to a divine form human or beastly in attributes. Images of gods are recognized by Homer and seem to be referred to in the *Rig Veda*, but these works represent an advanced stage of culture. Idols are not found among the lowest races. Savages, such as the Bushmen, Patagonians, Eskimo, Andamanese, have no idols. But theists like the Finns and Polynesians are idolaters, as are still more advanced races, the Mexicans, Egyptians, Babylonians, Greeks, and Hindus. (3) The fetish, often a stone, is worshiped. Accident, precedent, any peculiarity prompting the fancy that the object will be beneficent is sufficient to make a fetish. When no longer regarded as useful the fetish is flung away or laid aside in a god-hut. The fetish-worshiper scarcely makes a distinction between the divine power in a fetish and the inherent divinity of a fetish. There are certain clans in Africa which believe that there is a divine power in, but separate from, the object; but most fetish-worshipers probably make no distinction between the power and the thing. (See Fetishism.) (4) A stone is often worshiped also either as a totem or as the result of totemism (q.v.). The latter stage of worship is so far advanced beyond totemism as to be a new form of nature-worship. It arises in this way. When a totemist sacrifices to his totem he sheds blood near or on a stone which was originally the temporary habitat of the ancestral spirit. The stone itself in the first stage is revered only incidentally; but when successive generations have thus hallowed a stone, the divinity becomes gradually extended to the stone itself, and the primitive tomb-altar becomes itself a thing prayed to as a divinity. So the Australian *Churinga* sticks are revered as homes of the ancestor spirits and the redskin totem-poles are themselves divinities. So sun-stones, symbols of the sun, such as the white sun-stone of the Scandinavians, become divinities, even when the symbol does not (as is often the case) merely conceal an older form of worship. But many worshiped stones were originally only monuments. The long-famed Jupiter Lapis or 'stone Jupiter' is now known not to have been a 'stone god,' a fact which indicates that other stone gods also may have been misinterpreted. As the huge stone is revered, so is a huge cliff or mountain, generally as a local tutelary divinity. Mountains are believed to have an individual life and may beget offspring on rivers, being thus regarded as divine powers, though they usually take animal forms when acting as animate beings. Very old and widespread is the belief that a man's individual life may be deposited in a mountain or tree, and be destroyed only when the divine object is overthrown by a higher divinity.

Dendrolatry. Under this word may be included the 'worship of trees,' in the strict sense, and the worship of plants, phytolatry, in the general sense of worship of objects of the vegetable world. The terms, however, are not quite coterminous, since plants are revered only as totems or as useful objects, while trees are worshiped for a variety of reasons, either because they are totems, or because they are useful, or beautiful, or fearsome, or as symbols. In this phase of worship it is sometimes difficult to decide whether the divinity resides in the object or is the object. Both views were held by different members of some races. Thus this question became a subject of debate between the Brahmans and the Buddhists. The former held what is undoubtedly the more primitive belief, that the tree itself was an animate person. The Buddhist held, as did the Greek, that there was a spirit (dryad) in the tree. The worship of some form of the vegetable creation was general in antiquity, and has existed almost to the present day in Europe. Only a few hundred years ago the Teutons, for example, worshiped plants and trees, as they did rocks, rivers, and mountains. Traces of this belief are still visible in popular rites and superstitions. Both men and gods were supposed to have sprung from trees. Thus the Algonquin Indians and the Teutons both regarded the ash as the divine progenitor of men, and the mother date-palm was worshiped by the Semites, as other mother trees are to-day worshiped by the Dravidians. There are four varieties of plant and tree worship. The vegetable god, tree, or plant is revered (a) for its peculiar virtues or qualities. Thus in India the *soma* plant was regarded as divine because of its intoxicating qualities, as is the *cuca* plant in Peru; and the modern *peyote* cult of Mexico has the same origin. Or (b) the vegetable is a totem, examples of which are found in the divine corn and cocoanut of America and Samoa, respectively. Thirdly (c), the tree or plant is worshiped as a spirit in the material, as is the case in dryad-worship in Greece and India. Finally (d), the spirit revered is that of reproduction as shown in the vegetable, of which class are the corn mother of the Teutons and the mother date-palm of the Babylonians. To these must be added the sacred grove, as revered by Dravidians, Teutons, Greeks, Romans, etc. The trees of the grove are collectively sacred and may be individually divine; but the grove itself is really a temple of divinities, not a divinity *per se*. Tree-marriages, still common among the wild tribes of India, are a survival of totemism. To avoid the ill luck of a third marriage, even civilized Hindus wed a tree as a third wife.

Theriolatry or Zoölatry. Animal gods already have human characteristics and are quite anthropopathic. Love or fear, as in the case of human gods, prompts that greater respect which with savages constitutes worship. This is especially easy in the case of animals, for savages establish no barrier of soul and reason as peculiar possessions of man between themselves and beasts. A very early belief in metempsychosis (q.v.) taught primitive man to believe that beast soul and human soul were interchangeable. Thus the tiger is worshiped not only from fear, but because a special tiger is often believed to possess the soul of a departed chief. Some animals become divine as totems, but not all. Ordinary pests are deprecated by prayer and offerings. Some animals are worshiped merely because they are useful. The best developed systems of theriolatry are found among the Egyptians, Babylonians, and American Indians. But some of the monstrous beasts of Babylon are adored through symbolism rather than because of totemistic survivals. Reverence alone prompts man to make the image of god-beasts more powerful and mysterious than the natural beasts, and some of the beast forms are clearly symbolic, as in the portrayal of the sun as a swift horse or as a winged bull, or of spring as a winged snake. Of all forms of beast-worship, *ophiolatry* or serpent-worship seems to be most widespread. Other animals, horse, ass, reindeer, bear, tiger, boar, together with a few cases of divine fishes are worshiped by different races; but the snake appears to have been worshiped in every land, either as a soul-receptacle or friendly house-snake, in whose body resides the soul of an ancestor (as in Rome and India), or as a healing and mantic power of wisdom (as in the cults of Babylon and Greece), or as an evil spirit, world-snake or dragon. The negroes of Africa, the Dravidians and redskins among savages, the Mexicans and Peruvians on a higher plane, and the Egyptians, Greeks, Romans, and Semites (including Hebrews) regarded the snake in one or another of these forms as a divine animal. Sometimes the same snake is conceived differently at different times. In Sayce's opinion, Nina, the Babylonian serpent daughter of Ea, the water-god of wisdom, was at first typical only of divine wisdom, and the transference to the conception of the guile-loving evil serpent was due to the influence of the parallel conception of Tiamat, the dragon monster of chaos and evil. The dragon of the Eddas is evil, he is the Midgardswurm that embodies destruction, like the rain-preventing dragon Vritra of the *Rig Veda*, but beside the latter stands the figure of the 'Dragon of the Deep,' to whom the Vedic Aryan prays as to a beneficent divinity. So Apollo as a healing god is associated with Æsculapius's snake, but destroys the Pytho dragon. Among the Mongoloid Naga tribes, as among the Chinese, the dragon-snake is a world-divinity. Special aspects of snake-worship are the close connection with tree and phallic worship, as found among certain Dravidian tribes, who worship snakes with phallic rites, and the ditch-snake or mound-snake, a symbolic snake among the American wild tribes. Further, and perhaps most fundamental, is to be noticed the close connection between snakes and treasures, which they secrete or guard, as in the case of the Hesperides and many fairy-stories in the West and East. So in Egypt, Osiris in snake-form is associated with wealth, as is the Chaldean Hoa. This trait may be due to the fact that serpents actually hoard jewels and other bright objects. Probably the beauty, poison, and uncanny motion of the snake all combined to make it revered. Under zoölatry must also be noticed the worship of birds, according to more or less definite racial lines of demarcation. Thus the dove is Semitic, and is Greek only as belonging to a Semitic deity; the goose is the most universally revered bird, being worshiped by the Egyptians (sacred to the god Seb), the Japanese, the early Britains, the Romans, and especially by the Dravidians, from the remotest antiquity. Among the Aryans it yielded to the eagle (also the Hittite emblem), but it is still regarded as emblematic of the highest soul in the races to the east of India (Chinese and Japanese), whereas in India itself it has been displaced among the higher classes by the swan. The cock also was widely revered and was sacred to Mars, Æsculapius, Osiris, and to the Hindu battle-god, Kartikeya.

ANTHROPOLATRY. Man is worshiped like other animals. Some forms of anthropolatry, however, represent decadent aspects of theism. Thus in Finland and in Persia the national heroes are decayed gods, and get a sort of secondary reverence in their new guise. Ordinarily any hero or great man is revered as being more powerful than other men, and in the primitive mind worship and respect are synonymous. So priests are divine and all kings ipso facto are divine in India, China, and Japan to-day as they became in Rome, and are said to be among the South Sea Islanders. Sacrifices made to men who have become gods are recognized in the old Hindu law-books. The only rarity in anthropolatry is where the man-god conception embraces former beast-gods and is enlarged to that of an all-god. Thus Krishna in India amalgamates with animal avatars of Vishnu to make an all-god who appears in human or animal form.

ASTROLATRY. This 'worship of the heavenly bodies' is a general term (here including for convenience the worship of heaven itself) for what used to be called Sabaism. Sun and moon gods are not always early divinities. They were unknown, for example, to the older Roman cult, though the Romans worshiped earth and sky. The Aryan Hindu worshiped the sun before he did the moon; the Dravidian feared the sun as a malignant demon; while his Munda neighbor worshiped the same power as a beneficent divinity. The Babylonians perhaps worshiped Sin, the moon, before Bel, the sun; the Hottentots worshiped the moon and not the sun, though they revered Dawn. On the other hand, reversing the Roman order, the Aztecs and American Indians worshiped the sun and not the sky. There is no general principle of progression, such as has often been sought. The stars, again, are in some cases the last of the heavenly bodies to be worshiped; in other cases, a stellar mythology antedates solar or lunar gods. It is especially in connection with star-worship that the wildest theories of mythologists have been evolved. According to some scholars, all Semitic and Aryan mythology reverts to star-worship, and this is supposed to have been the chief religion of the Accadians and Hittites, about whose religion, however, we know in fact very little. It is often claimed that sun-worship is posterior to ghost-worship, and in some cases it is probable that a fully developed sun-worship was superimposed upon a more primitive cult, as among the Aztecs; but the Polynesian sun-light spirit is as antique as any god in the South Pacific, and sun-worship appears not only among the earliest Hindus, but also among the savage Mongoloid Munda tribes. Probably in some races sun-worship was as early as any form of nature-worship, and may be as old as ghost-worship. The beginnings of the worship of heavenly phenomena may be seen even among the Central Australians, who invoke the sun and lightning as living powers. The most remarkable development of sun-worship is to be found among the Mexicans and the Peruvians, where it has eclipsed all other forms; the Babylonians, where the highest gods were identified with the sun and moon; the Dravidians, among whom, as among the related Mongolians, sun-worship is generally found; and the Persians, especially in the Mithracult developed out of decadent Zoroastrianism. In Greece sun-worship is represented by Apollo, and in India by Vishnu, but in a rather perfunctory way. Neither of these gods can be said to be worshiped as the sun, though both retain traces of their earlier conception in the disk symbol and mythological characterization as arrow-shooting, pest-bringing, and yet kindly disposed divinities. The sun is represented in many religions, as in India, under the figure of a bull or horse, or bird, or as riding in a car dragged by seven steeds, or as having rays. Sun and moon are the goal of souls in several religions, such as the Polynesian and Hindu.

All worship of phenomena tends to personification. The question how far the thing and how far the spirit in the thing is worshiped cannot be answered categorically, for the answer depends on time, place, and object. Eventually, as in Greece and Germany, in Zeus and Wodan, the physical background almost vanishes, and only spirits remain, conceived as quite human. Even in the earliest stages of phenomenolatry, there does not appear to be any worship of the object as a physical thing, but only as a spirit-holding or spirit-imbued, i.e. spiritualized object, though in this stage spirit and life may not be distinguished. As to whether man first worshiped major or minor objects of nature, opinion is divided, as it is in regard to animism preceding nature-worship. Generally speaking, English scholars hold to animism as the earliest; German scholars to nature in its grander aspects; and the French to minor nature-worship. From an ethical point of view, it is to be observed that pure nature-worship cannot be sharply sundered from 'ethical religions.' Even taboo (q.v.) is ethical, and lofty ethics is found in connection with purely physical gods. The 'eye of heaven' that marks the sin of man is a natural interpretation of the all-seeing sun as soon as a man evolves ethical ideas and attributes them to his gods.

Consult: Tylor, *Primitive Culture* (Boston, 1874); Max Müller, *Natural Religion* (2d ed., London, 1892); Lang, *Magic and Religion* (ib., 1901); Saussaye, *Religionsgeschichte* (Freiburg, 1887); Brinton, *Myths of the New World* (New York, 1868); Moorehead, *Primitive Man in Ohio* (ib., 1892); Fergusson, *Tree and Serpent Worship,* and *Rude Stone Monuments* (London, 1872); Sayce, *Religion of the Ancient Babylonians* (ib., 1887); Jastrow, *Religion of Babylonia and Assyria* (Boston, 1898); Réville, *Native Religions of Mexico and Peru* (London, 1884); Crooke, *Popular Religion and Folk-Lore of Northern India* (Westminster, 1896); D'Alviella, *La migration des symboles* (Paris, 1891); Lefèvre, *La Religion* (ib., 1892); Waring, *Forms of Solar and Nature Worship* (London, 1874); Buckland, *Anthropological Studies* (ib., 1891); Frazer, *Golden Bough* (ib., 1900).

NAUBERT, nou'bĕrt, Friedrich August (1839-97). A German composer, born at Schkeuditz, Province of Saxony. He studied at the Stern Conservatorium of Berlin, and became organist and instructor in vocal music in the gymnasium of Neubrandenburg, Mecklenburg-Strelitz. He attained a considerable reputation as a vocal composer of the school of Robert Franz. His publications include soli, duets, trios, quartets, and choral works for four, six, and eight voices.

NAUCK, nouk, August (1822-92). A German classical scholar. He was born at Auerstedt, and after studying at the University of Halle, taught at several gymnasiums at Berlin until about 1859, when he became member extraordinary of the Imperial Academy of Sciences at Saint Petersburg. He remained in that city until his death. His best-known works are: *Aristophanis Byzantii Grammatici Alexandrini Fragmenta* (1848); the complete works of Euripides, with the fragments (1854); an annotated edition of Sophocles (*Sophoclis Tragœdiæ*), based upon Schneidewin (1867); Homer's *Odyssee* (1874) and *Ilias* (1877-79); *Iamblichi de Vita Pythagorica Liber* (1884); select works of Porphyrius, *Porphyrii Philosophi Opuscula Tria* (1860; 2d enlarged ed., *Opuscula Selecta,* 1886); and his greatest work, *Tragicorum Græcorum Fragmenta* (1856; 2d ed. 1889; with the *Tragicæ Dictionis Index,* 1892). The last work is considered the standard edition. Consult Zielinski, *August Nauck* (Berlin, 1894), where his writings are enumerated.

NAU'CRATIS (Lat., from Gk. Ναύκρατις, *Naukratis*). An ancient city of Egypt, situated on the Canopic branch of the Nile, near the modern Nebîreh, 53 miles southeast of Alexandria by rail. It was under King Amasis II. the only place in Egypt where Greeks were allowed to settle and trade, and thus became a very flourishing Greek colony. On the successful excavations of Petrie, consult his *Naucratis* (London, 1886-87). Petrie thinks that the Greek settlements at Naucratis may date from as early a period as B.C. 650.

NAUCY'DES (Lat., from Gk. Ναυκύδης, *Naukydēs*) (called of Argos). A Greek sculptor of the fifth century B.C. He was trained in the manner of Polyclitus I., and was the master of his brother Polyclitus II. A Discobolus, now in the Vatican, is believed to be a copy of a work by him. A gold and ivory Hebe, and statues of Hecate, Hermes, Erinna the poet, and some groups of athletes are mentioned by writers of his time, and later, as works of this sculptor.

NAUDET, nō'dā', Joseph (1786-1878). A French historian, born in Paris. He was made professor of Latin poetry at the College of France in 1821 and was director of the Royal Library from 1840 to 1860. He was also a member of the Academy. His works include: *Histoire de la guerre des esclaves en Sicile* (1807); *Histoire de l'établissement, de progrès et de décadence de la monarchie des Goths en Italie* (1811); *La conjuration d'Etienne Marcel* (1815); and *De l'administration des postes chez les Romains* (1863).

NAUE, nou'e, Julius (1834—). A German painter and archæologist, born at Köthen, Anhalt. He studied in Nuremberg and in Munich (1861-66). His best-known works include: "The Fairy-tale of Emperor Henry I. and Princess Ilse" (1865-67), in water colors; "Germania," "Roma," and six other great frescoes (1868), for a villa near Lindau; "The Myth of Prometheus" (1872-73), in water colors; "The Fate of the Gods" (1875-77), cycle in fresco; and seven paintings in tempera from the epic "Helgi and Sigrun" (1879). Subsequently he took up the study of Bavaria's prehistoric period, made numerous excavations of mounds, and published *Die prähistorischen Schwerter* (1885); *Die Hügelgräber zwischen Ammer- und Staffelsee* (1887); and *Die Bronzezeit in Oberbayern* (1894).

NAUGATUCK, ną'gȧ-tŭk. A town and borough (coextensive) in New Haven County, Conn., 17 miles northwest of New Haven; on the Naugatuck River, and on the Naugatuck Division of the New York, New Haven and Hartford Railroad (Map: Connecticut, C 4). It has the Whittemore Memorial Library, Salem School, Whittemore High School, and noteworthy business blocks, and is engaged extensively in manufacturing india-rubber goods, knit underwear, malleable iron, and paper boxes. Naugatuck was first incorporated in 1844 as a town, and in 1893 as a borough; consolidation was effected in 1895. The government, under the charters of 1893 and 1895, is administered by a board of warden and burgesses, annually elected, which has powers of appointment in all borough offices excepting the board of education, chosen by popular vote. Population, in 1890, 6218; in 1900, 10,541.

NAUHEIM, nou'hīm. A noted watering-place in the Grand Duchy of Hesse, Germany, on the Usa, 17 miles north of Frankfort (Map: Germany, C 3). The Kurhaus is surrounded by beautiful grounds. The waters, ranging in temperature from 86° to 95° F. and containing salt, iron, and carbonic acid, are used for both drinking and bathing, and are especially efficacious in cases of intestinal and cutaneous diseases, gout, rheumatism, and heart diseases. Considerable quantities of water and salt are exported. The place is visited annually by about 6000 patients. Population, in 1900, 4505.

NAULETTE, nō'lĕt'. A cavern on the Lesse in the Commune of Furfooz, near Dinant, Belgium. Here, in 1866, Dupont found a human lower jaw associated with bones of the elephant and rhinoceros. The Naulette man is now assigned to the Moustérian epoch (q.v.). Consult Mortillet, *Le préhistorique* (Paris, 1900).

NAUMACHIA, na̤-mā'kĭ-ȧ (Lat., from Gk. ναυμαχία, naval battle, from ναύς, *naus*, ship + μάχεσθαι, *machesthai*, to fight). Among the Romans, a mock naval battle; also, the place used for this purpose. Julius Cæsar was the first to introduce a naumachia into Rome (B.C. 46), causing a portion of the Campus Martius to be transformed into a lake, on which the spectacle came off. Augustus made an artificial lake (*stagnum*) near the Tiber for the same purpose, which was afterwards frequently used for naumachiæ. Claudius also gave an exhibition of the kind on Lake Fucinus, in which nineteen thousand combatants took part. These naumachiæ were not sham fights, any more than ordinary gladiatorial combats. Both sides fought in real earnest until one was utterly overpowered. The crews consisted of gladiators, prisoners, or condemned criminals.

NAUMANN, nou'män, JOHANN FRIEDRICH (1780-1857). An eminent German ornithologist. He was born at Ziebigk, worked on a farm with his father, a skilled ornithologist, and became inspector of the ornithological museum of the Duke of Anhalt-Köthen. He was a clever draughtsman and himself engraved the plates for the illustrations of his *Naturgeschichte der Vögel Deutschlands* (12 vols., 1822-44), a standard work. Naumann wrote, besides: *Taxidermie* (1815; 2d ed. 1848); *Ueber den Haushalt der nördlichen Seevögel Europas* (1824); and, with Buhle, *Die Eier der Vögel Deutschlands* (1819-28). In his honor, the German Ornithological Society named its journal *Naumannia*.

NAUMANN. A family of German musicians. JOHANN GOTTLIEB (1741-1801), the most important member, was born at Blasewitz, near Dresden. He studied under Tartini, Padre Martini, and others, and became Court composer at Dresden in 1764. In 1766 he was appointed kapellmeister at Dresden. He produced many operas, and in 1777 organized the royal orchestra of Stockholm, Sweden. He made several tours throughout Italy and Prussia and was regarded as one of the most important composers of his time. He wrote over 20 operas, 10 oratorios, 18 symphonies, and numerous smaller works, instrumental and vocal. Consult: Meissner, *Bruchstücke aus Naumanns Lebensgeschichte* (Prague, 1803-04).—His grandson, EMIL (1827-88), studied under Von Wartensee and Mendelssohn, and at the Leipzig Conservatory. He was chiefly famous for his valuable and scholarly writings, particularly with reference to church music; and was also the composer of an oratorio *Christus der Friedensbote* (1848), and the opera *Judith* (1848). Among his more important works are *Die Tonkunst in der Kulturgeschichte* (Berlin, 1869-70) and *Musikdrama oder Oper* (1876). He lectured on musical history at the conservatory at Dresden. —KARL ERNST (1832—), another grandson of Johann Gottlieb, became favorably known for his writings and compositions. He was born in Freiberg, Saxony, and received his musical education in Leipzig, completing his musical studies with a two years' period of organ study under Schneider of Dresden. His compositions are principally chamber music, and so far as is known he may be said to have written the first sonata for viola and pianoforte.

NAUMANN, KARL FRIEDRICH (1797-1873). A German mineralogist, born in Dresden. He studied at the Freiberg School of Mines, and at the universities of Jena and Leipzig, and in 1821 made a journey to Norway for scientific purposes. After his return he became an instructor at Jena. A year later he was called to Leipzig as professor, and in 1826 he accepted a similar position at Freiberg, but in 1842 he returned to Leipzig, where he remained until his retirement, thirty years later. Among his writings are: *Anfangsgründe der Kristallographie* (2d ed. 1854); *Elemente der theoretischen Kristallographie* (1856); and *Elemente der Mineralogie* (12th ed. 1885).

NAUMBURG, noum'bo͞ork, or NAUMBURG-ON-THE-SAALE. The capital of a circle in the Province of Saxony, Prussia, situated on the Saale, 30 miles southwest of Leipzig (Map: Prussia, D 3). Its cathedral of Saints Peter and Paul is an interesting building with four towers and many statues, paintings, monuments, and other specimens of early German art. There are a gymnasium and a Realschule. The town manufactures woolens, soap, leather, combs, and sausages. Glass and porcelain painting is also an important industry. The trade in wine is extensive. In 1029 Naumburg became the seat of the bishopric of Naumburg-Zeitz. Population, in 1900, 23,187.

NAUPLIA, na̤'plē-ȧ. A town of Greece, the capital of the Nomarchy of Argolis, seven miles southeast of Argos, on the Argolic Gulf (Map: Greece, D 4). It has railroad connection with Corinth. The impregnable situation of its harbor, protected by strong fortresses, renders it of great strategic importance. The Palamidi, a fortification originally constructed by the Turks and later strengthened by the Venetians, is at present utilized as a prison. Owing to its advantageous situation and spacious harbor, Nauplia is of some prominence commercially. From 1824 to 1834 it was the capital of Greece. In mediæval times Nauplia was one of the leading cities of the Peloponnesus. Here in 1831 Capo d'Istria, the President of the Republic, was assassinated. Population of commune, in 1889, 10,879.

NAUPLIUS (Lat., sort of shell-fish, which sailed in its shell as in a ship, from Gk. *ναῦς, naus*, ship + *πλεῖν, plein*, to sail). A larval stage in the development of certain crustaceans. See METAMORPHOSIS; and Plate of BARNACLES.

NAU'SEA (Lat., from Gk. *ναυσία, nausia*, seasickness, disgust, nausea, from *ναῦς, naus*, ship). A distressing sensation always referred to the stomach. It is unattended by pain, but is usually accompanied by a feeling of general languor or debility, a small and often irregular pulse, a pale, cool, and moist skin, general muscular relaxation, an increased flow of saliva, and a sensation that vomiting will supervene. It is most commonly a *direct* symptom of disease or disorder of the stomach, but sometimes it is a very important *indirect* symptom of disease of some part at a distance from the stomach—as, for example, the brain or the kidney. The nausea which is so troublesome to pregnant women is due to the irritation excited by the enlarged uterus being reflected by nervous agency to the stomach. Among the more common causes of nausea (which may or may not be followed by vomiting) may be mentioned fainting spells, the taking of a general anæsthetic, and surgical shock It may be provoked by blows upon the head, abdomen, testicles, or ovaries, or by powerful mental impressions such as revolting sights, odors, or sounds, and sudden fright. Other causes will be discussed under VOMITING (q.v.).

NAUSHON, na̤'shŏn'. One of the Elizabeth Islands (q.v.).

NAUSIC'AA (Lat., from Gk. *Ναυσικάα, Nausikaa*). In the *Odyssey*, the daughter of the Phæacian King Alcinous. When Odysseus is wrecked on the coast of Scheria, she discovers him and conducts him to her father's court.

NAUTCH, na̤ch (Hind. *nāch*, from Skt. *nātya*, dance, from *nart*, to dance). The term applied especially in Northern India to the dancing girls attached to the temples. The corresponding word in the south of India is bayadere (q.v.). The presence of these girls at temples and their double rôle of attendants on the deity and of courtesans is undoubtedly a survival of the custom formerly widespread, especially in the East, of sacred prostitution. The daughters of nautch girls are generally trained as successors of their mothers. As in like religious customs elsewhere, no social odium attaches to these women. The nautch dancers are completely enveloped in winding drapery, and move with slow and rhythmic motions of the body, while the hands are busied in graceful gesturing and in managing the drapery. The feet are little used. The nautch dance is primarily erotic in character, and now is often regarded by the natives as symbolizing the loves of Krishna (q.v.) and the milk-maids. See BAYADERE; DANCING GIRL.

NAUTICAL ALMANAC (from Lat. *nauticus*, from Gk. *ναυτικός, nautikos*, pertaining to ships or sailors, from *ναύτης, nautēs*, sailor, from *ναῦς, naus*, Skt. *nāu*, ship). A volume issued annually, and containing primarily the astronomical data required by navigators in the computation or reduction of the sextant observations by which the ship's position at sea is ascertained. The preparation and publication of these almanacs is very costly, and is therefore undertaken as a work of public utility by several different governments. Thus the United States issue the *American Ephemeris and Nautical Almanac;* Germany, the *Berliner Astronomisches Jahrbuch;* France, the *Connaissance des Temps;* and Great Britain, the *Nautical Almanac.* To the astronomer, the *Nautical Almanac* furnishes a great mass of important data; it gives the position of the moon in right ascension and declination for every hour, and the sun's latitude and longitude for every day in the year; it shows the obliquity of the ecliptic, the sun's and moon's parallax, aberration, etc., at different times; it supplies the necessary data for the determination of the real or apparent size, position, and motion of the planets and their satellites; it fixes accurately the places of the more important stars, and gives full details concerning eclipses, occultations, transits, and other celestial phenomena occurring during the year. It is generally issued two or three years in advance of its date for the sake of mariners going on long voyages. See ALMANAC.

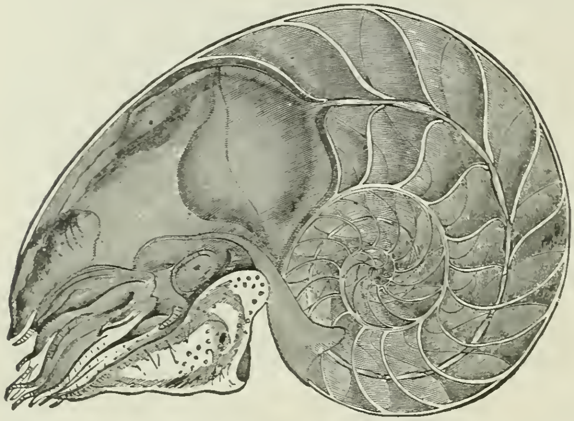
NAUTICAL SCHOOLS. See NAVAL SCHOOLS OF INSTRUCTION.

NAUTICAL SURVEYING. See HYDROGRAPHY.

NAU'TILOI'DEA (Neo-Lat., from Lat. *nautilus*, from Gk. *ναύτιλος*, sailor, *nautilus*, from *ναῦς, naus*, ship + *ειδος, eidos*, form). An order of fossil Cephalopoda, equal in rank to the Ammonoidea, containing about 2500 species that range from Cambrian to recent time, and are represented at present by only two or three living species of the genus Nautilus. The most ancient forms were straight conic shells (Orthoceras) which soon became coiled like the modern forms. Many of the extinct genera and species are most important horizon-markers or index fossils. See CEPHALOPODA; NAUTILUS; ORTHOCERAS.

NAU'TILUS (Lat., from Gk. *ναύτιλος, nautilos*, sailor, from *ναῦς, naus*, ship). The pearly nautilus (genus *Nautilus*) is the only living representative of an immense assemblage of shelled cephalopods of the subclass Tetrabranchiata, which flourished during past geological ages. The shell is coiled in one plane, divided into chambers by partitions or septa, the outermost being called the 'living chamber,' as it contains the animal; the septa are perforated by the siphuncle, which is central or nearly so, and the aperture is wide and spacious. The shell consists of two layers, the outer being porcellanous, the inner pearly, or nacreous, whence the name 'pearly' nautilus. The initial chamber consists of an obtuse incurved cone, marked on the outer surface of its posterior wall by a small scar called the *cicatrix.* It is supposed that a perishable embryonic shell (protoconch) was formed, the presence of which is indicated by the cicatrix.

The body is short and thick, divided into a large obtusely conical head bearing eyes, tentacles, ears (otocysts), and a rounded sac-like trunk. The mouth is surrounded by about 90 external filiform tentacles. The pair of tentacles on the inner or dorsal side are fused so as to form a hood-like lobe by which the aperture of the shell is closed when the animal is withdrawn into the living chamber. Beneath is the funnel (hyponome), not forming a completely closed tube as in the squids, but a locomotive organ, through which, as in other cephalopods, the water is ejected with sufficient force to throw the animal backward. In swimming forward, says Kent, the tentacles are extended radially from the head.



PEARLY NAUTILUS (*Nautilus pompilius*).
Seen in section showing the chambers and siphuncle. (Half natural size.)

The mouth is in the centre of the lobes and groups of tentacles, armed with a tongue (radula) and a pair of remarkably powerful horny jaws tipped with carbonate of lime. Olfactory organs and osphradia are present. The animal is attached within the living chamber by two oval muscles. The compartments of the shell are usually said to be filled with air or gas, but according to Verrill they are filled with seawater, which may be taken in or expelled so as to equalize pressure at varying depths.

Until recently the living nautilus was exceedingly rare, though the empty shells are cast ashore in great quantities in the Pacific and Indian oceans. Yet they have been for a long time trapped in baskets like lobster-traps by the natives of some of the Melanesian and Fiji islands and used as food. Willey at Ralum, in New Britain, succeeded in trapping the nautilus in 70 fathoms of water. He also succeeded at Lifu, one of the Loyalty Islands, in capturing specimens at a depth of only three fathoms. These he kept in a large submerged cage, feeding them daily until his efforts were rewarded early in December, 1894, by finding that they had spawned in the cage, yielding an abundance of eggs. These are not laid in bunches, as is the case with those of the squid, but are deposited separately by the female. Each egg is as large as a grape. There are said to be three species now living in the Pacific Ocean, while the number has been carried up to even four. The two better known species are *Nautilus pompilius* and *Nautilus umbilicatus*.

FOSSIL NAUTILI. Although the family Nautilidæ dates from the Jurassic period, the genus Nautilus is doubtfully referred to the Tertiary. The order Nautiloidea, however, originated as early as the Ordovician; the earlier types were straight and uncoiled, like Orthoceras. Very striking, says Hyatt, is the marvelously sudden rise of the Nautiloidea as a group; it reached its maximum in the Silurian, followed by a decline extending from the Devonian to the Triassic period. Then the forces acting unfavorably upon their existence were arrested, or their violence lessened, and the group has been affected by only very slight changes and an exceedingly slow process of retrogression, until the present time.

BIBLIOGRAPHY. Owen, *Memoir on the Pearly Nautilus* (London, 1832); Parker and Haswell, *Text-book of Zoölogy* (New York, 1898); Cooke, *Mollusks* (Cambridge Natural History, ib., 1895); Hyatt, in Zittel Eastman, *Textbook of Paleontology* (ib., 1900); Willey, "Pearly Nautilus" (*Zoölogical Results Based on Material from New Britain, New Guinea, etc.*, Cambridge, England, 1902; vi., Zoölogy).

NAUVOO, nạ-vōō′. A city in Hancock County, Ill., 12 miles north of Keokuk, Iowa; on the Mississippi River, at the head of the lower rapids (Map: Illinois, A 3). It is in a highly productive fruit-growing country, where the leading occupations are wine-making and the culture and shipment of fruit for market, particularly grapes and berries. Saint Mary Academy, conducted by the Benedictine Sisters, is in Nauvoo. The most interesting features in this vicinity are the remains of the old Mormon buildings. Population, in 1890, 1208; in 1900, 1321. Nauvoo was founded by the Mormons in 1840, and rapidly increased in size until in 1846 it had a population of 15,000. In this year the settlement was broken up by the people in the neighborhood. (See MORMONS.) An imposing temple, 130 feet long by 90 feet wide, left unfinished by the Mormons, was destroyed partly by fire in 1848 and partly by a tornado in 1850. In 1850 a company of French socialists, called Icarians (q.v.), under the leadership of M. Cabet, occupied Nauvoo, but their experiment proved a failure, and they abandoned the place in 1857.

NAVA, nä′vȧ. A seaport of Japan. See NAFA.

NAV′AHO, or **NAV′AJO**, *Sp. pron.* nȧ-vä′hō. An important tribe of Athapascan stock (q.v.). Their present reservation in northeastern Arizona and extending into New Mexico and Utah comprises nearly ten million acres, but it is almost entirely an arid desert of sand and rock, unfit for any purpose except scanty grazing. Like other tribes of the same stock, they call themselves simply *Dĭnĕ*, 'people;' they are called *Apaches de Navajo* in Spanish records at least as early as 1630. They came originally from the far northern home of their kindred, but have incorporated elements from all the neighboring tribes. They were roving and predatory in their habits, and were continually at war with the Ute and the Plains tribes. They were alternately at war or peace with the Spaniards during the early colonization period, but later became so troublesome that in 1705 and again in 1713 it was necessary to bring them to terms by vigorous invasions of their country. In 1744 Franciscan missionaries attempted to civilize them, but in a few years the effort was abandoned. In 1805, in consequence of continued raids, a Spanish force penetrated their stronghold in Tseyi (Chelly) Cañon and inflicted a severe defeat, killing 115 men, women, and children. The lesson, however, was soon forgotten, and between the fall of the Spanish power about 1815 and the American occupation of the country thirty years later they made the stealing of sheep, cattle, and horses from the Mexican settlements a steady and profitable business. With their booty they were enabled to become a pastoral tribe, and they adopted from the more civilized Pueblos a well-developed weaving art. From the Mexicans they learned the simpler forms of metal-working, especially in silver. In 1846 a number of prominent chiefs made their first treaty with the American Government, but, on account of the unfortunate killing of the principal signer three years later, the tribe again became hostile. Hostilities continued with but short intermissions until 1863, when it was determined to deport the entire tribe to the Bosque Redondo reservation on the Pecos River, near Fort Sumner, in eastern New Mexico. In the ensuing winter a mixed force of whites and Ute Indians under Kit Carson invaded the Navaho country and forced their cañon stronghold. Within a year nearly 8500 had been deported to the Bosque Redondo, and it was supposed that not more than 2000 remained at large in their own country, but later developments proved that not more than half, and these not the most troublesome, had been removed. The experiment proved a failure. The stock of the Navaho died or was stolen, their crops failed, and their numbers decreased from disease, escapes, and attacks by the Plains tribes. In June, 1868, a new treaty was made, under which the captives, then numbering 7300, were returned to a reservation set aside in their old country, and were given sheep and cattle with which to begin life anew. Since then they have remained quiet, steadily increasing in wealth and population. In 1884 the reservation was extended to its present dimensions to accommodate their rapidly increasing herds.

The Navaho have a fully developed clan system, including some fifty clans, with descent in the female line. Their government is democratic and local, rather than centralized, since the nature of their country and occupation prevents the formation of large organized bodies, so that each family shifts for itself in the search for temporary pasturage and water supply. They are agricultural to a limited extent. They make some pottery and baskets, but derive their main subsistence from their herds of sheep and goats, together with horses and some cattle. They are well known for the beautiful and durable blankets which they weave from the wool of their flocks, and for their artistic silver ornaments. Although, like most pastoral peoples, they are nomadic, they build at each regular halting place permanent *hogáns*, or circular houses, of logs covered with earth, with a short covered entranceway and smoke-hole at the top. Men and women alike are almost constantly at work caring for their herds, weaving, or laboring at the forge. They have elaborate and spectacular ritual ceremonies and an abundant mythology, with hundreds of sacred songs in the keeping of their priests. Aside from the industries which they have made their own they have adopted but little of the white man's civilization or teaching. They are estimated now at 20,000, less than half of whom are within the reservation limits, the rest ranging on outside pastures or working in the white settlements. Consult Matthews, *Navaho Legends* (Boston, 1897). See Colored Plate of INDIANS.

NAVAHO BLANKETS. See BLANKETS, with Colored Plate.

NAVAL ACADEMY, UNITED STATES. The school at which are educated the executive officers of the United States Navy. It was founded as the 'Naval School' in 1845, at Annapolis, Md., with a course fixed at five years, the first and last of which were to be spent at the school; but this plan was not strictly adhered to even at first, and was subsequently changed. In 1849 the course was changed to seven years, the first two and last two being spent at the school, and the three intervening years at sea, and the name of the institution was changed to United States Naval Academy. In 1851 the four years of study were made consecutive, and annual practice cruises were commenced. In 1861 the academy was removed to Newport, R. I., on account of the war. It returned to Annapolis in 1865.

In 1873 the course for cadet midshipmen was extended to six years, the last two to be spent at sea. In 1882 the title of cadet midshipman was changed to naval cadet, which in 1902 was replaced by that of midshipman. Appointments to the different corps were made by the Secretary of the Navy upon recommendation of the academic board; but only enough appointments were made to fill vacancies, all other graduates being honorably discharged. In 1889 the law provided that the cadets of the first class (seniors) should be separated at the beginning of the year into two divisions, and those destined for the line and the engineer corps should pursue separate courses of study during the first class year. In 1889, also, the age of candidates at date of admission, which had been from fourteen to eighteen years, was changed to fifteen to twenty years. In 1899 the act of March 3d consolidating the engineer corps with the line abolished the separate line and engineer divisions at the Academy. The same act increased slightly the numbers in all grades of the service and very much increased the lower grades. The number of graduates thus became insufficient, and in 1900 the number of cadets at the Academy was increased by an act authorizing appointments to the Academy every four years instead of every six. The number of officers in service subsequent to the Spanish-American War was wholly inadequate to the increasing demands of the fleet, and as the only means of adding to the number is through the Naval Academy, an increase in the number of cadets was proposed. This increase, made by Congress in 1902, provided for the appointment of a cadet every two years by each Senator, Congressman, and Delegate in Congress, and 11 by the President.

The course of study and instruction at the institution is much more advanced than the term Academy would imply, and approximates that of many post-graduate technical schools. The course for the first year (fourth class) includes mechanical drawing, algebra, geometry, descriptive geometry, trigonometry, English studies, French, Spanish, and hygiene, and practical exercises and instruction in seamanship, boats, ordnance, target practice, infantry, artillery, battery drill, fencing, gymnastics, dancing, and swimming. The course for the second year (third class) includes trigonometry, conic sections, differential and integral calculus, mechanical drawing, physics, chemistry, naval history, French and Spanish, and practical exercises and instruction in seamanship, boats, signals, ordnance, target practice, infantry, artillery, battery drill, fencing, and steam engineering. The course for the third year (second class) includes seamanship, principles of mechanism, mechanical processes, mechanical drawing, marine engines and boilers, integral calculus and mechanics, physics, chemistry, and electricity, and practical exercises and instruction in seamanship, boats, steam tactics, signals, ordnance, infantry, artillery, battery drill, target practice, fencing, and steam engineering. The course for the fourth year (first class) includes seamanship and naval tactics, gun and torpedo drills, naval ordnance and gunnery, navigation, theory of compass deviations, marine surveying, boilers, naval construction, engineering materials and designing, physics, electricity, and Spanish, and practical exercises and instruction in seamanship, boats, steam tactics, battery drill, target practice, torpedo practice, ordnance, artillery, infantry, fencing, compass correction, navigation, surveying, steam engineering, practical electricity, turret drill, etc.

From the first of June until the first of September the cadets are embarked on practice vessels for the summer cruise, when they are instructed practically in the various duties of their profession. For several years since the Spanish-American War one of the practice vessels has been a battleship temporarily detached from the fleet, the upper classes spending half the summer on her and half on the sailing training-ship *Chesapeake.* Until 1898 most of the buildings of the Academy were very old, many of them dating from the early part of the nineteenth century, and the accommodations for the cadets inadequate as well as unsuitable. The necessary expansion of the institution was brought to the attention of Congress by the war, and a very liberal plan of rebuilding the Academy was adopted. The expenditure authorized was $8,000,000, and the result will be the finest naval institution of learning in the world. About one-half the buildings were under construction in 1902. Consult: Soley, *History of the Naval Academy* (Washington, 1876); Benjamin, *The United States Naval Academy* (New York, 1900).

NAVAL APPRENTICE. See section on *Naval Apprentice,* under APPRENTICE.

NAVAL ARCHITECTS AND MARINE ENGINEERS, THE SOCIETY OF. An association incorporated under the laws of New York State, with headquarters in New York City. The object of the association is the promotion of the art of shipbuilding. The society holds annual meetings, and has a membership of over five hundred.

NAVAL ARCHITECTURE. See SHIPBUILDING.

NAVAL CADET. See CADET, NAVAL.

NAVAL CONSTRUCTORS. Officers of the United States Navy charged with the design, building, and repair of ships. The corps of naval constructors is filled by appointment of graduates of the Naval Academy who are sent (after graduation) to special technical schools for an additional course in shipbuilding. In 1902 there were twenty-one naval constructors and twenty assistant constructors. The constructors are not allowed a free hand in designs, as the general features are prescribed by the Secretary of the Navy upon the recommendation of the Construction Board, which consists of the chiefs of the bureaus of the Navy Department. The working out of the design, however, is left wholly to the construction corps.

NAVAL CROWN. In heraldry (q.v.), a rim of gold around which are placed alternately prows of galleys and square sails.

NAVAL INSTITUTE, UNITED STATES. An organization founded at Annapolis in 1873 by the officers then on duty at the United States Naval Academy. It has for its object the promulgation of knowledge concerning naval affairs among the officers of the naval service. During the first years of its existence it issued occasional numbers of its *Proceedings,* but in a short time the publication was made quarterly, and this has since continued. In addition to papers submitted by officers, the *Proceedings* contain a quarterly review of the naval work of the world in the "Professional Notes," which aim to give all available information concerning new ships, guns, torpedoes, etc., which has become available during the past quarter. Each year the Institute offers a gold medal, a life membership, and a prize of $100 for the best essay on any subject of interest to the service, reserving the right to withhold the offer if no worthy essay is presented.

All officers of the Navy and persons holding positions under the Navy Department are eligible to membership, and other persons interested in naval affairs may be elected as associate or honorary members. The present membership of the Institute includes about two-thirds of all the officers in the navy and is rapidly increasing.

NAVAL LAW. See MARTIAL LAW.

NAVAL OBSERVATORY. A Government institution situated at Washington, D. C., a division of the Bureau of Equipment in the Navy Department. Its functions are "to determine accurately the positions of the sun, moon, planets, and stars for use in preparing the *Nautical Almanac;* to test chronometers; to issue correct standard time daily; . . . to distribute to vessels of the Navy instruments of precision for navigating purposes: to conduct astronomical investigations of general and special scientific interest; and, since 1894, to publish the *Nautical Almanac.*" It had its origin in a depot of charts and instruments established by the Navy Department under the charge of Lieut. L. M. Goldsborough in 1830. At this depot, "in a small circular building, on a brick pier with a foundation 20 feet below the surface, he mounted a 3-inch transit instrument made by R. Patten of New York City." In 1833 Lieutenant Wilkes, U. S. N., moved the depot to another site on Capitol Hill, and at his own expense built an observatory containing a transit instrument of 3¾ inches aperture and 63 inches focal length; a Borda's circle: a 3½-foot achromatic portable telescope; a portable transit instrument; and a sidereal clock. In the summer of 1838 the Secretary of the Navy directed the superintendent "to make a constant series of observations in astronomy, magnetism, and meteorology, ordering an additional number of assistants (naval officers), and granting authority for the purchase of all necessary instruments." Under these instructions Lieut. J. M. Gilliss, U. S. N., began systematic observations in astronomy with additional instruments as follows: A sidereal clock and a mean time clock; a meridian circle of 5.5 inches aperture furnished with circles 30 inches in diameter; a portable achromatic telescope of 3¼ inches aperture and 42 inches focal length. The work done under his direction at the Capitol Hill depot between 1838 and 1842 was published in 1846 as *Astronomical Observations Made at the Naval Observatory*, being the first American volume of this nature.

A building for this depot was authorized by Congress in 1842 through the efforts of Lieutenant Gilliss. Taking the report of the Naval Committee which accompanied the bill as the exponent of the will of Congress, he, after consulting American and European scientists, prepared plans and erected the Naval Observatory. Soon after the instruments were in place Lieut. M. F. Maury succeeded to the charge of the observatory, remaining as superintendent until 1861, and in addition to astronomical work devoted much of his personal attention to the study of ocean currents and other hydrographic and nautical subjects, which gave him international reputation. He was followed as superintendent by such men as Gilliss, Davis, and Rodgers. Among the earliest of the scientific achievements of the new observatory were the observations of Neptune secured in 1846 immediately after the discovery of that planet, which enabled Sears C. Walker, by identifying two older foreign observations, to discuss the elements of Neptune during his short connection with the Observatory. The adaptation of electricity to record observations by Prof. John Locke, formerly lieutenant in the Navy, resulted in the installation of the first practical chronograph at the Observatory in 1849. With the 9.6-inch equatorial Assistant Astronomer James Ferguson discovered several planetoids between 1854 and 1860. The 26-inch lens made by Alvan Clark, at the time the largest refracting telescope in the world, enabled Prof. Asaph Hall to discover the satellites of Mars in 1877. In 1893 new buildings were completed on a more favorable site on Georgetown Heights, comprising a commodious office building occupied by the offices of the astronomical, nautical instrument, time service, and *Nautical Almanac* departments, while the 26-inch equatorial, a 9-inch and a 6-inch transit circle, and a 5-inch prime vertical instrument are disposed in suitable dome and houses on the south, east, west, and north of a clock-house, the longitude of which is 5h. 8m. 15.78s. W., and the latitude 38° 55′ 14.0″ N. In addition to the instruments named there are a 12-inch equatorial, a 6-inch altazimuth, a 5-inch transit, a 5-inch photoheliograph, and numerous others. The library contains about twenty thousand volumes, and is the most complete astronomical collection in the country. The publications of the Observatory comprise more than fifty large quarto volumes, which contain full details of the work executed, with many valuable scientific memoirs by Professors Asaph Hall, Simon Newcomb, William Harkness, and others.

NAVAL ORDER OF THE UNITED STATES. An hereditary patriotic society organized in Boston, Mass., on November 10, 1890, having for its objects the perpetuation of the deeds of the American Navy through the encouragement of research in naval arts and science and the preservation of historic memorials relating to the Navy of the United States. There are two classes of companions. The first class includes veteran officers and their male descendants; and the second class, enlisted men who have received the United States naval medal for bravery in the face of the enemy. The badge of the order is a gold Maltese cross coated with blue enamel and edged with gold. In the centre of the obverse is the insignia of the Navy of the United States with the motto, 'Fidelitas et Patria'; on the reverse is the insignia of the Marine Corps. There are State commanderies in Massachusetts, Pennsylvania, New York, California, Illinois, and the District of Columbia. Representatives from these commanderies meet triennially as a general commandery. The total membership is about 500.

NAVAL RESERVE. In all the more important navies, in addition to the regular forces serving continuously with the fleet, there are certain others which are drilled and instructed in order to be able to supplement the personnel of the fleet in time of war. In peace these men are largely employed in the merchant marine, in yachts, in auxiliary Government services, or are pensioners or others who have served the requisite length of time for pension or discharge, but are still within the limit of age. In some countries a portion of the naval reserves have not served either in the mercantile marine or the navy, but are given a certain amount of training for such service; while in countries in which service in the army and navy is compulsory the greater part of the reserve is made up of men who have completed the requisite length of active service with the fleet.

The naval reserve of the United States is small (about 4000 officers and men) and consists of battalions or divisions of State naval militia organized at various ports on the seacoast or the Great Lakes. These officers and men served in the war with Spain, and, considering their opportunities for training, they acquitted themselves with great credit and were a most important addition to the strength of the navy personnel. The defects of the system of training and organization were, however, so clearly shown that the establishment of a national naval reserve under the direct control of the Navy Department has been under continuous consideration and is likely to be effected, especially as the number of men likely to be obtained from the naval militia is inadequate to the demands of a strong war fleet.

In Great Britain the naval reserve consists of (1) the royal naval reserve, (2) the royal fleet reserve, and (3) the pensioners. On January 1, 1903, the total of these three classes was 41,540 men; in addition, there were 4200 men in the coast-guard, who are included in the regular effective force of the navy, but are employed in coast-guard duties. The reserves are drilled on board special drill ships, on board vessels of the regular fleet, at various barracks, etc. They receive a small retaining pay and full pay when actually serving. The reserve of the French and

German navies are derived chiefly from honorably discharged men who have served the required term of enlistment and then pass into the reserve. To these may be added the men who have not yet been called upon, but who will be required to serve in time of war, such as fishermen, merchant sailors, and others pursuing such callings as are useful in the war fleet, also those who may elect to serve in the navy rather than the army. On January 1, 1903, the effectives of the French reserve were about 50,000 in number, and of the German about 74,000. The Russian naval reserve is somewhat similarly derived, but contains a greater proportion of untrained men who are unfamiliar with nautical life. Its numbers are not definitely known and the requirements of entry are being changed; a fair estimate is 60,000—of which not more than half have received much training. The Italian reserve, like those of France and Germany, consists of men who have completed the term of active service and have passed to the reserve list. The number has at times exceeded 32,000 and is now probably not less than that. See NAVIES.

NAVAL SCHOOLS OF INSTRUCTION. In the United States the naval schools consist of the Naval Academy (q.v.), Naval War College, Naval Torpedo School, apprentice training schools, and gunnery training schools. The Naval War College is at Newport, R. I., and performs the double function of preparing plans of naval operations and instructing officers in special lines. The torpedo school for both officers and men is located at the Torpedo Station on Goat Island, Newport Harbor, R. I. The principal training station for enlisted men is the one for apprentices at Newport; but there are others at Port Royal, S. C., and San Francisco. The school for seamen gunners is divided between the naval gun factory at Washington and the torpedo station at Newport. Gun captains are trained on the gunnery training ships, which usually have headquarters at Port Royal, S. C.

FOREIGN NAVAL SCHOOLS. The naval school of *Argentina* is at Buenos Ayres. The age at date of admission is fourteen to seventeen years and the course is four years. The instruction is very good in theoretical branches, but the practical nautical exercises are very few.

The greater part of the executive officers of the *Austrian* navy are graduates of the naval academy at Fiume; the others are appointed provisionally and serve in the fleet until able to pass a satisfactory examination. The age at date of admission to the academy is fourteen to sixteen years. The course is four years, three months of every year being spent on board a practice ship. There are also gunnery training schools, torpedo schools, and sailing training vessels for men and boys.

The executive officers of the *Brazilian* navy are recruited from the graduates of the naval school at Rio de Janeiro. The limits of age at entrance to the academy are thirteen and seventeen years and the course is three years. The graduates are transferred to the naval college (Rio de Janeiro) for an additional course of four years.

There is a naval academy for the education of officers of the *Chilean* navy at Valparaiso. The course is six years, previous to which the cadet must have completed three years at the military academy at Santiago.

There is a naval school for the instruction of officers in the *Chinese* navy at Nanking, but only a part of the officers are educated there. It may be said that in the appointment of officers, as in everything connected with the navy, there is no system. The course at the academy is four to six years.

In *Denmark*, each year there are ten admissions to the naval school for officers, situated at Copenhagen. The candidates must be from fifteen to twenty years of age and have served nine months in the navy or eighteen months in the merchant marine. After a preliminary cruise of three months they are reëxamined and six of the ten selected, the others being discharged. The course of instruction is four years.

The training of officers and men for the *French* navy is undergoing some changes. The principal naval schools are the Polytechnic School (partly naval), Naval School, superior training school for executive officers, training school for engineer officers, medical, torpedo, machinist, gunnery, and ordnance schools. The naval school proper is on the old line-of-battle ship *Borda* at Brest. The requirements for entrance are high, and the range of subjects quite wide. The age at entrance is from fourteen to eighteen years. The course is two years. After completing the course at the naval school the cadets are promoted to *aspirants* second class, and sent on board a cruising training ship where their instruction is continued for a year. They are then promoted to *aspirants* first class and their training ceases. The school for engineers is a school of engine design and construction. The medical schools are three in number and are located at Brest, Rochefort, and Toulon. The course of study is two years. The torpedo, gunnery, and ordnance schools are for the practical and theoretical education of those officers who incline to become specialists. The machinist school is for the training of warrant and petty officers of this branch for higher grades.

The *German* naval academy is located at Kiel. The candidates for admission must not be more than seventeen years old and possess certificates of qualification for the upper classes of a royal high school (*Realgymnasium*), or pass an examination in the equivalent subjects. After entering they are given four weeks' practical instruction on shore; the cadets are then sent on board a cadet training ship and pass the winter abroad. Upon their return in the spring they are examined and, if qualified, promoted to ensign (*Fähnrich zur See*). They are then embarked for another full year's course of practical training and theoretical and practical instruction on one of the cadets' and boys' training ships. The young ensigns are then transferred to the naval academy for one year's course of theoretical instruction. At the close of the year the principal examination takes place; after which the ensigns are sent for half a year to the gunnery and torpedo ships and to the marine infantry school for special practical and theoretical courses in gunnery, torpedo, and infantry instruction. After this they are examined, and upon passing are sent for two years' practical training on board battleships or large cruisers; but they are promoted to lieutenant (*Lieutenant zur See*) at the end of the first year.

The naval school of the *British* navy is located at Dartmouth on board the old line-of-battle ships *Britannia* and *Hindostan*, though academic buildings on shore were commenced in 1902. The course is two years and includes instruction in seamanship, navigation, mathematics, and technical subjects. On completing the *Britannia* course the cadets or midshipmen are appointed to seagoing ships carrying a naval instructor who, in conjunction with an officer of the line and an engineer, supervises their instruction. After passing the necessary examinations and completing the required amount (about five years, including time spent on the *Britannia*) of sea service the midshipmen undergo an oral examination in seamanship carried out by three captains. Upon passing this they undergo a college examination at Greenwich, receiving certificates of the first, second, or third class, according to qualifications. This certificate materially affects promotion to lieutenant. After leaving the college the acting sublieutenants go through courses in pilotage, gunnery, and torpedo instruction. The men of the Royal Naval Reserve are drilled on board widely distributed ships for the greater convenience of the merchant sailors who form the principal part of the reserve. The training of firemen, machinists, etc., is carried out on vessels attached to the different dockyards.

The *Italian* naval academy is located at Leghorn (Livorno). The instruction is in two parts: (a) the normal course, and (b) the superior course. The limits of age at admission are thirteen and fifteen years. The normal course is five years in length, the theoretical instruction continuing during eight months of each year and the practical work on board the practice ships about three months. At the end of the course, having passed all examinations, the cadets are appointed midshipmen. They then are sent aboard cruising vessels for at least a year, after which they are commissioned as sublieutenants and are sent to the academy for the superior course of instruction, which comprises two sessions. The first session is obligatory for all sublieutenants, and the examination which takes place at the end fixes the rank of the officers in their grade and affects greatly the question of their advancement by selection (one-third are promoted to lieutenants by selection and two-thirds by seniority). To the second session only those are admitted who have attained a certain standard in their examinations, and these more fortunate young men receive a diploma which has an important influence upon their naval career and their eventual promotion. The naval constructors, constructing engineers, and commissary officers are also graduates of the naval academy. The schools for the enlisted men are five in number. There are also training ships for seamen.

Officers are supplied to the *Japanese* fleet in four ways: first, from the naval academy at Kure; second, by cadets sent to foreign naval schools; third, by promotion from the ranks (rare); fourth, by appointment from the marine school for merchant masters at Tokio. There are also torpedo, engineering, and gunnery schools, and several training ships for seamen and boys.

The naval school for the *Dutch* navy is located at Willemsoord. The age at entrance is fourteen to seventeen years and the course is four years. At the end of the course of four years the cadets pass examinations and are appointed as cadets of the first class. After two years' service in ships of the navy they are again examined, and, if found qualified, commissioned as second lieutenants. The school for naval engineers is at Hellevoetsluis. There are also gunnery and torpedo schools and school-ships for training seamen and boys.

The *Norwegian* naval school furnishes not only the officers of the regular service, but also those of the reserve. Candidates for admission to the school must not be over nineteen years of age and must have served for twenty-one months in the merchant marine. The course at the school is in two parts, inferior and superior. The inferior course is three years long and at the end the cadets become ensigns. Those ensigns who are not destined to form part of the regular navy are, after two years of ordinary service, made lieutenants of the reserve. The superior course has two terms of eight months each. After eighteen months of additional service the graduates of the superior school are promoted to the rank of lieutenant. There are also gunnery and torpedo schools and training ships for the enlisted force.

The naval school of *Portugal* is a polytechnic institution. The course for executive officers consists of three months on a training vessel, one year at the naval school, three months on the training vessel again, and lastly, another year at the school. The graduates are then appointed midshipmen, and after two years of service are commissioned as ensigns. There are gunnery and torpedo schools for both officers and men and training-school ships for boys.

The principal source of supply of officers for the Russian navy is the naval academy at Saint Petersburg. The candidates for entry must be between fourteen and eighteen years of age. The course is four years. At the conclusion of the course the cadets become midshipmen. There is also at the academy a post-graduate course for instruction of officers in strategy, tactics, international law, etc. The other source of supply of officers is the school of navigation and ordnance at Kronstadt. The course is four years and the instruction similar to that given at the naval academy. There are also training schools for the enlisted men with several training ships.

The executive officers in the *Spanish* navy are graduates of the royal naval school. The age of candidates at entrance is from thirteen to eighteen years. The course is three years, after which the cadets become midshipmen, and then serve one year on board a ship detailed as the school of application, one year on board the sailing vessel *Nautilus*, and one year on vessels in service. After a final examination they are commissioned as sublieutenants. There are also floating gunnery and torpedo schools and vessels for the training of seamen and of boys.

The executive officers of the active list of the *Swedish* navy are graduates of the naval academy at Stockholm. The limits of age of candidates at entrance are thirteen and sixteen years. The course at the naval academy is six years (eight months in each year at the school and four months on a practice ship). Upon graduation the cadets are made sublieutenants. They are then sent for six months as instructors in a school (*Exercisskolan*), where the enlisted men receive their naval instruction. This is followed by six months' service of various kinds, including some time spent at the dockyard. They then spend terms with the mobile defense of the coast and the gunnery school, and after eight or nine months in cruising ships they are commissioned as ensigns. There are also schools of the mobile defense, and a school for enlisted men (*Exercisskolan*) already mentioned, and a gunnery school.

In the *Turkish* navy the course of instruction is supposed to last ten years; four years at the primary school of Kassimpasha, four years in the preparatory school on the island of Halki, and two years at the naval school proper, also on the island of Halki. From the naval school the cadets graduate with the rank of lieutenant (*mulazim*).

Consult: the *Proceedings of the United States Naval Institute* (Annapolis); *Journal of the Royal United Service Institution* (particularly the number for October, 1901) (London); Brassey's *Naval Annual* (Portsmouth, 1886 et seq.); *Annual Reports of the Office of Naval Intelligence* (particularly the volume for 1888) (Washington); Soley, *Foreign Systems of Naval Education* (United States Navy Department, Washington, 1880); Buchard, *Marines étrangères* (Paris, 1891). See NAVAL ACADEMY; CADET, NAVAL; NAVIES; and section on *Naval Apprentice* under APPRENTICE.

NAVAL SIGNALS. See SIGNALS, NAVAL.

NAVAL TACTICS. See TACTICS, NAVAL.

NAVAL VETERANS, NATIONAL ASSOCIATION OF. A patriotic society organized in New York City in January, 1887, having for its chief purpose the preservation of the traditions and memories of the United States Navy during the Civil War. It admits to membership any officer, appointed or enlisted man who served in the United States Navy, United States Marine Corps, or United States Revenue Marine Service during any portion of the time between April 12, 1861, and August 25, 1865, and who has been honorably discharged or resigned by an honorable acceptance of resignation. The organization is divided into thirty-nine local associations, and has a membership of nearly 10,000.

NAVAL WAR COLLEGE. See NAVAL SCHOOLS OF INSTRUCTION.

NAVARINO, nä′vȧ-rē′nō. A town of Greece, in the Morea and in the Nomarchy of Messenia, at the southern extremity of the Bay of Navarino. It is at present officially called *Pylos.* The ancient Pylos was at the northern extremity of the bay, and is now called *Palæokastro* and *Palæo-Navarino.* Population, about 3000. Along the front of the bay stretches the island of Sphagia, or Sphacteria (q.v.). In 1492 the Turks captured Navarino, and held it, with two or three short periods of interruption, till 1821, when it passed into the hands of the Greeks. In 1825 it was taken by Ibrahim Pasha, and on October 20, 1827, in the Bay of Navarino, the allied British, French, and Russian fleets, numbering twenty-four ships and commanded by the British Admiral Sir Edward Codrington, defeated the combined Turkish and Egyptian fleets, comprising eighty-nine ships of war. In this battle sixty of the Ottoman ships were destroyed outright, and the rest were driven ashore in a shattered condition. The Turks lost 6000 men, while less than 200 of the allies were killed. The battle of Navarino brought about the achievement of Greek independence. Consult *Memoir of Sir Edward Codrington,* by his daughter (1873).

NAVARRE, nȧ′vär′. A former independent kingdom on both sides of the western Pyrenees, now constituting the Spanish Province of Navarra (capital Pamplona), and part of the French Department of Basses-Pyrénées. The Province of Navarre has an area of about 4050 square miles. A large portion consists of wooded mountains and well-watered valleys. The region about Pamplona is a treeless plateau. In the south, in the valley of the Ebro, is a fruitful district, called the Ribera (shore). In the southeast is a barren salt steppe. The region is drained by the Ebro, its affluents, the Ega and Aragon, the Arga, an affluent of the Aragon, and the Bidassoa. The population of the province is about 300,000.

HISTORY. This territory was occupied in ancient times by the *Vascones,* the present stock of the Basques, and they were never entirely subjugated by the Romans. The Visigoths met with sturdy resistance from the Basques, and had to content themselves with a nominal overlordship. The Basques were enabled to maintain some independence even during the Saracen conquest. Charles the Great, toward the close of the eighth century, conquered their country and made it a part of the Spanish mark. It soon became independent of the Franks and for a time its history is very imperfectly known. Apparently Sancho Garcia (905-925), who wrested the region of the Upper Ebro from the Saracens, was the first to bear the title of King of Navarre. In the form of government the Basque influence and the tribal feelings were strong, and the governmental institutions were primitive. The King was elected, and limited in his power by a council of twelve nobles. The kingdom developed rapidly by conquests. Sancho III., the Great, who died in 1035, was also King of Castile, and Aragon was under his control as a dependency of Navarre. He divided his kingdom among his three sons. Sancho IV. of Navarre was murdered in 1076 and the nobles chose King Sancho of Aragon as their ruler. Until 1134 Navarre was united with Aragon (q.v.). In that year the King of Aragon, Alfonso the Battler, bequeathed his kingdoms to the Templars and Hospitalers. The people of Navarre, dissatisfied, chose the son of Sancho IV. as King and recovered their independence. The country continued under this dynasty for a hundred years, but Navarre, shut in by Castile and Aragon, was prevented from developing by conquests from the Moors. In 1234 Navarre passed by inheritance to Champagne. Queen Joanna of Navarre married Philip IV. of France in 1284, and from that time until the extinction of the Capetian dynasty, in 1328, the history of Navarre was intimately connected with that country. Then the kingdom went, as a dowry, to Philip of Evreux, who married Joanna, daughter of Louis X. Her son was Charles the Bad. (See CHARLES II. OF NAVARRE.) His grand-daughter Blanche married King John of Aragon, and Navarre was connected with Aragon from 1458 until 1479. John's daughter, Eleanora, who succeeded to the throne of Navarre in 1479, was married to Gaston de Foix, Viscount of Béarn, and thus Béarn was united with Navarre. Eleanora died soon after her accession and was succeeded by Francis Phœbus. His successor, Catharine de Foix, married in 1484 a French noble, Jean d'Albret. In 1512 Ferdinand of Aragon conquered what is now the Spanish portion of Navarre. The kingdom was thus reduced to a small district, to the north of the Pyrenees. Jeanne d'Albret married in 1548 Antoine de Bourbon. Their son, Henry, ascended the throne of Navarre in 1572, and in 1589 became King of France as Henry IV. Navarre was united to France by decree in 1607, but down through Charles X. all French kings bore also the title of King of Navarre. Consult Bordenave, *Histoire de Béarn et Navarre* (Paris, 1873).

NAVARRETE, nä′vȧ-rā′tā, Domingo Fernandez (1610-89). A Spanish missionary. He was born at Peñafiel, Old Castile; entered the Dominican Order, and in 1647 went to the Philippine Islands, where he became professor of theology at Manila. Later he made a missionary journey into the interior of China and resided there for a number of years, becoming in time the head of his Order in China. During a persecution he was imprisoned at Canton, but escaped and reached home in 1673. In 1677 he became Archbishop of San Domingo. He published the first volume of his work, *Tratados históricos, políticos, éticos y religiosos de la monarquía de China* (1676); but the second volume was suppressed by the Inquisition. A projected third volume was never published. Consult Navarrete's China, in *Churchill's Collection of Voyages and Travels*, vol. i. (London, 1744).

NAVARRETE, Francisco Manuel de (1768-1809). A Mexican poet, born at Zamora. He entered the Franciscan Order and ultimately became professor of Latin at the University of Valladolid. He attained some reputation, especially for his bucolic poetry. A collection of some of his works was printed as *Entretenimientos poéticos del P. Navarrete* (1823).

NAVARRETE, Juan Fernandez, properly Fernandez-Navarette (c.1526-79), surnamed El Mudo (the Mute). A Spanish biblical painter, born at Longroño. He studied in different parts of Italy, especially at Venice under Titian, and returned to Spain after twenty years, with his reputation well established. In 1568 he was made painter to the King, and employed on the decorations for the Escorial. Among those still surviving are a "Saint Jerome," "Christ at the Pillar," "the Nativity," "The Martyrdom of Saint James," and "A Holy Family." In 1576 he painted his most famous picture, "Abraham and the Three Angels," for the Escorial, and in 1577-78 he further painted eight pictures representing the "Apostles," the "Evangelists," "Saint Paul," and "Saint Barnabas." Among his other works are "Saint John in Prison," Hermitage, Saint Petersburg, and "The Holy Family," Weimar Museum. Navarrete's manner shows the influence of his master, Titian, and he plays an important part in the technical development of the Spanish school. He died at Toledo, March 28, 1579.

NAVARRETTE, Martin Fernandez de (1765-1844). A Spanish navigator and author, born at Avalos, Logroño, Spain. He entered the Spanish navy in 1781, served in the West Indies and in the Mediterranean, and took part in the combined French and Spanish attack on Gibraltar in 1782. He became a lieutenant in 1789, and, having already attracted attention by his writings on naval questions, was commissioned to collect documents relating to the history of the Spanish navy. From 1796 to 1806 he was detailed on special service in the Department of Marine, resigning in the latter year rather than recognize Joseph Bonaparte. He again took office after the restoration, became a recognized authority on naval affairs, and in 1823 was appointed director of the hydrographic office. Subsequently he was chosen Senator and made a Councilor of State. His greatest work was his *Coleccion de los viajes y descubrimientos que hicieron por mar los españoles desde fines del siglo XV.* (7 vols., 1825-65). He also wrote a *Life of Cervantes*, published with a new edition of *Don Quixote* (1820); and left material for two posthumous works, *Discertación sobre la istoria de la Nautica* (1846) and *Biblioteca marítima española* (1851).

NAVAR′RO, Madam. See Anderson, Mary Antoinette.

NAVARRO, nȧ-vä′rō, Pedro (1446-1528). A Spanish general, who greatly developed the use of mines in war. His early life is obscure. In 1500 he was employed by Gonsalvo de Córdova in the campaign against Naples. He was very successful in his use of mines against the famous Castello Nuovo in 1503, and was made Count of Alvetto by Ferdinand of Aragon. Navarro joined the French army after the battle of Ravenna (1512), and contributed largely to the success of the campaign of Marignano (1515). In Lautrec's disastrous campaign against Naples, Navarro was captured, taken to that city and imprisoned there. His death followed immediately.

NAVAS DE TOLOSA, nä′vȧs dā tō-lō′sȧ, Las. A village of Andalusia, Spain, 37 miles north of Jaen, noteworthy as the scene of a battle (July 16, 1212) between Alfonso VIII. of Castile, aided by a large army of Crusaders, chiefly French and English, and an army of Moors under Mohammed ibn Abdallah. The Christians were victorious and permanently broke the Mohammedan power in Spain. Here also, in 1812, a battle took place between the Spanish and French.

NA′VE (ML. *navis*, nave of a church, ship, Lat. *navis*, ship). A term used most commonly in connection with church architecture, and with two meanings. In the first place it denotes the higher middle division where there are three or five divisions; as in a church of the type established in the fifth century in the Christian basilicas of Italy. The side divisions are called aisles, and nearly all large Christian churches have had 'three aisles;' the word aisle in this case covering nave as well. A few large buildings are five-aisled, and the Cathedral of Antwerp is a seven-aisled church, but the nave is nearly always the middle and much the broadest and highest part. There are some churches, especially of the later Gothic period, which have aisles and nave of the same height; such are the cathedrals of Carcassonne and Erfurt, and of Vienna in Austria; but the central division remains the widest and is still the nave. In the ordinary form of church, where the nave is much higher than the aisle, the uppermost part of it is called the clearstory, and the large windows in the clearstory walls transmit much the largest amount of daylight to the interior.

The same use of the term for the middle and widest and highest division exists in the description of a Roman basilica, or bath establishment (Thermae, see that term), or any building which is lighted in part by windows in the wall of a higher division rising above the roofs of the lower divisions; thus it is disputed whether the middle part of the Ulpian basilica at Rome was roofed, and was a real nave, or open to the sky like a court.

The original meaning of the word was, however, different. It applied to all that part of a church which was farthest from the sanctuary, that is, that part into which the people entered from out of doors, excluding, however, the narthex or porch. For convenience, and because the majority of Christian churches in the West are oriented (see ORIENTATION), this may be called the Western part.

In the churches of the basilica type, then, all to the east of the great transept was the nave; and this use of the term continues. Thus, if we are speaking of a cruciform church, we speak of the eastern part as the choir; the middle part, which has its greatest length athwart the main lines of the church, we call the transept, and all west of the transept (except porch or tower) is the nave. In this sense, the nave includes the middle division and the side divisions, and we are compelled to say of the cathedral of Le Mans, for instance, that the nave consists of a nave and two aisles, while the choir has a nave and four aisles. These are difficulties only to be overcome by the use of explanatory phrases.

NAVESINK (năv′*e*-sĭṇk) **HIGHLANDS.** A chain of hills forming a bold headland inside of Sandy Hook, in Monmouth County, New Jersey (Map: New Jersey, D 3). They are important landmarks to ships approaching New York. On them are located two first-class lighthouses, fifty-three feet high, both of which show fixed white lights. The adjacent region, which is very beautiful and easily accessible from New York City, attracts many visitors.

NAVEZ, nȧ′vå′. FRANÇOIS (1787-1869). A Belgian biblical and genre painter. He was born at Charleroi, November 16, 1787, and first studied under Isidore and Joseph François. He was a pupil of the Academies of Brussels and Ghent, and studied with David, in whose manner his works are executed. From 1817 to 1822 Navez was at Rome, after which he settled permanently in Belgium. He was made director of the Brussels Academy, and died at Brussels, October 12, 1869. Among his best works are the "Nymph Salmacis and Hermaphroditus" (1829), Ghent Museum; "Elijah Raising the Shunamite's Son" (1821), and the "Meeting of Isaac and Rebecca" (1826), Haarlem Pavilion; "The Holy Family" (1851), Antwerp Museum; "The Spinning Women of Fondi" (1845), New Pinakothek, Munich; and "Hagar and Ishmael in the Desert," Brussels Museum.

NAVICULAR DISEASE (Lat. *navicularia*, relating to ships, from *navicula*, diminutive of *navis*, ship). A disease of the horse, consisting in strain of the strong flexor tendon of the foot, at the point within the hollow of the fetlock where it passes over the navicular bone. It is most common among the lighter breeds of horses, and especially where the pasterns are upright, toes outturned, and work is early and severe on hard roads. It soon gives rise to a short tripping yet cautious gait, undue wear of the toe of the shoe, wasting of the muscles of the shoulder, and projecting or pointing of the affected limb while standing. Give rest, remove the shoe, shorten the toe, and apply hot poultices, changed every few hours. Laxative medicine and bran mashes may be ordered. After a few days, and when the heat and tenderness abate, cold applications should be given; after another week the animal may be placed for two months in a grass field, where the ground is soft and moist; or, if sufficiently strong, at slow farm work on soft land. Division of the nerve going to the foot removes sensation, and consequently lameness, and hence is useful in relieving animals intended for breeding purposes or for slow work. The operation, however, is not to be recommended where fast work is required, for the animal, being insensible to pain, uses the limb as if nothing were amiss, and the disease rapidly becomes worse. See HORSE.

NAVIES (OF. *navie*, from Lat. *navia*, ship, variant of *navis*, Gk. ναῦς, *naus*, Skt. *nāu*, OIcel. *nōr*, ship, *naust*, naval station; connected with Gk. νεῖν, *nein*, to swim). The term navy is applied to the armed force of a country which operates on the water or in coast and harbor defense. The history of navies goes back to the earliest days of ships, for no sooner were such craft built than their value as weapons of war was at once seen. The Chinese were among the earliest of navigators, but little is known concerning their ancient fighting craft. The most ancient war vessels of which the details are known were those of the Egyptians, and the date assigned to them is B.C. 3000. At the same time it is evident that there were many other peoples that possessed fighting vessels, and that the Egyptians were far from paramount; for they had repeated naval combats with the Mysians, Phocæans, and Phœnicians, and probably also with the Pelasgians, Daunians, Oscans, Cretans, and Sicilians. It is therefore impossible to fix any sort of priority to the possession of naval defense. Herodotus says: "These Phocæans were the first of all the Greeks who undertook long voyages, and they are the people who discovered the Adriatic and Tyrrhenian seas, and Iberia and Tartessus (a part of modern Spain). They made their voyages in fifty-oared galleys and not in merchant ships." At this time, and for a long time subsequent and anterior, the shapes of merchant and war vessels were quite different, the former being broad and suitable for carrying cargo and the latter narrow and sharp so as to make speed. In addition, the war vessels were built with rams and other warlike appurtenances, while the merchant vessels made a much greater use of sails.

The command of the sea, so far as the Mediterranean was concerned, finally passed to the Phœnicians. Of their cities, Tyre soon took the lead in wealth and power, reaching its zenith about B.C. 1000, when the expression 'a Tyrian sea' became "a proverbial expression for a sea whose navigation was prohibited to all but those who claimed the ownership thereof." After a more or less complete naval supremacy lasting many centuries the power of the Phœnicians began to wane through the repeated assaults of the Assyrians, who attacked Phœnicia by land. Notwithstanding great numerical inferiority, the Phœnicians managed, though defeated, to preserve their independence, though in 870 they were compelled to pay tribute. In 724-720 Tyre was captured, but not destroyed, and in 650 the Tyrians threw off the foreign yoke. But the devastating wars of the past two hundred years had so reduced the population that soon after their reassertion of independence their slaves rose and mastered the city. Very soon after this the Egyptians made themselves masters of Phœnicia, but in 605 the Chaldeans drove them out. The naval power of the Phœnician fatherland had now become of little importance, but her colonies were wealthy and flourishing. In the sixth century Carthage declared its independence, and though it never attained the masterful position of the parent State, for a century or more it was, upon the water, the most powerful of the Mediterranean States.

The decline of the Phœnician naval power permitted the rise of that of the Greeks and Persians. The confederated Greek fleets completely defeated the Persians at Salamis (B.C. 480). The naval supremacy of Athens was destroyed in the Peloponnesian War (B.C. 431-404).

The Romans found it necessary to build a war fleet when they came in conflict with the power of Carthage. Their first success was the defeat of the Carthaginian fleet at Mylæ (B.C. 260). With the fall of Carthage the naval power of Rome became paramount in the Mediterranean. Finally the battle of Actium (B.C. 31) cut off the last opposing naval force in the Mediterranean, that of Egypt.

Early in the Middle Ages the countries about the Baltic and North seas, which had been sending out their rovers in every direction, began to develop organized naval power. The predatory expeditions of the Norsemen show organized power, though the actual warfare was mostly upon land. The songs and stories of the Scandinavians and Danes contain many accounts of sea fighting, but the accounts are so intermixed with fable and poetic imagery that it is hard to separate fact from fiction. It is not until the ninth or tenth century that we begin to reach anything approaching reliable history. The first great sea fight of which we have a full account is that between King Olaf Trygvesson of Norway and the allied Powers of Denmark and Vendland, which were assisted by the Norwegians of the Province of Viken (from which the name of Viking is derived). Notwithstanding his brave and able defensive fight, Olaf was overcome by weight of numbers, defeated, and killed. This was in the year 1000. In 1014 Olaf the Saint assisted the Saxons to capture London, which was occupied by the Danes. This fight is interesting from the fact that it was won by a fleet fighting against land forces. The culmination of the naval power of Norway was reached soon afterwards under Harald Hardrada. About five years before the landing of William the Conqueror in England, Harald destroyed the Danish fleet in a fiercely fought action at Nisaa. In 1066 he started with a fleet and army to assist Earl Tostig, brother of Harold of England, who was in rebellion and had fled to Norway. The ambition of the Norwegian King in this instance caused his death, for he was killed in battle at Stamford Bridge, September 25, 1066—three days before the landing of the Normans and less than three weeks before the battle of Hastings. After the death of Harald Hardrada the Norse sea power declined.

When, after the fall of Rome, there ceased to be any dominant power in the Mediterranean, there was an increase of piracy and robbery on the sea and along unprotected coasts. The geographical position of Italy caused it to be the natural doorway to merchandise entering Europe from the East or moving in the opposite direction. The development of maritime trade thus brought about caused the Italian commercial cities to be the heaviest losers by piracy, and made it necessary for them to establish naval forces. Of the Italian States, Venice, Pisa, and Genoa took the lead in commerce, and all gradually developed powerful navies. The army of Venice was composed chiefly of mercenaries and commanded by one because it was feared that a native might use its power to overturn the Government; but the navy, from which nothing of the kind was feared, became the pride of the people. The Senate encouraged the nobles to trade and serve in the fleet and they became merchants and admirals.

In the ninth century the Saracens had become powerful and troublesome in the Mediterranean, where their piratical armed vessels and strong fleets were the terror of every merchant who had a venture on the sea. They carried their depredations to the coast of Italy, so that in 842 the Venetians coöperated with the Greeks in sending a naval expedition against them. The hostile fleets met at Cortona. The Greeks fled at the first attack of the enemy, but the Venetians fought against vastly superior numbers until their loss was so great as to make further resistance impossible, when the few survivors endeavored to make their escape. For a quarter of a century the humiliation of defeat rankled in the Venetians, and finally they sent out a new force which gained a decisive victory over their enemies on the same spot. During the next six or seven centuries the Pisans, Genoese, and Venetians strove for naval and commercial supremacy with each other and with the Saracens and their natural successors, the Turks. Genoa and Venice profited by the Crusades, furnishing ships, munitions of war, and provisions to the Crusaders. Pisa succumbed to Genoa in the great sea fight off Meloria in 1284. Previous to this Genoa and Venice had entered upon their great struggle for supremacy. Both republics extended their territories by land and sea, and Venice held most of hers until the rise of the Turkish Empire, when she lost many of her islands and seaports, which constituted an almost uninterrupted territory from the head of the Adriatic to Asia Minor and the Bosporus, including Cyprus, Crete, and the Morea. The contest between Venice and Genoa for control of the Mediterranean continued at intervals until 1380, when the Genoese fleet and army which had threatened Venice were captured at Chioggia by the Venetians under Admiral Vettor Pisani, one of the greatest of naval commanders. After the battle of Chioggia the military and naval power of Genoa declined quite rapidly. Venice, on the contrary, continued to grow in wealth, power, and extent of territory until at the close of the Middle Ages the Turks became dominant in the eastern Mediterranean, while at the same time the Republic had to withstand the combined arms of the covetous Christian powers.

The Turks, who had firmly established themselves in Europe, dreamed of universal conquest and were expanding their territory at every opportunity. At last in 1571 Venice, Philip II. of Spain, and Pope Pius V. united in a great effort to put an end to the aggressive naval power of the Moslems, and the combined fleet, under Don John of Austria, dealt an irreparable blow to Turkish prestige in the battle of Lepanto. This victory did not arrest the decline of Venice, whose commercial prosperity was greatly affected by the change in the channels of trade which had been brought about by the discovery in 1497-98 of the water route to India.

Spain made a strong effort to become a great maritime nation, but ultimately failed, partly from governmental mismanagement, partly from various causes connected with the temperament of her people or with the country's environment. In 1588 she sustained a crushing blow in the defeat of the Invincible Armada, which was to conquer England.

Though the fact was not yet recognized, Neptune's sceptre was passing to northern nations, the English and the Dutch. But good sailors as the Dutch were, they were too few in number and too poor long to cope with their great rival, and Britain became mistress of the waves. Alfred the Great is commonly regarded as the founder of the British navy. Before his time the various petty kings had naval forces, but Alfred combined them into an English fleet and took command of it against the Danes in person, and England's first naval victory was gained in his reign off the coast of Essex. Alfred's grandson Athelstan fostered the maritime spirit of his people as regards both commerce and naval affairs. He granted the title of 'thane' to any merchant who had made three voyages on the high seas in his own ship freighted at his own expense, though this was a title previously confined to men of noble rank and extensive landed possessions. Edwy the All Fair is said to have had large fleets, and under Canute the Great English maritime commerce assumed large dimensions. After the Normans had firmly established their rule they also encouraged the growth of shipping and provided for its defense. Henry II. and Richard Cœur de Lion are both known to have had strong naval forces, and under John it was decreed "that any ships of other nations, though at peace and in amity with England, should be made lawful prizes if they refused to strike to the royal flag." Such an arrogant assumption is not likely to have been made unless the power to carry it out existed, and we know that John's fleet gained a victory over the French in the harbor of Damme. During the century which followed a sort of piratical war existed between England and France and the coasts of both were ravaged by the freebooters on either side. At length, in 1340, the English fleet, commanded by Edward III. in person, won the great victory of Sluis, the French losing nearly their whole force of three hundred vessels and 20,000 men killed, wounded, and prisoners. According to Charnock, this was the first action in which beaked galleys were wholly laid aside and vessels propelled chiefly by sails relied upon. From this time there was no particular improvement in the British navy (except that heavy guns were placed on board ship) until the reign of Henry VIII., who gave great attention to the fleet, building several relatively very large vessels, of which by far the greatest was the *Henry Grace de Dieu*. She carried 72 guns and 700 men and her tonnage is variously stated at from 1000 to 1500.

Henry VIII. was the first sovereign in Europe to establish a corps of officers for sea service only; and he did more for the navy than any preceding monarch, using improved models for his ships and employing many Italian shipwrights (then the best in the world) in their construction. He greatly increased the number of vessels and established the arsenals at Portsmouth, Woolwich, and Deptford. Edward VI. and Mary paid little attention to the fleet, but Elizabeth recognized its vital importance and increased the number of ships and their size, besides improving the condition of the officers and gathering vast quantities of naval stores. From her reign to the present day the British navy, though not without rivals, has never been equaled.

In this brief review of the history of ancient and mediæval navies only those are considered which have been of greatest importance in the different periods. This has excluded a very large number from mention except so far as their histories are bound up with the histories of others. The greatest apparent omission is in the case of France. Her navy has always been respectable and occasionally very powerful, but it has never been paramount, and its prestige suffered at different times from defeats brought about by governmental neglect and mismanagement. It has not been to France what that of Great Britain has been to the British Islands and Empire, an absolute necessity. Her fleet has been built up or neglected according to the prevailing policy of the Government.

Modern naval development may be said to have begun with the rapid increase in the size of ships which took place at the close of the fifteenth century (see GUNS, NAVAL); and mediæval history finally closed with the battle of Lepanto in 1571, the last great action in which rowing galleys played an important part. From this time the sail-propelled man-of-war was gradually improved until early in the nineteenth century, when sails began to give way to steam. During this period the British navy managed to retain its general supremacy, though the temporary rise of the Dutch naval power seriously threatened it; and for a few years Louis XIV. managed to maintain a French fleet which was superior to the British, and with which Admiral Tourville defeated the combined British and Dutch forces off Beachy Head (1690). Two years later the French fleet was destroyed at La Hogue by the allied British and Dutch. From this time forward the superiority of the British navy was undoubted. Though it lost many single-ship actions with the French and Americans, no foreign navy could stand before its full strength.

After the close of the Napoleonic wars the great naval Powers were Great Britain and France alone. In the second rank were Spain, Russia, the Netherlands, and Turkey. In the third were Austria, Denmark, the United States, the Two Sicilies, Sardinia, Portugal, and Prussia. In 1860 the conditions were much the same, except that the United States had risen to the second category, the Netherlands had sunk to the third, the Kingdom of Italy was forming, and that of the Two Sicilies tottering to its fall; while Greece, Brazil, Peru, and Chile had organized naval forces.

During the American Civil War the navy of the United States, whose history and present condition will be found fully treated under UNITED STATES, became greatly expanded, but from 1865 to 1881 it steadily declined, until it reached the point of almost absolute uselessness so far as the ships were concerned, and ceased to be a factor among the naval armaments of the Powers. In 1866 the North German Confederation took over the Prussian navy and made some additions; and the fleet again received some increase of strength in the decade following the formation of the German Empire. Italy began to develop a fleet as soon as the Kingdom was established, but the disastrous battle of Lissa in 1866 caused a temporary check, and it was not until 1872 that she adopted the building policy that in a dozen years brought her up into the first rank of naval Powers. Russia began to reconstruct her fleet after the close of the Crimean War and has pursued a steady and unwavering policy of naval increase from that date to the present. In 1881 the United States began to rebuild the navy, but it was not until 1890 that battleships of the first class were commenced. After completing four large armorclads in 1878-80, Germany added little to her fleet until 1888-89, when a programme was adopted which included the construction of 28 ships of various types. Japan organized its navy on a modern footing soon after the close of the Civil War in the United States, and slowly added to it until after the battle of the Yalu (1894), when she began to build the fine vessels that have made her navy the most powerful outside of Europe, with the exception of that of the United States. Of the Powers of the second rank, Austria is easily first. After the War of 1866 she did little for several years, and then (1872-78) built only three ships of much importance. In 1887 she launched two small armorclads, and in 1895-96 three coast defense vessels. Then was instituted a shipbuilding policy which, if persisted in, may soon place her among the great maritime Powers. Turkey, which had a powerful navy about 1880, has allowed it to fall into decay, and had not in 1903 a single ship of the first or even of the second class.

So far as the collective strength of their heavy fighting ships is concerned, navies are considered to rank as follows in 1903: 1, British; 2, French; 3, Russian; 4, United States; 5, German; 6, Italian; 7, Japanese; 8, Austrian. To the lesser Powers it is difficult to assign places. The relative positions of the United States and Germany are disputed, though all authorities agree that their forces are very nearly equal. At the opening of the twentieth century the French and Italian navies have been falling behind their rivals, and the Russian is hardly holding its own. If the present conditions remain unchanged, it seems likely that in a very few years the United States and Germany will be superior at sea to all other Powers except Great Britain, and will be striving with each other for second place.

The condition of the various navies in 1901-02 was as follows:

MODERN NAVIES.

Argentina. The Argentine navy is the most powerful one possessed by a South American State. In May, 1902, the fleet consisted of 4 high-speed armored cruisers of 6840 to 7180 tons (launched 1895-98), 1 third-class battleship of 4267 tons (launched 1880, but recently rebuilt), 2 armored coast-defense vessels of 2336 tons (launched 1890-91), 2 armored coast-defense vessels of 1558 tons (launched 1874-75, but being reconstructed), 3 high-speed protected cruisers of 3200, 3570, and 4780 tons (launched 1890-95), 1 small partially protected cruiser of 1442 tons (launched 1874), 2 torpedo gunboats of 1070 and 520 tons (launched 1890-93), 3 gun vessels of 550 to 820 tons, 1 cruising school-ship of 2750 tons (launched 1897), 1 torpedo school-ship of 1100 tons (launched 1880), 4 torpedo-boat destroyers of 280 tons, 2 torpedo boats of 110 tons, 6 of 85 tons, 4 of 52 tons, 10 of 16 tons, and 1 torpedo mining boat. In addition there were building in Europe two high-speed armored cruisers of 8500 tons, and in Buenos Ayres a submarine boat was reported as under construction. The former by a treaty signed in 1903 between Argentina and Chile were to be disposed of, while further disarmament was contemplated. The naval academy is located at Buenos Ayres. There is a small naval station at La Plata and a torpedo school and torpedo-boat station at Buenos Ayres, but the principal navy yard will be at Bahia Blanca when the works which were under construction in 1902 are completed.

Austria. The navy of Austria is in power of its fighting ships eighth in rank among the navies of the world and sixth among those in Europe. For many years no new vessels of importance were added to the fleet, but in 1893 the armored cruiser *Kaiserin Maria Theresia* was launched and three small battleships were commenced; and since that time the annual building programme has steadily increased. As reorganized in 1901 the Navy Department forms an autonomous section in the Ministry of War under the control of a vice-admiral, who is commander-in-chief of the fleet and marine forces, and who represents the Minister of War in the discussions of the budget of the Navy Department. The department consists of the marine cabinet, the general staff, and three administrative sections divided into eight bureaus. The naval budget for 1901-02 amounted to 46,690,820 crowns ($9,478,236.46; 1 crown = $0.203), an increase of 3,200,000 crowns on that for the previous year. The principal navy yard is at Pola (which is the headquarters of the fleet), but there is another at Triest, and several small stations along the Dalmatian coast. The tabular statement later in this article gives the strength of the Austrian fleet.

Belgium. The seacoast of Belgium is only 42 miles long, and there are no very important seaports except the interior one of Antwerp. For fishery protection there is a small armed steamer of 684 tons, but there is no navy properly so called.

Brazil. Among the navies possessed by South American nations the navy of Brazil is third in power. The principal navy yard, together with the naval academy and apprentice school, is located at Rio de Janiero, but there are other naval stations at Pernambuco, Santa Catalina, and Bahia. The fleet consists of 2 small battleships of 5700 and 4950 tons (launched 1883-85, but rebuilt in 1893-96), 2 new coast-defense armorclads of 3162 tons (launched 1898-99), 4 protected cruisers of 4537, 3450, 2750, and 1300 tons (launched 1890-96), 3 cruisers of 1414 to 1911 tons (launched 1877-90), 5 torpedo gun vessels of 500 to 1030 tons (launched 1892-98), 1 old monitor of 1000 tons, 6 small river monitors of 340 to 470 tons, 15 first-class torpedo boats, 7 second-class torpedo boats, 6 third-class torpedo boats, 2 submarine boats (Goubet type—Paris, 1895), 2 new submarines (projected), 6 armed merchant steamers, 16 small gunboats of 137 to 726 tons, 2 old armorclads of about 1500 tons used as floating batteries, 3 small transports, and several small vessels used for river service.

Bulgaria. The navy of Bulgaria consists of one small gunboat and four royal yachts; the personnel is variable and uncertain.

Chile. Of the navies of South American countries, the navy of Chile is second in power, being exceeded only by that of Argentina. The naval school for officers is at Valparaiso. The principal dockyard is at Talcahuano, though there are naval stations at Valparaiso and Llica and smaller ones elsewhere. The fleet consists of 1 third-class battleship of 6900 tons (launched 1890), 1 fourth-class battleship of 3500 tons (launched 1874, but rearmed about 1890), 1 old monitor of 1870 tons (launched 1865), 2 high-speed armored cruisers of 7000 and 8500 tons (launched 1896-97), 1 protected cruiser of 4500 tons (building in 1902), 4 protected cruisers of 3600, 4420, 2080, and 2080 tons (launched 1890-96), 1 new steel-sheathed cruising training ship of 2500 tons (launched 1898), 3 torpedo gunboats of 750 to 860 tons (launched 1890-96), 4 torpedo-boat destroyers of 300 tons (launched 1896), 6 torpedo boats of 130 tons, 13 smaller torpedo boats, several small vessels and old gunboats, and a number of merchant steamers which are held at the disposal of the Government in case of war. In 1902-03 negotiations were concluded with Argentina by the terms of which the war vessels under construction in Europe were not to be added to the fleet, and the reduction in vessels and armament was provided for.

China. The navy of China was never an organized force. The fleet was made up of squadrons supported, officered, and manned by different sections of the Empire, and the squadrons were called the Pe-chi-li squadron, Fu-chow squadron, and Canton squadron. The war with Japan swept away all the armored vessels and many of the unarmored ones and left the navy in a deplorable state, from which it has not yet recovered. There is not now, and there has not been at any time, any well-considered plan of supplying officers to the fleet, although there has been for many years a naval school at Nanking at which a few officers are educated by foreign instructors. What officialism and corruption failed to do in weakening the fleet, incompetency in the older officers accomplished. The principal dockyard is at Fu-chow, but there is a naval arsenal at Shanghai and small yards at Tien-tsin and Canton. The vessels possessed in 1902 in the different squadrons were 2 protected cruisers of 24 knots speed and 4300 tons (launched 1897-98), 5 protected cruisers of 2500 to 2950 tons (launched 1883-97), 3 cruisers of 2200 tons (launched 1883-90), 9 cruisers of 1200 to 2100 tons (launched 1875-87), 1 steel screw training ship of 1800 tons (launched 1895), 6 torpedo gun vessels of 850 to 1030 tons, 12 gunboats of 340 to 580 tons (launched 1869-95), 1 special service vessel (cruiser and cable ship) of 1400 tons, 1 armored gunboat of 200 tons (launched 1875), 6 small wooden floating batteries for river operations, 22 gunboats belonging to river and customs service of 120 to 850 tons, 4 dispatch vessels and training ships of 1200 to 1500 tons (launched 1869-79), 3 armed transports, 1 sailing training vessel of 400 tons, and 21 torpedo boats of 27 to 120 tons (launched 1885-99). Four torpedo-boat destroyers built by Schichau in 1898-99 were captured by the allied forces at Taku in 1900 and added to the British, French, German, and Russian navies.

Colombia. The navy of Colombia consists of 2 gunboats of about 400 tons, 2 armed yachts, 1 barque-rigged sailing vessel of 315 tons register, and 2 sailing cutters used in the revenue service.

Costa Rica. The only war vessel possessed by Costa Rica is a small torpedo boat built by Yarrow in 1892.

Denmark. Though necessarily small, the Danish navy has an excellent reputation as regards organization and efficiency. At the head of it is the Minister of Marine, who is assisted by a superior officer (usually a vice-admiral or rear-admiral) who has the title of 'director-general.' The Navy Department is divided into four principal sections: (1) Secretariat; (2) Admiralty; (3) Commissariat and Accounts; (4) Justice. The chief of the secretariat is the director-general; of the admiralty, a captain in the navy. The other two sections have civilian heads. The only dockyard is the royal arsenal, Copenhagen. The fleet consists of 2 armored vessels of 3470 tons (1 launched 1899, 1 building in 1902), 1 fourth-class battleship of 5370 tons (launched 1878, undergoing reconstruction), 6 armored vessels of 2080 to 3290 tons (launched 1868-96—older vessels rebuilt recently), 3 protected cruisers of 1290 tons (launched 1890-92), 2 protected cruisers of 2580 and 2900 tons (launched 1882-88), 4 small cruisers of 560 to 1570 tons (launched 1862-76), 6 gunboats of 215 to 360 tons, 4 surveying vessels of 95 to 145 tons, 1 torpedo mine boat of 389 tons, 1 royal yacht of 770 tons, about 20 special service vessels, receiving ships and hulks, 9 first-class torpedo boats of 90 to 143 tons, 4 second-class torpedo boats of 50 to 82 tons, 15 third-class torpedo boats of 15 to 44 tons.

Ecuador. The navy of Ecuador consists of one small cruiser of 811 tons (launched 1885, repaired 1900), two iron steamers lightly armed, and one torpedo boat of about 85 tons.

Egypt. Egypt has no navy, properly speaking. The armed vessels possessed by the Government are sixteen steam and sailing vessels of the coast guard service of 10 to 450 tons, three dispatch vessels of 330 to 700 tons, one transport of 3700 tons, thirteen shallow-draught river gunboats, and three royal yachts, which carry small guns.

France. The success of the French navy in war has never been proportional to its strength. This has been due to disorganizing forces from without the service which have prevented efficiency. Since the fall of the Empire the navy has greatly improved, and seems to be at present highly efficient; certainly, the ships, armaments, and equipments are of the best, and the personnel of apparently equal excellence. At present the French navy is second to that of Great Britain only, but for financial reasons the number of new ships now in hand and proposed is insufficient to enable France to maintain her present relative lead, and it is likely that within the next decade her navy will be surpassed by those of Russia, Germany, and the United States. It seems likely that the French naval authorities have realized the drift of naval matters for several years, and that the special attention that has been paid to the development of submarine boats is due to the hope of obtaining a defensive naval weapon which, at little expense, would enable the French coasts to be adequately protected. The French Navy Department is presided over by a Minister of Marine, a civil officer who is a member of the governmental Cabinet. Until 1902 the executive head was the chief of the naval general staff, but this was changed, and the chiefs of bureaus are directly subordinate to the Minister of Marine, the chief of the staff sinking to the level of a bureau officer. The sections or bureaus of the department are: (a) General Staff; (b) Office of the Minister of Marine; (c) Personnel; (d) Material; (e) Ordnance; (f) Submarine Defenses; (g) Hydrography; (h) Central Control (financial inspection); (i) Accounts; (j) Pensions. There are in addition six consultation or advisory boards: (a) Superior Naval Council; (b) Board of General Inspectors; (c) Council of Works; (d) Commission on Equipment; (e) Commission on Machinery and Plant; (f) Board to Classify Officers for Promotion. The principal naval arsenals (see ARSENAL) are located at Cherbourg, Lorient, Brest, Rochefort, and Toulon, but there are others at Saigon (Cochin-China), Bizerta (Africa), Fort de France (West Indies), etc. By far the greater part of the executive officers are graduates of the Naval Academy at Brest, but many are now obtained from other schools, especially those promoted from the enlisted force. The men are enlisted voluntarily or drafted from the *conscription maritime*. The strength of the fleet is shown in the statistical table later in this article.

GERMANY. The navy of Germany is of comparatively recent origin. The Prussian navy and that of the North German Confederation were both weak. After the formation of the Empire a number of armored ships of importance were built, but it is only within the last dozen years that Germany began to take rank as a great naval power. From 1890 to the present the building of powerful new ships has proceeded steadily. After completing the vessels of several small building programmes, the Government in 1898 prepared a 'sexennate' programme, which was approved by the Reichstag. This provided for the construction of 7 new battleships, 2 armored cruisers, and 5 small cruisers, besides replacing vessels which had become antiquated. The bill laid down the principle that the life of a battleship and of a coast-defense ship should be considered as twenty-five years, that of a large cruiser as twenty years, and of a small cruiser as fifteen years; after which times the vessels are to be considered as antiquated and replaced. In 1900 a much more comprehensive law was passed. This provided that not later than 1916 the German fleet should consist of 38 battleships, 20 large cruisers, 45 small cruisers, and 16 divisions of torpedo boats. Should the finances of the Government permit, the programme will be completed earlier than 1916, and it now seems probable that this will be the case. In 1902 the Government also proposed to ask legislative authority to construct two battleships, five cruisers, and a torpedo division (six boats) in excess of the programme provisions. In 1889 the administration of the German navy was reorganized; all matters connected with *personnel*, command of the fleet, mobilization, strategy, tactics, etc., were placed under the *Oberkommando*, and all matters connected with construction, dockyards, and *matériel* were put under the *Reichsmarineamt*. The *Oberkommando* was presided over by the commanding admiral of the navy, and the *Reichsmarineamt* by a vice-admiral acting as Naval Secretary of State under the Chancellor of the Empire. The two sections were wholly disconnected and were brought into harmony with each other by the Marine Cabinet acting advisory to the Emperor. In 1899 this organization was changed. The title of *Oberkommando* was changed to *Admiralstab*, and the office of *Oberkommandant*, or commanding officer of the navy, abolished. Additional authority was given the *Reichsmarineamt*, and the Emperor and his advisers in the Naval Cabinet exercised direct control of naval affairs.

The Imperial naval arsenals are at Kiel, Wilhelmshavn, and Danzig; the Naval School and Naval Academy are at Kiel. The composition of the fleet is given in the comparative tables further on.

GREAT BRITAIN. The British navy has been the most powerful navy in the world for three centuries, and it is to-day more than equal to the combined forces of any two Powers—probably equal to any four in actual warfare, as allied forces never can develop their full strength from lack of one supreme directing authority. The Naval Department is administered by the Board of Admiralty of six persons, consisting of the first lord, first sea lord, second sea lord, junior sea lord, controller, and civil lord. Theoretically, the members of the board are equal in authority; practically, the first lord is supreme. He has supervision over all departments, prepares the naval budget and programme, and is responsible to Parliament for the affairs of the navy; he is therefore necessarily a member of Parliament. The first sea lord (a flag officer) has charge of movements of the fleet, detail of executive officers, discipline, naval intelligence, deputy adjutant-general of marines, gunnery training establishments, naval reserves, hydrographic office, etc. The second sea lord (a flag officer) has charge of the intelligence department as far as it affects mobilization, manning the navy, training schools for boys, engineer officers, personnel of naval reserves, etc. The junior sea lord (usually a flag officer) has charge of transports, medical department, coal for the fleet, certain officers' allowances, chaplains, and naval instructors, and the intelligence department as regards mobilization so far as it affects the preceding. The controller (a flag officer) has charge of naval construction, dockyards, ordnance material, stores (except coal for fleet), and expense accounts. The civil lord has charge of naval works, general accounts, Greenwich Hospital, civil personnel. The first lord is assisted by the financial secretary and the permanent secretary. The former deals with all financial questions, assisted by the accountant-general and the director of navy contracts, the latter being also under the superintending lords as regards purchases made for their several departments. The financial secretary is a member of Parliament and of the party in power, and through him all Parliamentary statements are made in the House of Commons, unless the first lord be a member of that House. The permanent secretary superintends all correspondence in the name of the board, prevents the various departments from acting independently, and provides for the due execution of orders.

The total personnel of the British navy on April 1, 1902, amounted to 118,625; it will be increased during 1902-03 to 122,500. The sum total of the naval budget for 1902-03 was £31,255,500.

The principal dockyards are at Bermuda, Cape of Good Hope, Chatham,* Devonport,* Esquimalt (British Columbia), Gibraltar, Halifax, N. S., Haulbowline (Cove of Cork), Hong Kong, Jamaica, Malta, Pembroke,* Portsmouth,* Sheerness,* Sydney. Of these, the ones marked with a star are first-class yards in all respects. Secondary yards and naval stations exist at Ascension Island, Bombay, Calcutta, Colombo, Dartmouth, Delagoa Bay, Deptford, Greenwich, Plymouth, Portland, Sydney, Trincomali, Wei-hai-wei, and London (West India Docks). Naval cadets of the line are educated at the Royal Naval School at Dartmouth. The Royal Naval College at Greenwich is for post-graduate courses. The engineering college is at Keyham, and there are engineering schools at all the principal dockyards. The gunnery and torpedo schools are both located at Portsmouth. (See NAVAL SCHOOLS OF INSTRUCTION.) The strength of the British fleet is given in the table on a following page.

GREECE. The navy of Greece is naturally small, but it is by no means insignificant. The quality of its officers and men and their organization and training have never been tested by war, as practically no use was made of the fleet during the war with Turkey. In 1901 the Government decided to expend annually the sum of 2,500,000 drachmas ($482,500) for the purpose of repairing and adding to the fleet. The fleet consists of 3 small battleships of 4885 tons (launched 1889-90, rebuilt 1897-1900), 1 old armorclad of 1774 tons (launched 1868, reengined 1897), 4 small cruisers of 1000 to 1800 tons (launched 1879-85), 1 old school-ship of 1300 tons, 11 gunboats of 380 to 410 tons (launched 1859-84), 1 torpedo depot ship of 1100 tons, 1 old training ship of 2030 tons (launched 1869, reëngined 1897), 3 torpedo mining vessels, several smaller vessels of no particular military value, 31 torpedo boats of 18 to 85 tons (launched 1878-85), 2 old Nordenfeldt submarine boats, purchased in 1886 (probably useless), 20 torpedo vidette boats.

HAITI. The Haitian navy consists of one steel gunboat, 260 tons; one iron corvette, 1200 tons; two iron sloops of from 500 to 900 tons; and one gun vessel of 900 tons. The steel gunboat *Crête à Pierrot*, 940 tons, was sunk by the German gunboat *Panther*, as a punitive measure, September 7, 1902.

ITALY. The modern Italian navy dates from 1860, when the fleets of Sardinia and the Two Sicilies were combined. Immediately after the formation of the Italian Kingdom the construction of a powerful navy was commenced. The newly constructed fleet received a severe setback at Lissa in 1866, but it was continually added to, and in 1890, so far at least as ships were concerned, it was the third navy in the world. It then reached the limit of size permitted by the national finances. Since 1890 it has preserved about the same strength of fleet, but the increases in the navies of the United States, Russia, and Germany have forced Italy to sixth place in naval rank. The head of the navy is the Minister of Marine (an admiral), who is assisted by the 'superior council' of the navy, composed of 1 vice-admiral (or admiral), president; 3 vice-admirals (or rear-admirals), 1 director-general of the civil personnel, members; 1 rear-admiral (or captain), who is a member and secretary; and lastly the chief of the bureau or office whose affairs are under consideration. By the law of November 23, 1889, the Navy Department is divided into 10 sections, as follows: (1) General Staff and Cabinet, which consists of (a) cabinet of the minister, which coördinates the different branches; (b) questions of a general military kind, strategy, and tactics, auxiliary fleet, defense of the coast, and fleet manœuvres; (c) rules and arrangements concerning the service, discipline, dress, etc. (2) Direction of the service as regards personnel. (3) Naval Construction. (4) Armament and Equipment. (5) Merchant Marine. (6) Hydrographic Service. (7) Medical Department. (8) Military Engineering (fortifications, works, etc.). (9) Office of Revision. (10) Accounts.

The Naval Academy and College is located at Leghorn. The principal dockyards are at Castellamare, Spezia, Venice, Taranto, and Naples; naval stations at Genoa, Messina, Licata, Cagliari, and Palermo. The Italian fleet as it existed in 1902 is summarized in the table given later in this article.

JAPAN. The modern Japanese navy may be said to have commenced with the purchase of the armored ram *Stonewall* (renamed *Adzuma*), which was built for the Confederate navy and sold to Japan at the close of the Civil War. Since then the strength of the navy has steadily increased, but it was not until 1894 that it began to take rank among the navies of the great Powers. In that year two large battleships were ordered, and during the next eight years four more battleships and six large armored cruisers were built. These accessions placed the Japanese navy in 1902 seventh among the naval forces of the world. The principal navy yards are at Yokosuka, Kure, Saseho, Onohara, and Nagasaki. The comparative tables show the strength of the fleet.

MEXICO. Until 1901 the navy of Mexico consisted of a small cruising training ship of 1200 tons (launched in 1891), and four gunboats of 425 to 450 tons (launched 1874-75). In 1901 a building programme was laid down providing for the construction of eight gunboats of 1000 tons and 16 knots, and two torpedo boats. Two of the gunboats in 1902 were nearly completed.

MOROCCO. The navy of Morocco consists of a small cruiser of 1200 tons (launched 1892) and one gunboat of 450 tons (launched 1898).

NETHERLANDS. In the days of sailing vessels the navy of the Netherlands was a powerful one, but the great cost of modern fighting ships has prevented the Netherlanders, a naturally seafaring race, from maintaining a powerful fleet. The navy is represented in the Cabinet by the Minister of Marine. The administration, presided over by the Minister, consists of a chief (a captain) of the general staff, 1 director of naval construction, 1 director (commander) of the personnel, 1 director (captain) of pilotage, 1 director (captain) of the hydrographic service, 1 inspector of pay, provisions, and clothing, 1 medical inspector.

The executive officers are educated at the Royal Naval Academy at Willemsoord, while the engineers are educated at the special engineer school at Hellevoetsluis. The naval arsenals are four in number and located at Amsterdam, Hellevoetsluis, Willemsoord, and Fijenoord. There are small stations abroad in Surinam, Curaçao, Borneo, Sumatra, Java, and Celebes. The fleet consists of 3 small battleships of 4950 tons (building in 1902), 1 battleship of 5400 tons (launched 1874), 2 coast-defense ships of 3375 and 2490 tons (launched 1866 and 1891), 3 coast-defense ships of 3520 tons (launched 1894), 13 monitors of 1520 to 2200 tons (launched 1868-78), 5 armored river gunboats of 352 to 388 tons (launched 1870-79), 1 armored cruiser of 4600 tons (launched 1892), 6 protected cruisers of 3900 to 4033 tons (launched 1896-99), 3 cruisers of 3400 tons (launched 1876-82), 1 protected cruiser of 1703 tons (launched 1890), 64 gunboats of 175 to 1298 tons (launched 1874-1900), 5 surveying vessels of 300 to 800 tons, 42 special service vessels, receiving ships, school-ships, etc., 39 torpedo boats of 45 to 90 tons, 3 torpedo boats of 140 tons, 33 torpedo boats of 29 to 37 tons.

Norway. The navy of Norway is entirely separate from that of Sweden, though, of course, both fleets would be combined in case of war. With the possible exception of that of Sweden or Denmark, the Norwegian navy is the oldest in Europe. In proportion to its population, Norway has a greater mercantile marine and furnishes more mariners than any other country, but the great expense of modern fighting ships prevents the maintenance of a large naval force, or an attempt to do more than defend the coast. The government of the navy is confided to the commanding officer of the navy and the Minister of Marine and Posts. The last-named is an administrative office and constitutes the ministry proper; both branches have their headquarters at Christiania. The commanding officer of the navy is a rear-admiral, and he is assisted by a captain, while a second captain is stationed at Stockholm as naval aid to the King.

The executive officers of the active service and those of the reserve are educated at the royal naval school. Norway possesses but a single military port, that of Horten, near Christiania. There are five naval establishments, of which that of Karljohansvorn at Horten is the only shipbuilding yard; the others at Bergensund, Trondhjem, Fredriksvaern, and Christiansund are naval depots and supply stations. The fleet consists of four small battleships of 3400 to 3850 tons (launched 1896-99), 4 monitors of 1448 to 2000 tons (launched 1866-72—rebuilt 1895-98), 1 protected cruiser of 1113 tons (launched 1891), 1 cruiser of 1370 tons (launched 1896), 1 torpedo gun vessel of 380 tons (launched 1896), 2 wooden cruisers of 1006 and 1610 tons (launched 1862-80), 12 gunboats of 190 to 635 tons, several small gunboats, sailing training ships, etc., 10 torpedo boats of 90 tons (launched 1897-1901), 21 torpedo boats of 27 to 65 tons (launched 1882-1901), and 6 submarine boats (building in 1902).

Persia. The navy of Persia consists of an armed dispatch vessel of 1200 tons (launched 1885—remodeled from merchant steamer).

Peru. Previous to the war with Chile the Peruvian navy was of some importance, but a large sea-going monitor was captured by the Chileans, an old monitor (purchased in the United States) was sunk, and an armored frigate was wrecked while chasing a Chilean gunboat. The naval force in 1902 consisted of a wooden cruiser of 1658 tons (purchased in France in 1900—launched 1877), 1 cruiser of 1700 tons (launched 1881—a sister to the U. S. S. *Topeka*), 1 gunboat of 420 tons (launched 1883), 1 small iron cruiser (launched 1891), 1 screw frigate (training ship), 1 armed transport of 1400 net tons measurement (launched 1863), and several paddle steamers.

Portugal. From time to time plans have been made for increasing the strength of the Portuguese fleet, but aside from an occasional cruiser the financial resources of the country have been unable to meet the demands of the naval programme. The Navy Department forms part of the Ministry of the Marine and Colonies. It is presided over by a vice-admiral with the title of director-general, and consists of the divisions of (a) personnel and (b) material. The only naval arsenal is at Lisbon, where is also located the naval college, a sort of polytechnic institute in which all the officers of the navy are educated—even the medical officers having a final course there. The fleet consists of 1 old armored coast-defense ship of 2480 tons (launched 1875), 1 protected cruiser of 4280 tons (launched 1898), 2 protected cruisers of 1800 tons (launched 1898), 2 cruisers of 1660 and 1765 tons (launched 1896-99), 4 small cruisers of 1110 to 1429 tons (launched 1864-84), 21 gunboats of 160 to 729 tons (launched 1873-1902), 25 river gunboats of 34 to 300 tons (launched 1888-1902), 1 transport of 3000 tons, 3 training ships, a number of small craft, 1 armed royal yacht of 950 tons (launched 1899), and 11 torpedo boats of 31 to 60 tons (launched 1880-93).

Rumania. The Navy Department in Rumania is a branch of the Ministry of War. The officers hold military titles and are overshadowed by the army in every way. There is a naval school for the instruction of petty officers, but a military education is apparently sufficient for the higher officers. There is a small navy yard at Galatz at which gunboats are occasionally built. The fleet consists of 1 protected cruiser of 1325 tons (launched 1887), 4 gunboats of 104 to 400 tons (launched 1862-86), 1 armed yacht of 350 tons, 6 torpedo boats of 55 tons (launched 1888-95), 8 second-class torpedo boats and launches of 10 to 32 tons (launched 1882-95), and 12 gunboats and coastguard vessels of 45 to 110 tons (launched 1873-93).

Russia. The Russian navy really dates from the time of Peter the Great, though the dwellers in the lands now belonging to Russia along the shores of the Baltic have been seafaring people from time immemorial. The navy and Navy Department are presided over by the general admiral, who is always one of the Imperial family. He has under his orders an Under-Secretary of State having the rank of vice-minister and called the director of the Ministry. The general admiral is assisted and advised by a board of admiralty consisting of 4 admirals, 5 vice (or rear) admirals, and 1 lieutenant-general of naval corps. The Minister of Marine or director of the Ministry is an admiral appointed by the Emperor. The subdivisions of the Ministry are: (1) General Staff; (2) Chief Naval Judicial Court; (3) Material and Supplies; (4) Technical Committee; (5) Scientific Committee; (6) Hydrographic

Bureau; (7) Medical Bureau; (8) Chancellerie; (9) Administration of Courts-Martial; (10) Archives.

The naval schools are the naval academy, at Saint Petersburg, naval college (higher course at the naval academy), school of navigation, ordnance, and naval construction at Kronstadt, and marine engineering school. The present plans are to combine all the schools in one establishment. The principal dockyards are the New Admiralty Works at Saint Petersburg, Galernaya Island Yard at Saint Petersburg, Kronstadt arsenal, Nicolayev dockyard, Sebastopol arsenal, Windau dockyard, Libau dockyard, Port Arthur (Liao-tung Peninsula), Vladivostok, Sveaborg, Revel, Archangel, Baku, Batum, Nicolayevsk (Amur), and Kagala (Oxus). The number and displacement of the vessels of the fleet are given in the table. The transport service between Russia and Eastern Siberia is carried on by the Russian Volunteer Fleet, which receives a large subsidy from the Russian Government. It consists of 18 steamers of 7650 to 12,000 tons (launched 1891-1900), and 1 of 2700 tons (launched 1895). The vessels of the Black Sea Steam Navigation Company, 12 in number, mostly of about 2400 tons, are fitted to receive armaments and act as auxiliary cruisers or transports in time of war.

Santo Domingo. The naval force of this little republic consists of 1 small gunboat of 322 tons (launched 1894), 1 cruiser of 1000 tons (launched 1896), 1 cruiser of about 1000 tons (rebuilt in 1896-97).

Sarawak. The navy of this little Bornean State consists of three small gunboats of 118 to 300 tons (launched 1875-84).

Siam. The navy of Siam consists of 1 protected cruiser of 2500 tons, 8 gunboats of 260 to 800 tons, 1 old floating battery of 950 tons, 1 old depot ship of 545 tons, 6 dispatch vessels of 100 to 700 tons, 1 torpedo boat of 45 tons (launched 1888), and 43 small steamers for river and coast service.

Spain. The navy of Spain received a serious setback in the Spanish-American War, losing about half the fleet. During 1901 the navy was reorganized, and soon after it was proposed to construct a new and powerful fleet of 8 battleships of 12,000 tons, 4 cruisers of 8000 tons, and a limited number of smaller cruisers and torpedo vessels. All the old vessels not actually needed have been or are to be sold, the arsenals and naval establishments are being reorganized, and other improvements are contemplated. It is hoped by these means so to reduce the unnecessary expenses that a fine fleet can gradually be built and maintained without adding greatly to the expenses of the Government. The navy is presided over by a Minister of Marine, formerly a naval officer, but the incumbent in 1902 was a civil official. He is assisted by a council of 9 persons, of whom 5 are officers of the navy, 1 is a Senator, 1 a Deputy of the Cortes, 1 an inspector-general of engineers, and 1 a field marshal of artillery. The central administration consists of: (1) Section of Personnel; (2) Section of Equipment; (3) Section of Navigation and Maritime Industries; (4) Section of Naval Construction; (5) Section of Naval Ordnance; (6) Section of Accounts; (7) Section of Administrative Affairs. The reorganization of the navy in progress in 1902 may effect considerable changes in these arrangements. The principal dockyards are located at Ferrol, Cadiz (La Carráca), Trubia (army gun-factory where naval guns are made), Bilbao, and Cartagena. There are, in addition, several naval stations and supply depots. The naval school is located on the old wooden frigate *Asturias*. All executive officers are required to pass through the school; the course is three years, after which the cadets serve as midshipmen for further instruction. The fleet in 1902 consisted of 1 battleship of 9900 tons (launched 1887—partly rebuilt 1897-98 and 1900-01), 2 old battleships of 7000 tons (launched 1863-65—rebuilt as armored cruisers 1897-98), 1 armored cruiser of 9090 tons (launched 1895), 3 armored cruisers of 7000 tons (launched 1896-1900), 1 protected cruiser of 5372 tons (building in 1902), 2 protected cruisers of 5000 tons (launched 1891-92), 2 protected cruisers of 1875 and 2030 tons (launched 1898-1900), 1 small protected cruiser of 1040 tons (launched 1890), 2 cruisers of 3090 and 3342 tons (launched 1879-87), 3 cruisers of 1152 tons (launched 1885-88), 10 torpedo gunboats of 570 to 830 tons (launched 1889-97), 1 torpedo-boat destroyer of 386 tons (launched 1886), 4 torpedo-boat destroyers of 370 to 400 tons (launched 1896-97), 1 armed yacht of 1800 tons (purchased 1898), 7 training ships of 800 to 4000 tons, 1 transport of 2000 tons, 42 gunboats of 37 to 525 tons (launched 1877-95), 16 torpedo boats of 65 to 108 tons (launched 1885-1901).

Sweden. The navy of Sweden has been very much increased during the last fifteen years, and now possesses many effective coast-defense ships. The navy is presided over by a Minister of Marine with headquarters at Stockholm; the Minister is either a naval officer or civilian. The department comprises four bureaus, viz.: (a) The Cabinet of the Minister; (b) The Bureau of Personnel; (c) The Naval Staff; (d) The Bureau of Material. The school for executive officers (there are no marine engineer officers in the navy) is located at Stockholm; the full course is six years.

There are two naval arsenals, one at Stockholm and one at Karlskrona. The fleet consists of 4 small battleships of 3650 tons (building in 1902), 7 small battleships of 3100 to 3450 tons (launched 1886-98), 4 single-turret monitors of 1500 to 1580 tons (launched 1865-75—reconstructed 1898-1902), 9 very small single-turret monitors of 240 to 460 tons (launched 1869-76—nearly all recently rebuilt), 3 cruisers of 1530 to 2000 tons (launched 1870-86), 7 torpedo gunboats of 670 tons (launched 1896-99), 15 gunboats of 190 to 640 tons (launched 1861-84), 12 miscellaneous vessels, 12 vessels of 170 to 2858 tons, used as school-ships, training ships, and floating barracks, 1 torpedo-boat destroyer of 320 tons (building in 1902), 5 torpedo boats of 44 to 85 tons (building), 15 torpedo boats of 60 to 85 tons (launched 1884-1900), and 13 second-class boats of 34 to 44 tons (launched 1882-1902).

Turkey. The reduction of revenue entailed by the Turco-Russian War of 1877-78 caused Turkey to let her navy become wholly ineffective for purposes of war. About 1890 it was decided to rebuild some of the most available vessels of the fleet, and now all the old ships have either been rebuilt or are in process of reconstruction. The Navy Department, however, needs reconstruction more than the ships, for so long as present prac-

NUMBER AND DISPLACEMENT OF VESSELS OF DIFFERENT CLASSES, BUILT AND BUILDING, FOR THE PRINCIPAL NAVAL POWERS, NOVEMBER 30, 1902.

TYPE.	United States.				Great Britain.			
	Built.	Tons.	Building.	Tons.	Built.	Tons.	Building.	Tons.
Battleships, first class (above 10,000 tons)	10	112,329	9	131,200	41	551,160	11	167,750
Other battleships and coast-defense ironclads	10	41,002	2	6,428	5	40,740	...	....
Armored cruisers	2	17,415	8	111,800	17	158,300	20	205,700
Protected cruisers, first class (above 6000 tons)	2	14,750	3	28,880	21	201,950	...	....
Protected cruisers, second class (3000 to 6000 tons)	12	47,100	6	18,600	52	228,480	4	17,760
Unprotected and partially protected cruisers (above 1000)	23	32,111	...	....	48	105,630	2	1,140
Gunboats (below 1000 tons and of or above 400 tons)	6	4,020	...	....	84	70,645	...	....
Torpedo-boat destroyers	12	5,259	4	1,620	108	35,066	23	11,455
Torpedo boats, first class (above 100 tons)	25	3,913	5	1,116	19	2,971	9	1,746
Torpedo boats, second class (below 100 tons)	6	285	...	....	151	6,076	...	....
Submarine boats	1	75	7	840	...	....	9	1,305
Total displacement	109	278,259	44	300,484	546	1,401,018	78	406,856

Total built and building: United States, 153—578,743 tons. Great Britain, 624—1,807,874 tons.

TYPE.	France.				Germany.			
	Built.	Tons.	Building.	Tons.	Built.	Tons.	Building.	Tons.
Battleships, first class (above 10,000 tons)	20	225,667	6	87,780	9	100,969	5	62,779
Other battleships and coast-defense ironclads	19	87,303	...	....	23	110,886	...	....
Armored cruisers	15	105,324	10	110,546	3	28,146	2	18,238
Protected cruisers, first class (above 6000 tons)	4	31,513	...	....	...	....	...	....
Protected cruisers, second class (3000 to 6000 tons)	17	68,783	1	5,595	10	50,120	1	3,250
Unprotected and partially protected cruisers (above 1000)	18	32,840	...	....	30	61,250	5	13,446
Gunboats (below 1000 tons and of or above 400 tons)	25	14,151	...	....	10	9,029	1	900
Torpedo-boat destroyers	16	4,764	18	5,388	35	11,815	6	2,100
Torpedo boats, first class (above 100 tons)	38	5,665	...	....	47	7,080	...	....
Torpedo boats, second class (below 100 tons)	186	13,379	26	2,319	38	3,420	...	....
Submarine boats	12	1,553	22	1,704	...	....	...	....
Total displacement	370	590,942	83	213,332	205	382,715	20	100,713

Total built and building: France, 453—804,274 tons. Germany, 225—483,428 tons.

TYPE.	Japan.				Russia.			
	Built.	Tons.	Building.	Tons.	Built.	Tons.	Building.	Tons.
Battleships, first class (above 10,000 tons)	6	84,300	...	....	11	124,231	8	105,754
Other battleships and coast-defense ironclads	2	9,287	...	....	13	72,982	...	....
Armored cruisers	7	60,600	...	....	8	70,193	...	....
Protected cruisers, first class (above 6000 tons)	...	....	...	....	5	32,330	4	26,340
Protected cruisers, second class (3000 to 6000 tons)	10	41,226	2	6,730	5	18,612	5	15,200
Unprotected and partially protected cruisers (above 1000)	14	25,570	...	....	8	10,057	...	....
Gunboats (below 1000 tons and of or above 400 tons)	12	6,906	...	....	11	6,277	...	....
Torpedo-boat destroyers	15	4,597	4	1,500	27	7,222	27	9,374
Torpedo boats, first class (above 100 tons)	18	1,240	6	900	39	4,670	10	1,500
Torpedo boats, second class (below 100 tons)	58	4,302	10	850	93	4,826	...	....
Submarine boats	...	....	...	....	...	....	1	....
Total displacement	142	238,028	22	9,980	220	351,400	55	158,168

Total built and building: Japan, 164—248,008 tons. Russia, 275—509,568 tons.

TYPE.	Austria-Hungary.				Italy.			
	Built.	Tons.	Building.	Tons.	Built.	Tons.	Building.	Tons.
Battleships, first class (above 10,000 tons)	...	....	2	21,200	9	116,596	7	88,553
Other battleships and coast-defense ironclads	9	57,430	2	16,600	2	19,290	...	....
Armored cruisers	2	11,520	1	7,300	5	31,891	1	7,294
Protected cruisers, first class (above 6000 tons)	...	....	...	....	...	....	...	....
Protected cruisers, second class (3000 to 6000 tons)	2	8,128	...	....	6	20,554	...	....
Unprotected and partially protected cruisers (above 1000)	8	15,620	...	....	15	30,209	...	....
Gunboats (below 1000 tons and of or above 400 tons)	10	5,670	...	....	16	12,774	...	....
Torpedo-boat destroyers	...	....	...	....	9	2,833	2	650
Torpedo boats, first class (above 100 tons)	6	858	...	....	13	1,706	4	560
Torpedo boats, second class (below 100 tons)	63	3,759	...	....	124	8,140	...	....
Submarine boats	...	....	...	....	1	105	1	....
Total displacement	100	102,985	5	45,100	200	244,098	15	97,057

Total built and building: Austria-Hungary, 105—148,085 tons. Italy, 215—341,155 tons.

N. B.—Vessels launched before 1878, unless reconstructed and rearmed, are not included in these lists. Unprotected cruisers and gunboats do not include converted merchant vessels or yachts.

tices prevail the vessels will soon become useless for lack of care. The Minister of Marine is an admiral appointed by the Sultan. The department is divided into four bureaus, viz.: (1) Personnel; (2) Material; (3) Construction; (4) Medicine and Hygiene. The only great dockyard is the arsenal of Constantinople; this is a large and very excellent establishment as regards plan and arrangements, but is not properly kept up, and much of the machinery and fittings cannot be used. The personnel of the fleet consists of 6 vice-admirals and 11 rear-admirals with the rank of *pasha;* 130 captains, 25 commanders of superior grade, 55 commanders of inferior grade, 300 lieutenant-commanders—all with the rank of *bey;* 250 lieutenants, and 200 sub-lieutenants—with the rank of *effendi;* 400 engineers, 60 surgeons, 100 commissary officers, 110 pay officers. The enlisted force on paper is about 15,000 men; in fact, it rarely exceeds 3000, and sometimes is considerably less. For many years the larger vessels of the navy swung around their buoys in the Golden Horn without moving and without sufficient men on board to move them. The fleet consisted in 1902 of 1 battleship of 10,650 tons, which has been under construction at the arsenal of Constantinople for nearly ten years, and in 1902 was still far from being ready to launch; 7 old battleships of 5600 to 9120 tons (launched 1864-74, and very thoroughly rebuilt, modernized, and rearmed 1895-1902), 5 old battleships of 2050 to 2720 tons (launched 1868-72, but in 1902 undergoing thorough reconstruction), 1 armored coast-defense gunboat of 330 tons (launched 1864), 3 protected cruisers of 3250 tons (building in 1902 at Philadelphia, Elswick, and Kiel), 2 protected cruisers of 4050 tons (building at arsenal in Constantinople—work practically suspended for many years), 6 small cruisers of 643 to 1815 tons (launched 1892-96), 3 torpedo gunboats of 450 to 900 tons (launched 1890-92), 4 torpedo-boat destroyers of 180 to 270 tons (launched 1894-1900), 22 torpedo boats of 42 to 150 tons (launched 1884-92), 6 gunboats of 200 tons (2 completed 1894—others building), about 25 special service vessels.

United States. The head of the Navy Department is the Secretary of the Navy, a civil officer, and a member of the Cabinet; and the Assistant Secretary is also a civil officer. The department is divided into eight bureaus, Navigation, Ordnance, Equipment, Construction and Repair, Steam Engineering, Yards and Docks, Supplies and Accounts, and Medicine and Surgery; and there is in addition the office of the Judge Advocate-General. The Bureau of Navigation has charge of the personnel and the direction of the fleet; the duties of the other bureaus are indicated by their titles. Under the Bureau of Navigation are the Office of Naval Intelligence and the Naval Academy; under the Bureau of Equipment are the Hydrographic Office, the Compass Office, the Naval Observatory, and the Nautical Almanac Office. The Board of Construction, which passes on the general features of new ships, is made up of the chiefs of the Bureaus of Navigation, Ordnance, Equipment, Construction and Repair, and Steam Engineering. Strategical and tactical matters are controlled by the General Board, which is similar to the general staff of foreign services. For further and detailed information, see *Navy* in the article on the United States.

Uruguay. The navy of Uruguay consists of 3 small gunboats of 270 to 400 tons (launched 1883-91), 1 dispatch boat of 400 tons (launched 1882), and 1 transport of 260 tons. The senior officer has the rank of rear-admiral.

Venezuela. The navy of Venezuela previous to the difficulty of 1902-03 with the European Powers consisted of 2 armed steamers of 500 to 832 tons, a torpedo gunboat of 571 tons (launched 1891; purchased from Spain 1899), and several river gunboats (built in England 1891-93).

See Armor Plate; Ships, Armored, where will be found a complete bibliography; Guns, Naval; Galley; Shipbuilding; Tactics, Naval; Torpedo Boats.

NAVIGABLE RIVER (in Law). See River.

NAVIGATION (Lat. *navigatio*, a sailing, from *navigare*, to sail, from *navis*, ship + *agere*, to lead). In a broad sense, all means whereby the ship is made to proceed from place to place, but in a more technical sense, only those means whereby the course of the vessel is directed or ascertained.

HISTORY OF NAVIGATION.

The early history of navigation is wrapped in obscurity. The Egyptians had vessels large enough to be called ships about 3000 years B.C., and perhaps long before this. The Chinese also built ships at a very early date. The appliances for navigating these vessels must have been few and rude, and a voyage of a few hundred miles was regarded as a great undertaking. Considering the difficulties under which they labored, the voyages of the Phœnicians must be regarded as daring ventures. They spread their merchant fleets throughout the Mediterranean, navigated Solomon's squadrons to the Persian Gulf and Indian Ocean, and planted colonies everywhere.

Principal among these colonies was Carthage. The Carthaginian fleets passed the Pillars of Hercules, and, with no better guide than the stars, are believed to have sailed northward to the British Isles, and southward for some distance along the west coast of Africa. In B.C. 611 a Phœnician expedition fitted out by Pharaoh Necho started to circumnavigate Africa, a feat which is said to have been actually accomplished. From the eighth to the fourth century B.C. the Greek States gradually developed the art of navigation, and at the time of the Peloponnesian War the Athenians appear to have been skillful tacticians, capable of concerted manœuvres. In the fourth century B.C. Alexander the Great destroyed the power of Tyre, transferring its commerce to Alexandria, which became the centre of trade for the ancient world. Rome wrested from Carthage its naval power, and took its vast trade into the hands of the Italian sailors.

During all this period the average size of the vessels had been continually increasing. Sails were known, and some knowledge was evinced even of beating up against a foul wind; but oars were the great motive power; speed was not thought of, a voyage from the Levant to Italy being the work of a season. During the time of the Roman Empire no great progress seems to have been made, except in the size of the vessels; but regular fleets were maintained, both in the

Mediterranean and on the Atlantic coast of Gaul, for the protection of commerce.

The barbarian nations of the North developed the art of navigation in their own way. The Saxons, Jutes, and Norsemen began to roam the ocean in every direction; in small vessels they trusted more to the winds than to oars, and, sailing singly, gradually acquired that hardihood and daring which ultimately rendered them masters of the sea. The Norsemen extended their voyages to Iceland, Greenland, and Newfoundland, while they first ravaged and then colonized the coasts of Britain, France, and Sicily.

In the Middle Ages the Venetians, the Genoese, and the Pisans became the carriers of the Mediterranean Sea. Their merchants traded to the farthest Indies, and their markets became the exchanges for the produce of the world. Their constant rivalries gave occasion for the growth of naval tactics. So rich a commerce tempted piracy, and the Mohammedan corsairs spread over the Mediterranean, and, passing through the Straits of Gibraltar, ravaged the Atlantic coast.

The mariner's compass (q.v.) came into quite general use in the thirteenth century, and rendered the seaman independent of the sun and stars, so far as simple steering was concerned. The variation of the compass from true north seems to have been observed as early as 1269, but it was not until the voyages of Columbus that much attention was paid to it.

It was not until the thirteenth century that the employment of the mariner's compass brought about the development of practical nautical charts. (For ancient cartography, see GEOGRAPHY and MAP.) These first appeared in Italy; they were constructed by the aid of the compass and took the name of compass charts. The oldest of them is the so-called Pisan chart, which belongs probably to the middle of the thirteenth century, and it covers the whole of the Mediterranean. The earliest chart of which the exact date is known appears to be that of P. Visconte (1311). These charts are all plane, and together with other early ones are chiefly of the Mediterranean; but some of those appearing in the fourteenth century show the Azores, the Canaries, and the coast of Africa as far as Cape Bojador.

The translation and dissemination of Ptolemy's works in the fifteenth century caused a great improvement in maps and charts, and the subsequent labors of Copernicus and Mercator brought them to a very satisfactory state, considering the lack of geographical information. Mercator (1512-94) engraved an extensive atlas. Edward Wright, who published in 1599 a work entitled *Certain Errors in Navigation Detected and Corrected*, gives a complete exposition of the proper method of constructing a Mercator's projection, together with other information of value. In what is known as Mercator's projection, meridians are straight lines parallel to each other, and are crossed by the parallels of latitude at right angles. In order to preserve the proportion that exists in the curved surface of the earth and render the track of the ship (loxodromic curve) a straight line on the chart, the meridians are expanded or increased in length. The augmented latitudes are computed and published in a table of 'meridional parts' by means of which the parallels of latitude are placed. In Mercator charts of great extent the areas of portions differing much in latitude are greatly out of proportion, but contiguous areas differing little in latitude compare fairly well.

The rude character of the early instruments used in navigation prevented close determination of a ship's position at sea. Watches were unknown until about 1530, when Gemma Frisius immediately recognized the possibility of using them for the purpose of ascertaining the difference of longitude between two places. These early timepieces were very defective, however, and it was not until 1765 that Harrison was awarded £10,000 by the British Government for his chronometer, a second £10,000 which he received being paid in 1773 after further trials of his invention.

The date of the first attempts at determining latitude by measuring the altitude of heavenly bodies (at first, the fixed stars) is unknown, but Columbus is said to have had a cross-staff (see SEXTANT) for this purpose. Somewhat later the astrolabe was devised. In 1594 the celebrated navigator Davies published in his pamphlet entitled *The Seaman's Secrets* a modification of the cross-staff. In using this instrument the observer stood with his back to the sun looking at the horizon through a sight at the end of the staff, while the shadow of a movable projection fell on the sight box. In 1729 Pierre Bougeur devised an improved form of Davies's instrument. This was followed almost immediately by the invention of the quadrant by Hadley in England, who described his instrument in a paper to the Royal Society in May 1731, and by Thomas Godfrey of Philadelphia, who made an instrument as early as 1730 that was used at sea in August, 1731.

The earliest work devoted specially to navigation was that of Pedro de Medina, published at Valladolid in 1545. In 1530 Gemma Frisius wrote upon astronomy, cosmogony, and the use of globes. In 1537 Pedro Nuñez (Nonius), cosmographer to the King of Portugal, published a work on astronomy, charts, and some parts of navigation. In 1556 Martin Cortes published at Seville *The Art of Navigation*. Davies, in *The Seaman's Secrets*, defines three kinds of sailings—horizontal, paradoxical, and great circle. The paradoxical embraced latitude, longitude, and distance, and combined what are now called traverse and Mercator's sailings. He also gave a clear description of great-circle sailing and the proper method of accomplishing it.

Among the developments in navigation in the nineteenth century were the patent log, the Thomson sounding machine, the Thomson compass, the Ritchie liquid compass, compensation of the deviations of the compass, and the great-circle sailing chart. Almost all the old appliances were much improved, and steam propulsion has greatly simplified navigating problems. Charts (q.v.) are undergoing constant correction and are, considering all things, wonderfully accurate, but much can yet be done and is being done. The most serious enemies of the navigator of the present day are fogs and irregular currents.

MODERN ART OF NAVIGATION.

In the merchant service vessels are taken in and out of port by a pilot. When the vessel is ready to leave port, the pilot (or captain in the United States Navy) takes charge. Men are stationed at the wheel for the purpose of steering and others at the lead to take soundings. Then by means of buoys, beacons, landmarks, ranges, etc., the ship is kept in the channel. When there is any danger that she may touch bottom, soundings are taken steadily at short intervals. For convenience in entering or leaving port at night, harbor lighthouses and lighted buoys are placed in proper locations. For convenience in navigating many channels, ranges are established. That is, two objects are placed in such a manner that by steering so as to hold them in line the ship is kept in the deep water of the channel. Many of these ranges are formed by two lighthouses and can therefore be used at night.

When the outer buoys and dangers are passed and the vessel is in deep water the pilot is discharged. The position of the vessel is then carefully ascertained by compass bearings or other means. This is called taking the *departure* and may be done at any time before losing sight of the land.

The further navigation of the vessel is effected by means of: (a) dead reckoning (q.v.); (b) compass bearings, or horizontal angles, if proceeding along the coast with the land in plain sight; (c) the lead (q.v.), so long as the depth is not much over one hundred fathoms; (d) observations of the heavenly bodies.

Navigation by means of dead reckoning consists in determining the position of the ship by means of the record of courses and distances sailed which is kept in the log-book (q.v.). (See SAILINGS.) When the course of a vessel is along a coast with objects in sight which may be identified and which are marked on the chart, it is possible to obtain the position of the ship at almost any time during the day, and, by means of observations of lighthouses, frequently during the night. When the water is not deep and the coast not clearly visible, an approximate position can be obtained by soundings, but these are not always to be relied upon except within rather wide limits, whereas by compass bearings of objects on shore or by measuring the horizontal angles between three objects the exact position may be determined if the chart is reliable—and charts of much frequented coasts are generally very reliable.

When far from land, the most accurate way of determining the ship's position at any time is by observations of the heavenly bodies. Of these, the most useful is the sun, but observations of the moon, planets, and stars are also taken. The general practice is to determine the longitude by means of the sun in the morning and afternoon, the time when it bears about east or west being the most favorable, and to determine the latitude about noon, when the sun bears north or south. The altitude of the sun above the horizon is measured by means of a sextant (q.v.) and the exact time ascertained by means of a chronometer regulated to Greenwich (in American and British vessels) time. The chronometer may not show the exact Greenwich time, but its error and rate of gaining or losing is known, having been carefully determined in port. From the altitude of the sun its zenith distance is obtained (zen. dis. = 90° — alt.); the declination of the sun from the equator can be obtained from the *Nautical Almanac;* and the latitude is known with sufficient accuracy from previous observations and dead reckoning. By solving the oblique spherical triangle whose vertices are at the pole, the zenith, and the sun, and of which three sides (as given above) are known, the hour-angle of the sun east or west of the meridian is ascertained. Correcting this by adding or subtracting the 'equation of time' (derived from the nautical almanac) the mean local time is obtained. The difference between this and the Greenwich time of the chronometer gives the *longitude in time,* which is reduced to degrees in the usual manner.

The simplest method of obtaining latitude, and the one most commonly used, is what is called "latitude by meridian altitude." This is taken at the time the sun bears north or south as it crosses the meridian. The observer knows the approximate longitude. A short time before the body reaches the meridian, he begins to take altitudes of it (usually the sun is taken). As soon as the altitude stops increasing and begins to decrease he knows that the sun has crossed the meridian and that the maximum altitude obtained is the one sought. If h is the altitude thus obtained and d is the declination of the body obtained from the *Nautical Almanac,* then the latitude $= 90° - (h + d)$, the sign of d being *plus* if the body is on the same side of the equator as the ship and *minus* if on the opposite side. If a meridian altitude cannot be obtained, a spherical triangle must be solved, in which case the time must be as near noon as possible, otherwise a considerable error in latitude may result from a small one in observation or time.

The ship's position when ascertained is *plotted* (i.e. correctly located) on the proper chart and a line drawn connecting it with the preceding position. The continuous line joining the various positions is called the ship's track and shows her latitude and longitude at the different parts of her voyage. As soon as a position is determined and placed upon the chart the navigator determines the course for the next day, or next few hours as the case may be, by finding the course which must be steered to arrive at the point desired. This operation is facilitated by the outline drawing of a compass placed on the chart, the circumference of which is divided into degrees. By means of parallel rulers the direction of the new course is transferred to this compass and the correct course ascertained. The course thus obtained is either the *true* course or *magnetic* course, according to the character of the chart compass, some of which are laid down with the north point directed toward the true north and some with it directed toward magnetic north.

If the log-book of the ship is carefully kept and the speeds and courses accurately determined, the navigator may each day determine not only his position, and the course and run since the previous day, but also the ocean currents, because —neglecting errors in observations, etc.—the difference between the course and run by log (or the dead reckoning) and the actual course and run as determined by astronomical observations is due to current. He also frequently checks the table of compass errors by bearings of the sun —the correct directions of the sun being computed.

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S. N. (New York, 1899); and *Bowditch's Practical Navigator*, published by the Hydrographic Office, United States Navy, Washington (new editions every three or four years, but all recent editions substantially the same).

Much information in regard to navigation is contained in the following articles: Almanac; Astronomy; Collisions of Vessels; Compass; Dead Reckoning; Fog Signals; Helm; Latitude and Longitude; Lead; Log; Log-Book; Rules of the Road; Sailings; Seamanship; Sextant; Soundings; Steering; Tacking; Wearing.

NAVIGATION, Freedom of. The right which all nations possess of unrestricted passage over the high seas. While the right is now universally admitted, it is only within the past century that the question has become a settled one. Formerly claims of territorial jurisdiction were made over large portions of the ocean, and these claims have led to much controversy and frequent international disputes. (See Mare Clausum; Bering Sea Controversy, etc.) But the question of national control in its present phase is reduced to the application of the rule to broad arms or recesses of the sea, narrow seas inclosed within the territory of a single State, straits leading to inland seas, such inland seas and navigable rivers rising in one country and discharging through the territory of another.

Of the first class, bays are generally conceded to belong to the States to which the embracing promontories belong, unless the headlands are so far separated as not to permit of effective defense. Thus Delaware Bay was in 1792 declared to belong exclusively to the United States, and a like claim for Chesapeake Bay would hardly be contested, although the Bay of Fundy is held to be a part of the high seas.

The straits over which international controversy has chiefly arisen are those leading into the Baltic and Black seas. Denmark claimed exclusive control over the former by prescriptive right. As early as 1319 certain prescribed tolls were levied upon the Dutch, an attempt to increase which a century afterwards resulted in war. In the seventeenth century England and France contracted to pay the same Sound Dues that the Dutch paid. This continued until about 1855, when an arrangement was made whereby, on the payment of 35 million rix-dollars (about $17,500,000), Denmark relinquished her claim to tolls, and agreed to properly police and protect the passage. The United States' share of the capitalized tariff was $393,011. Previous to Russia's acquisition of the northern coast of the Black Sea it was Turkish water, but by the Treaty of Adrianople (1829) entrance through the straits into the Black Sea and navigation thereon was permitted to Russia and Powers friendly to her. But according to the ancient custom all foreign vessels of war had been prohibited entrance into the Bosporous and the Dardanelles and this inhibition was continued under the Treaty of London (1841) between Turkey and the five Powers. By the Treaty of Paris of 1856 the Black Sea was neutralized, but in 1871 Russia secured the abrogation of this provision of the treaty and has the right of maintaining her fleets of whatever size in the Black Sea. Turkey may in time of peace lawfully open the straits to her friends, although unfriendly to Russia, whenever it may seem necessary to provide for her own safety.

When a navigable river runs between two States both are guaranteed its unmolested use and the line is held to run along the middle of the stream. But when a river rises in the territory of one State and discharges through the territory of another, international law does not admit the moral claim sometimes asserted by the upper State to right of navigation to the mouth. Yet nearly all such streams flowing through the territory of Christian nations have now been opened by international agreement. By the act of the Congress of Vienna (1815) declaring free the use of certain streams separating or traversing the territory of different Powers, the Rhine and Scheldt were opened to navigation. This act also opened most of the other European rivers, excepting the Danube, which by the Treaty of Bucharest and later by that of Adrianople (1829) was made free for common commercial use to Turkey and Russia. Later by the Treaty of Paris (1856) this also came within the application of the concert of the Congress of Vienna. At the close of the Revolutionary War Spain held the territory at the mouth of the Mississippi and refused the United States outlet to the Gulf of Mexico. The Louisiana Territory was subsequently ceded to France, and its purchase by the United States in 1803 removed the question. The Saint Lawrence was thrown open to the United States by the reciprocity treaty of 1854 with Great Britain, which also included the reciprocal use of the Upper Lakes and the freedom of Lake Michigan to Canadian subjects. In South America the freedom of the Rio de la Plata to commerce was guaranteed by a series of treaties from 1853 to 1859, while the Amazon was in 1867 declared by Brazil to be open to all nations. The Stikine, Yukon, and Porcupine rivers of Alaska, rising in British territory, were opened to the subjects of England and the United States by the Treaty of Washington (1871), while the Congo and Niger in Africa were opened under an agreement for an international commission provided for by the Congo Conference of 1884-85. Consult the authorities referred to under International Law; Mare Clausum.

NAVIGATION ACT. The name applied to each of a series of acts, known collectively as 'The Navigation Acts,' passed by the English Parliament, beginning with 1645, for the purpose of protecting the shipping of Great Britain and her colonies, of injuring the shipping of the Dutch, the chief rivals of the English, and of exploiting, for the benefit of England, the commerce of the English colonies. See Navigation Laws.

NAVIGATION LAWS. The early restriction placed upon commerce was but one phase of the application of the economic doctrines advocated prior to the time of Adam Smith, prohibiting exports, regulating intercourse, and generally obstructing the operation of economic laws. The first recorded British navigation law belongs to the reign of Richard II. (1381), and required the shipment of merchandise by the "King's liege people" in "ships of the King's liegance." Subsequently a more liberal policy was pursued. With the discovery of the New World and the consequent growth of colonial dependencies, both the importance of navigation laws as a question of policy and their sphere of influence were greatly extended. England, France, Spain, Portugal, and Holland by their restrictions prohibited all commercial intercourse between their colonies and other nations; and Spain even treated the crews of foreign ships wrecked upon her coasts as pirates. In 1645 the English Parliament passed an act prohibiting the importation into England of whale oil and other products of the whale fisheries, in any vessels except such as were owned in England and were manned by English seamen. This act was the first of a long series of acts which are known collectively in history as "The Navigation Acts." The acts of 1651 and 1660—the latter of which is known officially as "The First Navigation Act"—served as the basis of the British legislation in this field for almost two hundred years. In general, the objects of these acts, as of the succeeding ones, were to protect the shipping of England and her colonies, and to exploit the trade of the colonies in the interest of the mother country. The chief feature of the acts of 1651 and 1660 was the prohibition of the importation into England of foreign products except in English ships or in the ships of the country of production. In 1663, by what is usually known as the 'Second Navigation Act,' it was ordered that "none of the products of the English plantations or factories . . . in Asia, Africa, or America shall be carried anywhere (except to other plantations) till they be first landed in England, under the forfeiture of ships and cargoes." The English restrictive measures neither destroyed the Dutch commerce of the seventeenth century nor stamped out American shipping interests of the eighteenth. The Lloyd's register of 1775 returned for the three years next preceding, 2311 vessels of American build as against 3908 of British construction. The chief features of the British Navigation Code, which was essentially identical with that of all maritime nations, as it existed down to the time of its repeal in 1849, required: That no foreigner could own, wholly or in part, an English ship; the captain and three-fourths of the crew must be British subjects; foreign products must be imported in British ships or in ships of the country of production; products of Asia, Africa, and America could not be imported into Great Britain *from any European port* in any ship whatsoever, and such products could be imported from any other place only in British ships or those of the country of production. No coastwise trade was permitted in foreign ships to the United Kingdom or between different British possessions, and trade of any kind was permitted only by special authorization. The effort to evade these restrictions involved great waste of capital, while the adoption of a more liberal policy has resulted in no diminution of the prosperity of the British Merchant Marine.

The American navigation policy began with the treaty of commerce entered into with France in 1778, which included a provision to take as the "basis of their agreement the most perfect equality and reciprocity." But the liberal tone of this instrument was discontinued when, under the influence of the New England representatives the framers of the Constitution in 1789 gave to Congress an unrestricted power to enact navigation laws (U. S. Con., Art. I., § viii., clause 3). In 1789-92 the foundation of the American system was laid by the levying of tonnage dues and import taxes after the English custom so drastic in nature as to give American shipments a practical monopoly of American commerce. This was followed by a registration act (1792) and the closing of the coasting trade to foreign shipping in 1793. After the close of the War of 1812 the two countries somewhat modified their attitude toward each other, and a treaty was entered into placing their ships upon a reciprocal footing in the ports of the United States and Great Britain and suspending somewhat the discriminating duties charged upon the goods carried. This tendency gradually resulted in England in the Reciprocity Acts of 1824 and the final repeal of her navigation laws.

The American system continued practically unchanged. In addition to those already stated, some of its more vexatious provisions which prevailed for three-quarters of the nineteenth century forbade or restricted the registration of foreign-built or foreign-owned vessels, the repair of vessels abroad, without payment of duty on materials used in repairs, or foreign vessels in the United States, without duty on entry of repairs, and compelled all vessels to first report at a port of entry and conform to the customs regulations before they could proceed to the port of delivery to discharge their cargoes; and foreign vessels could discharge only at the port of entry.

Meanwhile, American shipping had undergone various changes consonant with the economic forces in operation during this period. From 1815 to 1842 with an abundant natural supply of building material coupled with American ingenuity, it increased 70 per cent., but with the change from wooden to iron vessels, this advantage was shifted in England's favor and during the period following the Civil War the depression in freight rates and the more lucrative opportunity furnished for the investment of American capital in other directions resulted in the decrease of the American merchant marine. The decrease was also accentuated by the law forbidding any but American-built vessels to carry the American flag. The changed conditions of the past decade, however, and the modification of the statutory restrictions—by an act of 1892 foreign-built vessels of 8000 tons burden, and a speed of twenty knots an hour, which are owned in a certain part by Americans, can fly the American flag—have invigorated ship-building and shipping interests generally in the United States.

Under the provisions of the act of 1884 owners can now fill vacancies in the positions of officers below captain by aliens when in foreign voyages; seamen can be discharged at foreign ports on mutual application of master and seaman without payment of additional wages; seamen are allowed only one month's pay in case of injury to the vessel; consular fees for services to vessels and seamen are paid by the United States Treasury. Ship-building is encouraged by permitting a drawback on imported materials equal in amount to the duty paid, if the vessel is built for export. Vessels must now have the port of registry, or the place where the owner resides, if in the same district, painted upon their sterns. Vessels in trade with contiguous foreign territory no longer are required to pay a capitation tax on passengers, thus putting vessels trading with

Canada and Mexico on equal terms with the railroads, and more liberal mail laws have been passed. By the act of 1886 the tonnage rates were reduced to 3 cents per ton, not to exceed 15 cents per ton per year in the aggregate on each entry of all vessels from any foreign port in North America, Central America, the West Indies, Bahamas or Bermudas, and a rate of 6 cents not to exceed 30 cents upon all vessels entering from foreign ports, the President being authorized to suspend this duty so far as it was in excess of tonnage and other duties imposed by the country of their home port. The further act limiting the liability of ship-owners for the ship's debts, excepting wages, to the amount of his interest has proved a great benefit. The United States Shipping Commissioners were established by the act of 1872, and later, by the act of 1884, were placed under the control of the Treasury Department, as was the Bureau of Navigation, established in that year.

NAVIGATORS' ISLANDS. See Samoan Islands.

NAVILLE, nȧ'vĕl', Edouard Henri (1844—). A Swiss Egyptologist, born at Geneva, June 14, 1844. He studied at the university of his native city, King's College, London (1862), Bonn (1866), and at the Faculté des Lettres, Paris, receiving his degree in 1867. During his university career he paid much attention to Egyptology, and in 1868 he followed the courses of Lepsius at Berlin. The following year he went to Egypt, and in 1870 he published as the result of his investigations there his work, *Textes relatifs au mythe d'Horus recueillis dans le temple d'Edfou* (Geneva). His *La litanie du soleil* appeared in 1875, and his *Inscription historique de Pinodjem III.* was published at Paris in 1883. In 1874 Naville was commissioned by the London Congress of Orientalists to edit the text of the Egyptian *Book of the Dead* (q.v.). Naville spent the next ten years collecting material in the libraries and museums of Europe. The results of his labors appeared in *Das ägyptische Todtenbuch der 18. bis 20. Dynastie* (1886), one of the most important works in the history of Egyptology. Beginning in 1882, Naville usually spent his winters in Egypt conducting investigations for the Egypt Exploration Fund, and his work in this direction produced most valuable results. In 1891 he became professor of Egyptology in the University of Geneva. Among the most important of Naville's works, in addition to those already mentioned, are: *The Store City of Pithom and the Route of the Exodus*, Egypt Exploration Fund Memoir i. (1885); *Goshen and the Shrine of Saft el Henneh*, Egypt Exploration Fund Memoir iv. (1887); *The Festival Hall of Osorkou II.*, Egypt Exploration Fund Memoir x. (1892); *Ahnas el Medineh*, Egypt Exploration Fund Memoir xi. (1894); *Deir el Bahari*, Egypt Exploration Fund Memoirs xii., xiii., xiv., xvi., xix. (1894-1901).

NAVY, Department of the. One of the nine executive departments of the United States Government, created by act of Congress of April 30, 1798, and charged with the general control and administration of the navy. From 1789 to 1798 the management of naval affairs was under the control of the War Department. At the head of the department is a secretary, who is a member of the Cabinet, appointed by the President with the advice and consent of the Senate, and receives an annual salary of $8000. As the President is by the Constitution the commander-in-chief of the navy, the Secretary is generally subject to his direction. It is his duty to execute such orders as the President may give relative to the administration of naval affairs, including the procurement of naval supplies and the construction, armament, equipment, and employment of vessels of war. A variety of specific duties are imposed upon him by law, in which cases he is not subject to the direction of the President. He makes annual report to the President of the operations of the Navy Department. His deputy is the Assistant Secretary, who is appointed by the President, and who during the absence or incapacitation of the Secretary acts in his stead, taking the title of acting Secretary. An act of June 8, 1880, authorized the appointment of a judge-advocate-general of the navy from the marine corps or the navy with the rank of colonel or captain. It is his duty to receive, revise, and record the proceedings of courts-martial, courts of inquiry, boards for the examination of officers for retirement and promotion in the naval service, and to give opinions on such legal questions as arise in the course of the administration of the navy. Another officer of importance attached to the Navy Department is the commandant of the marine corps.

By an act of July 5, 1862, eight bureaus were established in the Navy Department, at the head of each being a chief, appointed by the President from among the officers of the navy. These are, the bureaus of (1) Yards and Docks; (2) Equipment; (3) Navigation; (4) Ordnance; (5) Construction and Repair; (6) Steam Engineering; (7) Medicine and Surgery; and (8) Supplies and Accounts. See *Navy*, under United States.

NAVY REGISTER. An annual official publication of the United States Navy Department. It gives a list of the officers of the navy and marine corps in order of their rank, a list of retired officers, a statement of resignations, retirements, dismissals, and deaths since the publication of the previous register, the number of stations with the ships on each and the names of officers attached to them, and an enumeration of the ships of the navy, with some details of their character, present condition, and service.

NAVY YARD. The principal navy yard of the United States is located at Brooklyn, N. Y., on the East River. There are three dry docks at this yard and one under construction. Here also is located the naval clothing factory which makes the uniforms for the enlisted men. The other important navy yards of the United States are at Norfolk (Va.), League Island (near Philadelphia), Boston, Mare Island (San Francisco Bay), and Port Orchard (Puget Sound); there are less important yards at Portsmouth (N. H.) and Pensacola (Fla.), and a yard of considerable importance is being developed at Charleston, S. C. In England the term dockyard (see Dockyards, Royal) is equivalent to the American designation navy yard. The great naval establishments on the Continent of Europe are generally termed arsenals (q.v.).

NAWANAGAR, nŭ-wä'nŭ-gŭr'. A seaport of India. See Nowanagar.

NAX'OS (Lat., from Gk. Νάξος). The largest, most beautiful, and most fertile of the Cyclades.

It is situated in the Ægean, midway between the coasts of Greece and Asia Minor. Extreme length, about 20 miles; breadth, 15 miles. Population, in 1896, 15,608. The principal products and articles of export are wine, corn, oil, cotton, fruits, and emery. The wine of Naxos (the best variety of which is still called in the islands of the Ægean *Bacchus wine*) was famous in ancient as it is in modern times, and on this account the island was celebrated in the legends of Dionysus and Ariadne. The island also contains good quarries of marble of a rather coarser grain than that of Paros. They were worked in the sixth century B.C., as is proved by the unfinished statues found in them, among which is a famous colossus, some 34 feet in length. The most flourishing period in the history of the island seems to have been in the sixth century B.C. under the rule of the tyrant Lygdamis. In B.C. 490 it was ravaged by Persians, and later joined the Delian League, from which (B.C. 469) it was the first to revolt. The island now became a dependency of Athens. After the conquest of Constantinople by the Latins, it became in 1207 the seat of a dukedom, founded by the Venetians, and in 1566 was seized by the Turks. It now forms a portion of the Kingdom of Greece (q.v.). Naxos, the capital, with a population of 2000, is situated on the northwest coast, contains Greek and Catholic churches, and a castle built by the Venetians, and is the seat of a Greek and a Latin bishop. Consult: Ross, *Reisen auf den Inseln des Aegäischen Meeres*, i. (Halle, 1840); Tozer, *Islands of the Ægean* (Oxford, 1890); Curtius, *Naxos* (Berlin, 1846); Duget, *De Insula Naxo* (Paris, 1867).

NAY'LER, James (c.1617-60). An English Quaker. He was born at Ardsley, in Yorkshire. In 1642 he became an adherent of the Parliament, and served for about eight years under Fairfax and Lambert. While in the army he began to preach as an independent, but in 1651 was led by George Fox to become a Quaker, and for three years was Fox's literary coadjutor. But popularity, especially with women, turned his head. His followers fancied that he resembled the pictures of Christ, and they called him 'Jesus' and the 'Lamb of God.' He was arrested on charges of blasphemy, tried before Parliament, and sentenced to the pillory, whipping, branding, and imprisonment for two years. The whole punishment was inflicted. He was released in 1659, recanted his errors, and was again received by the Society of Quakers. A collection of his writings was published in London in 1716, and his *Memoirs* in 1719 and reprinted in 1800.

NAZ'ARENE (Gk. Ναζαρηνός, *Nazarēnos*, more frequently Ναζωραοῖς, *Nazōraois*, from Ναζαρά, *Nazara*, Ναζαρέθ, *Nazareth*, Nazareth). A term applied to Jesus to indicate that He came from the somewhat obscure Galilean town Nazareth (q.v.), which was not connected with any Messianic prophecies or expectations (cf. John i. 46 and vii. 41). 'Jesus the Nazarene' (i.e. 'Jesus of Nazareth') became a popular term used by friend and enemy alike (quite frequently in the Gospels and Acts). When the Gospel of Matthew was written the term was considered a fulfillment of Isa. xi. 1. (Matt. ii. 23). It was thus an easy transition for the Jews to speak of the early Christians as the sect of Nazarenes (Acts xxiv. 5). Throughout the obscure and checkered development of Jewish Christianity the name was preserved, until in the fourth century 'Nazarenes' meant those Jewish Christians who, unlike the Ebionites (q.v.), were quite loyal to Jesus' teachings and not strongly anti-Gentile in their sentiments. Their general traditions and usages were, however, more Jewish than Christian. They had a Gospel of their own, made no use of Paul's Epistles, and were looked upon unfavorably by many orthodox Christians. While the Ebionites, however, grew ever more bitter toward Catholic Christianity, these seem to have gradually become lost in the greater Gentile Church. Their Gospel, known to us mainly through Jerome, was probably the same as that called by other writers the Gospel of the Hebrews, and was in existence as early as 150. All the evidence indicates that it was a secondary form of Matthew, with certain additions and variations. The work was by no means heretical in its tendencies. Later writers, from the fourth century onward, were inclined to class it as apocryphal, probably on account of the differences between it and the canonical Matthew, and also because there was no place for a fifth Gospel. The Gospel used by the more bigoted Jewish-Christian sect of Ebionites was not identical with the Nazarene Gospel, but a secondary form of the Greek Matthew. Consult: Zahn, *Geschichte des neutestamentlichen Kanons*, ii. 2 (Leipzig, 1892); Nicholson, *Gospel of the Hebrews* (London, 1879); Resch, *Agrapha* (Leipzig, 1889); Kruger, *History of Early Christian Literature* (New York, 1897).

NAZARENES, or **NAZARITES**. A group of German painters. See Pre-Raphaelites.

NAZ'ARETH (Gk. Ναζαρέθ, *Nazareth*, Ναζαρά, *Nazara*, from an Aramaic word of uncertain form and meaning). A town of ancient Galilee, famed as the place where Jesus passed His childhood. The New Testament records are singularly silent as to the details of the life of the Holy Family in Nazareth. The only passage giving any light is Matt. xiii. 54-58 (= Mark vi. 1-5, Luke iv. 16-30), the record of a visit by Jesus after He had begun His public ministry. From the question of Nathanael (John i. 46) it may be inferred that it was a place of no special importance, but not necessarily that it had a bad reputation. Since the town is not mentioned in the Old Testament or Josephus, we are entirely ignorant of its early history. The New Testament writings and the Talmud only show that Jesus was popularly called, perhaps at first in contempt, 'the Nazarene,' and His followers 'Nazarenes.' (See Nazarene.) No further mention is found until Eusebius, who says in his *Onomasticon* that it was fifteen Roman miles eastward from Legeon (the ancient Megiddo), and not far from Mount Tabor. Epiphanius, a century later, says that it had become in his day a mere village. The Christians of the first three centuries appear to have regarded it with no consideration. In later centuries it began to attract pilgrims. It naturally was reverenced by the Crusaders, who greatly embellished the place. After its final capture by the Moslems in 1291 it declined, though retaining its attraction for pilgrims. About 1620 a great Franciscan church and convent of the Annunciation was built. This has become one of the most popular pilgrim shrines in Palestine. The house in which Mary lived is said to have been miraculously transported to Loreto, Italy (q.v.). Of late years Nazareth has materially increased in population, at present containing over 10,000 souls, of whom nearly 8000 are Christians. The situation is most beautiful. In the upper reaches of a valley leading down to the Plain of Esdraelon to the south, shut in by hills, with a very fertile soil, it is isolated from the world. It is only necessary to climb the hills, however, to gain one of the finest views in Palestine. The modern town, mainly on the steep slopes of the southwest side of the valley or basin, is probably farther from the summit of the hill than was the ancient town of Jesus' day. Of all the 'holy places' in Palestine few can rival the spring near the Greek Church of Gabriel, a spot probably often visited by Mary and Jesus. Consult: Stanley, *Sinai and Palestine* (New York, 1883); George Adam Smith, *Historical Geography of the Holy Land* (New York, 1896); Baedeker-Socin, *Palestine and Syria* (Leipzig, 1898), with a plan of the town and description of the antiquities; Ritter, *Erdkunde*, vol. xvi. (Berlin, 1852); Guérin, *Galilée* (Paris, 1880); Buhl, *Geographie Palästinas* (Freiburg, 1896).

NAZARITE. See Nazirite.

NAZARITES (from Lat. *Nazarita*, from Gk. Ναζαρίτης, *Nazaritēs*, from Heb. *nāzar*, to separate oneself). A Christian sect found in Hungary, and particularly numerous in the Magyar districts of Eastern Hungary. They believe in the Trinity, but reject transubstantiation and infant baptism. They have no priesthood, refuse to take oaths, to perform military service, or participate in politics, and have given the Government much trouble.

NAZIRITE (Heb. *nāzīr*, from *nāzar*, to consecrate). Among the Hebrews, one who had devoted himself in a peculiar sense to Yahweh. The term is used of two classes: (a) Nazirites for life, and (b) Nazirites for a limited period. The law in the post-exilic Priestly Code (Num. vi.) refers to the latter class alone. According to this law, one who had taken the vow of Naziriteship was to abstain from wine or any intoxicating drink, not to suffer a razor to touch his head, but to let the locks of his hair grow long, and to avoid all ceremonial defilement. It is evident from these regulations—particularly the first two—that the Nazirite was to lead a life marked by the return to the simpler and rougher fashions of primitive times. The original purpose of such vows among the Hebrews, as among the Arabs, where they are also found (cf. Wellhausen, *Reste arabischen Heidenthums*, p. 143, Berlin, 1897; W. R. Smith, *Religion of the Semites*, pp. 482 sqq., London, 1894), was for war or revenge, but it was natural also to extend the customs involved to sacred seasons of the year when the deity was to be approached. So among the Arabs to this day, during the days spent by the pilgrims in Mecca (see Hajj), it is forbidden to cut the hair, and other restrictions are imposed, most of which emphasize the return in the holy season to more primitive fashions. As for the Nazirite for life, we have only two instances in the Old Testament, Samson and Samuel. The former, in so far as he embodies popular elements, represents the hero of a rude age. It is not said of him that he was to abstain from wine, and, as a matter of fact, he frequently was involved in acts (such as contact with the carcass of a lion) which brought in their wake ceremonial defilement. The long hair in his case may have originally been the natural condition, just as the hero Eabani among the Babylonians is described as 'hairy.' In the case of Samuel, the Naziriteship involves, likewise, merely the obligation to let the hair grow, and this may have been customary among the guardians of the sanctuaries, who were in a perpetual state of 'sanctity.' The application, therefore, of the term Nazirite to Samson and Samuel in the post-exilic sense of the word is due to the projection into the past of a condition which reached its development centuries after the age of these two personages. Naziriteship in time lost its old significance and became a species of private asceticism. In this sense, John the Baptist is a 'permanent' Nazirite (Luke i. 15) and Saint Paul possibly (though not certainly) a temporary one (Acts xxi. 17-26). Consult: Dillmann, *Die Bücher Numeri, Deuteronomium und Josua* (Leipzig, 1886); Driver, *The Books of Joel and Amos*, in the *Cambridge Bible for Schools and Colleges* (Cambridge, 1897); Nowack, *Hebräische Archäologie* (Freiburg, 1894); Benzinger, *Hebräische Archäologie* (ib., 1894); Smend, *Lehrbuch der alttestamentlichen Religionsgeschichte* (ib., 1893).

NEÆ′RA (Lat., from Gk. Νέαιρα, *Neaira*). The name of several nymphs in Grecian mythology, and of a maiden mentioned in the poems of Horace, Vergil, and Tibullus. It is used also in Milton's *Lycidas*, to designate an imaginary charmer.

NEAGH, nā, *Ir. pron.* nā′äg, Lough. The largest lake of the British Isles, in the northeastern part of Ireland, 13 miles west of Belfast (Map: Ireland, E 2). It is rectangular in shape, 17 miles long by 10 miles wide, and has a mean depth of 40 feet. It is drained northward into the Atlantic Ocean through the Bann River. Canals connect it with Belfast on the east and Lough Erne on the southwest.

NEAGLE, nā′g'l, John (1796-1865). An American portrait painter. He was born in Boston, November 4, 1796, but his parents moved to Philadelphia soon after his birth. He was practically self-taught. About 1818 he began painting portraits in Lexington, Ky., and later practiced in other cities. On his return to Philadelphia, he married the daughter of Thomas Sully, the painter, from whom he received instruction and encouragement. He made rapid progress and rose in public favor, was made director of the Pennsylvania Academy (1830-31), and first president of the Artists' Fund Society of Philadelphia (1835-44). Neagle was a good draughtsman and colorist, and clever in delineation of character. Most of his important works are in Philadelphia, and include a full-length portrait of Patrick Lyon at the Forge (1826), Pennsylvania Academy; portraits of Rev. Dr. Joseph Pilmore, Saint George's Hall; Henry Clay, Union League Club; Dr. Thomas Parke, City Library; and George Washington, Independence Hall. Other works are a portrait of Gilbert Stuart, Athenæum, Boston, and several Indian portraits, New York Historical Society.

NEAL, Daniel (1678-1743). The historian of the Puritans, born in London. He entered Oxford, but left before completing the course, to study for the dissenting ministry in England and Holland. In 1703 he returned to England, in 1706 became pastor of an independent congregation in Aldersgate Street, London, and remained at its head to the end of his life. His first work, a *History of New England* (1720), won for him the honorary degree of master of arts from Harvard in 1721. Neal's greatest work, however, was the *History of the Puritans* from the Reformation to 1689, originally undertaken by him in conjunction with Dr. John Evans. Dr. Evans died in 1730, and Neal completed the work himself (1732-38). The work was, on the whole, very favorably received by the Puritans, but Neal's studied misrepresentation and suppression of facts evoked criticism. Nevertheless, the history is for the most part a scholarly piece of work.

NEAL, David Dalhoff (1838—). An American painter. He was born at Lowell, Mass., October 20, 1838, and after studying in New Orleans, La., went to San Francisco, where he was employed in making drawings on wood. In 1862 he went to Europe, and entered the schools of the Royal Bavarian Academy, Munich. In the following year he married the daughter of Chevalier Maximilian Ainmüller, and began his first regular lessons in oil painting with his father-in-law, devoting himself to architectural subjects. From 1869 to 1876 he studied figure painting under Alexander Wagner and under Piloty. After 1879 he principally practiced portrait painting. Among the works in his early style are the "Chapel of Nonberg, Salzburg" (1864); "Chapel of the Kings, Westminster;" and "Saint Mark's." His first figure composition, "James Watt," was exhibited at the Royal Academy, London (1873). The "First Meeting of Mary Stuart and Rizzio" (1875) received the great medal from the Royal Bavarian Academy. His most noted work, "Oliver Cromwell and John Milton," is now in the Public Library, Cleveland, Ohio. His portraits owe their success to their good characterization. A fair example is that of Rev. Mark Hopkins for Williams College.

NEAL, John (1793-1876). An American poet and novelist of English-Quaker descent, born in Portland, Maine. Neal was self-educated, and studied law at Baltimore, supporting himself by literary work with an energy that characterized him throughout his long and varied life. Between 1817 and 1819 he published *Keep Cool*, a novel in two volumes, two volumes of verse, and a five-act tragedy, *Otho*. Meantime he was admitted to the Maryland bar. In 1823 he paid a visit to England. Here he was a pioneer of American letters, attracting and compelling attention, the first American to contribute to the great quarterlies and to *Blackwood*, and becoming secretary of Jeremy Bentham. Returning to America in 1827, he took up the practice of law in Portland, and in 1828 began to edit the *Yankee*, contributing much to various other magazines and newspapers, earnestly opposing capital punishment, and being an early advocate of woman's suffrage. He established a gymnasium, said to have been the first in the United States, and he was himself skilled in all the arts of exercise, and a sympathetic teacher and adviser of young men, notable among whom was E. A. Poe. While engaged energetically in journalism, he poured out a steady stream of novels, interspersed with other works. The more noteworthy of his chaotic, Byronic novels are *Randolph* (1823) and *Logan* (1823); *Rachel Dyer* (1828) and *The Downcasters* (1833) are soberer but not memorable productions. The interesting autobiography, *Wandering Recollections of a Somewhat Busy Life* (1869), was practically the last of his voluminous writings, all of which are characterized by haste, but not less by an ebullient genius and distinctive nationality.

NEAL, Joseph Clay (1807-47). An American humorist, born at Greenland, N. H. He settled in Philadelphia, where in 1831 he became editor of the *Pennsylvanian*, a Democratic journal. In 1844 he founded the *Saturday Gazette*, which had a large circulation. His best-known book, *Charcoal Sketches; or, Scenes in a Metropolis* (1837; second series 1849), enjoyed a considerable degree of popularity, and was republished in London. He wrote also *Peter Ploddy and Other Oddities* (1844).

NEALE, nēl, Edward Vansittart (1810-92). An English Christian Socialist, born at Bath and educated at Oriel College, Oxford. He became an advocate of social reform, and joined the group of Christian Socialists under F. D. Maurice. Neale founded the first coöperative stores in London. He assisted in forming several industrial societies, was a founder of the Cobden Mills in 1866, and of the Agricultural and Horticultural Association in 1867, and general secretary to the Central Coöperative Board from 1875 until 1891. He visited America in 1875. He was a director of the Coöperative Insurance Company and of the Coöperative Newspaper Society, and a Vansittart Neale scholarship at Oriel College for the sons of coöperatives was founded in his honor in 1890. His writings include: *The Characteristic Features of Some of the Principal Systems of Socialism* (1851); *The Mythical Element in Christianity* (1873); and *A Manual for Coöperators* (1879).

NEALE, John Mason (1818-66). An English author and hymnologist, born in London. He graduated at Trinity College, Cambridge, in 1840, and took holy orders in the Church of England. While chaplain and tutor at Downing College, he warmly embraced high-church views and adhered to his principles in spite of severe criticism. He was for many years warden of Sackville College, East Grinstead, and was the founder of an Anglican sisterhood of Saint Margaret. His extensive writings on theological and ecclesiastical subjects include *A History of the So-called Jansenist Church in Holland* (1858) and *Mediæval Preachers* (1857). He translated the several parts of Bernard of Cluny's *De Contemptu Mundi*, "Jerusalem the Golden," and in 1863 published *Hymns of the Eastern Church*. He also published, in addition to various collections of hymns: a *History of the Jews* (1841): *An Introduction to the History of the Holy Eastern Church* (1850); *Stories for Children from Church History* (1850); *Theodore Phranza, or the Fall of Constantinople* (1857); *History of the Council of Florence* (1861); and *Essays on Liturgiology and Church History* (1863).

NEANDER, nå-än′dẽr, Johann August Wilhelm (1789-1850). One of the most famous of ecclesiastical historians. He was born at Göttingen, January 17, 1789, of Jewish parentage, and received his early education at the Johanneum in Hamburg. On February 15, 1806, he publicly renounced Judaism, and was baptized in Saint Catharine's Church, Hamburg, changing his name from David Mendel to Neander (from Greek νεός, *neos*, new + ἀνήρ, *anĕr*, man, in allusion to the religious change which he had experienced) and taking his Christian names from several of his friends. He now proceeded to Halle, where he studied theology under Schleiermacher, and concluded his academic course at his native town of Göttingen. In 1811 he took up his residence at Heidelberg University as a privat-docent; in 1812 he was appointed extraordinary professor of theology; and in the following year was called to the newly established University of Berlin as professor of Church history. Here he labored till his death, July 14, 1850. Neander enjoyed great celebrity as a lecturer. Students flocked to him, not only from all parts of Germany, but from the most distant Protestant countries. His works, in the order of time, are: *Ueber den Kaiser Julianus und sein Zeitalter* (1812); *Der heilige Bernhard, und sein Zeitalter* (1812); *Der heilige Bernhard und seine vornehmsten gnostischen Systeme* (1818); *Der heilige Johannes Crysostomus und die Kirche, besonders des Orients, in dessen Zeitalter* (1821-22); *Denkwürdigkeiten aus der Geschichte des Christenthums und des christlichen Lebens* (1822-24); *Antignosticus, Geist des Tertullianus und Einleitung in dessen Schriften* (1826); *Allgemeine Geschichte der christlichen Religion und Kirche* (1825-52); *Kleine Gelegenheitsschriften* (1824); *Geschichte der Pflanzung und Leitung der christlichen Kirche durch die Apostel* (1832-33); *Das Leben Jesu Christi in seinem geschichtlichen Zusammenhange*, written as a reply to Strauss's work (1837); *Wissenschaftliche Abhandlungen*, published by Jacobi (1851); *Geschichte der christlichen Dogmen*, also published by Jacobi (1856); and several other posthumous works. The majority of these works have been translated into English, viz., *General History of the Christian Religion and Church* (trans. by Torrey, 12th ed. 1882); *History of the Planting and Training of the Christian Church by the Apostles* (trans. by Ryland, 1842); *Memorials of Christian Life in the Early and Middle Ages* (trans. by Ryland, 1832); *Life and Times of Saint Bernard* (trans. by Miss Matilde Wrench, 1843); *Life of Chrysostom* (trans. by Stapleton, 1845); *Life of Jesus Christ* (trans. by McClintock and Blumenthal, 1848); *Lectures on the History of Christian Dogmas* (trans. by Ryland, 1858); *The Emperor Julian* (trans. by Cox, 1850); and his commentaries on Philippians, James, and First John. Consult his *Life* by Philip Schaff (New York, 1886); by Wiegand, with bibliography (Erfurt, 1890); and by Schneider (Schleswig, 1894).

NEANDERTHAL (nå-än′dẽr-täl) **MAN.** The name applied to a dolichocephalic early Quaternary type in Western Europe, based on the upper portion of a human skull found 60 feet beneath the surface by quarrymen in a ravine called Neanderthal, near the village of Hochdal, between Düsseldorf and Elberfeld, in Rhenish Prussia. Anthropologists have varied greatly in their judgment of this relic. The preponderance of opinion is toward the view that the Neanderthal skull represents the oldest known dolichocephalic folk of Europe. Crania of the Neanderthal type were subsequently found at Brux (Bohemia), Podbaba (near Prague, Bohemia), Eguisheim (near Kolmar, Alsace), Denise (near Le Puy, Haute-Loire), Marcilly (Eure, France), Bréchamps (Eure-et-Loir), Tilbury (England, near London), Bury-Saint-Edmunds (Suffolk, England), and Victoria Cave Galley Hill, Hamilton (England). This type, in addition to its low cranial index (70-75.3), was characterized by a low forehead, prominent brow ridges, and low stature (about 1.59 meters, or 62.5 inches).

NEAP′OLIS (Lat., from Gk. Νεάπολις, 'new town'). An ancient town, the seaport of Philippi in Macedonia. The modern town of Kavalla (Map: Balkan Peninsula, E 4), with about 5000 inhabitants, is on or near its site. Paul landed here when he sailed from Troas to begin his missionary labors in Europe (Acts xvi. 9-11). The town lay on a bay, which afforded excellent anchorage, nearly opposite the island of Thasos, and was distant about nine miles from Philippi.

NEAP′OLIS. The ancient name of Naples (q.v.).

NEAP-TIDES. See TIDES.

NEARCHUS, nē-är′kŭs (Lat., from Gk. Νέαρχος). The commander of the fleet of Alexander the Great in his Indian expedition (B.C. 327-326). He was the son of Androtimus, and was born in Crete, but settled in Amphipolis in Macedonia, near the Thracian boundary. He was high in favor with Philip, but was banished on account of his adherence to Alexander. When, however, Alexander succeeded to the throne of Macedon, Nearchus was recalled, and when the conquest of the Persian Empire was begun, he was appointed Governor of Lycia and other districts in the south of Asia Minor. In B.C. 329 he accompanied Alexander to Bactria, with a body of Greek mercenaries. When his patron ordered a fleet to be built on the Hydaspes, Nearchus received the command of it. He sailed down the Indus, and then to the Persian Gulf, and arrived at Susa, in Persia, February 24, 324, shortly after Alexander himself, who had marched overland. After the death of Alexander Nearchus accepted the decision of the other generals with regard to the position of the kingdom, and retained his own provinces under Antigonus, whom he accompanied against Eumenes. In 314 Antigonus appointed him a councilor of his son, Demetrius. Fragments of his narrative of his voyage have been preserved in the *Indica* of Arrian. Consult McCrindle, *Invasion of India by Alexander the Great* (Westminster, 1896).

NEARCTIC REGION (from Gk. νέος, *neos*, new + ἀρκτικός, *arktikos*, arctic, northern). A region in zoögeography including the entire continent of North America, except the hot coastlands of Mexico. It is a part of Arctogæa, or the Holarctic Region, in the view of those who regard the Northern Hemisphere as a unit in zoögeography; but in the scheme of Sclater and Wallace it is one of the six primary regions, coordinate with the Palearctic Province. (See DISTRIBUTION OF ANIMALS, *Zoögeographical Map.*) Of further interest here are the subdivisions or local faunal areas that have been distinguished.

The earliest attempt at this set apart three regions—an 'Eastern,' from the Atlantic to the plains; a 'Central,' including the dry interior plains; and a 'Western,' the Pacific Slope. As early as 1854 Louis Agassiz stated that the eastern half of the continent contained three faunas: a northern, which he called 'Canadian;' a middle (Great Lakes to the latitude of Kentucky), which he called 'Alleghanian;' and a southern or 'Louisianian.' Later writers, especially Allen, dealing mainly with birds, made eight zones in succession from north to south—Arctic, Hudsonian, Canadian, Alleghanian, Carolinian, Louisianian, Floridian, and Antillean. Ornithologists still use this classification east of the Mississippi River. Subsequently Merriam announced the opinion that there was no reason for recognizing a 'Central Province,' and that too much stress had been laid upon the dissimilarities between Eastern and Western animals. He asserted the view that only two primary subdivisions of the Nearctic Region should be made—a 'Boreal' province and a 'Sonoran' province. The former stretches from New England and the Great Lakes northwest across Canada to Alaska, and sends down long arms along the heights of the Alleghanies and the Rocky Mountains, and along the Pacific Coast, whose fauna is a mingled one. Everything south of this is 'Sonoran,' embracing nearly all the United States, a great area of the plains of Northwestern Canada, and all of Mexico except the low tropical coast-lands. These generalizations, however, have not been universally accepted, most critics objecting that too high rank has been accorded to the 'Sonoran' region, whose boundaries are regarded as too indefinite to entitle it to be differentiated and outlined as Merriam proposed in his "Biological Survey of the San Francisco Mountain Region," in *North American Fauna, No. 3* (Washington, 1890). The question of the subdivision of the Nearctic Region therefore remains open.

NEARSIGHTEDNESS. See Sight, Defects of.

NEATH, nēth. A municipal borough and river port in Glamorganshire, South Wales, on the Neath, seven miles northeast of Swansea (Map: England, C 5). It has extensive copper and iron works. Copper, spelter, iron, tinplates, and fine bricks are extensively exported; stone is quarried, and coal and culm are produced. The town, built on the site of the Roman station Nidum, contains the remains of an ancient castle, burned in 1231. The town received its first charter from Edward II. It owns its gas, water, slaughter-houses, markets, tramways, library, cemetery, the Victoria Gardens pleasure ground, a fair-field, and real estate worth $1,000,000. Population, in 1891, 11,157; in 1901, 13,700.

NEBENIUS, nȧ-bā′nė-ụs, Karl Friedrich (1785-1857). A German statesman and economist, born at Rhodt, near Landau. In 1819 he took a prominent part in working out the Baden Constitution, and for many years was the principal statesman of the Grand Duchy. In 1833 he was made Privy Councilor of State, and soon afterwards became Minister of the Interior and president of the Cabinet Council. Owing, however, to reactionary influences, he did not keep this position very long. In 1845 he again joined the Cabinet, but the Revolution of 1849 compelled him to resign, and thereafter he devoted himself entirely to literary pursuits. He published, among many treatises on political economy: *Bemerkungen über den Zustand Grossbritanniens in staatswirtschaftlicher Hinsicht* (1818); *Ueber technische Lehranstalten* (1833); and wrote a *Geschichte der Pfalz*, which appeared posthumously (1874).

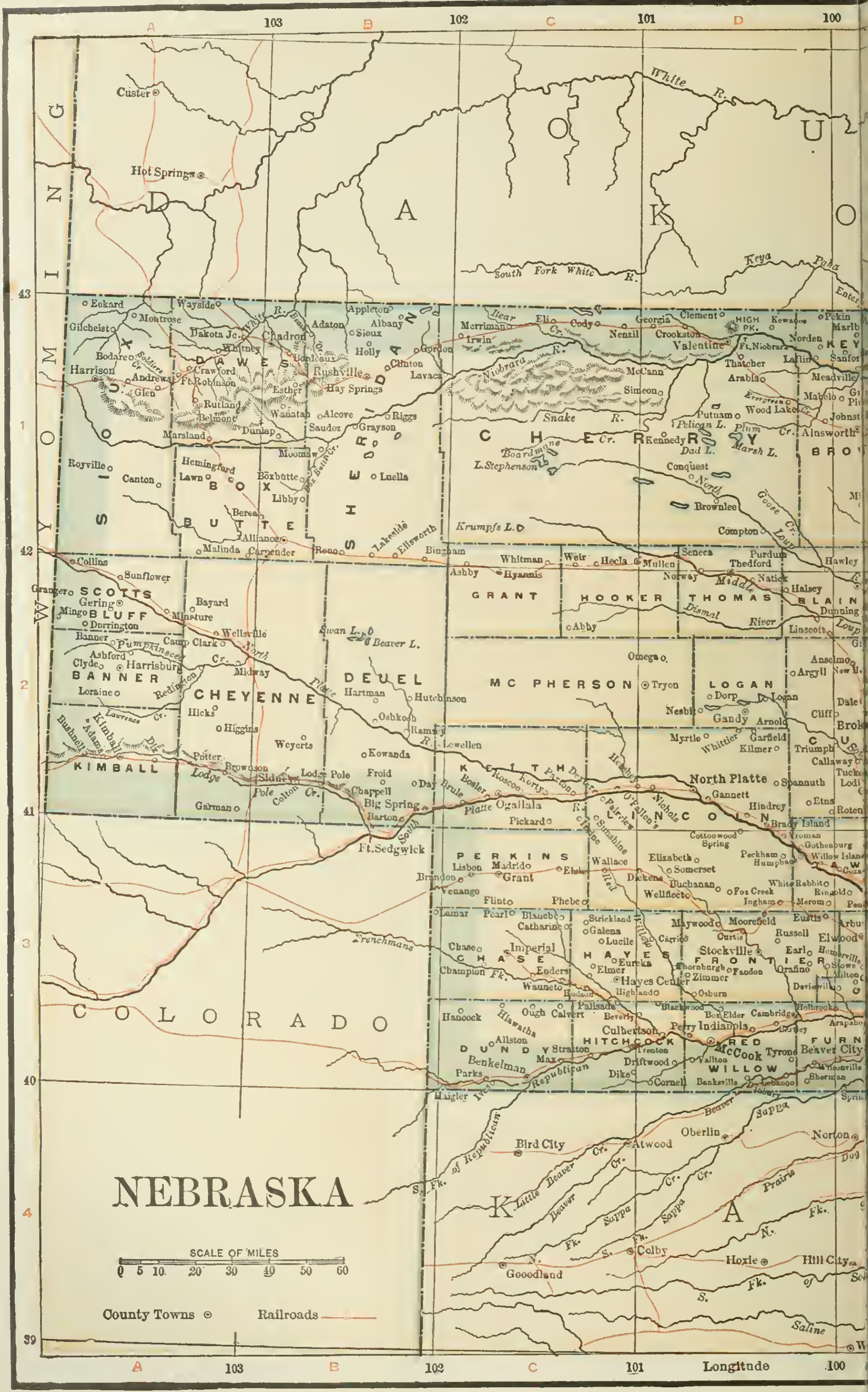
NE′BO (from Bab. *nabū*, to call, name, proclaim). A deity of the Babylonians and Assyrians, mentioned in Isaiah xlvi. 1. The name also occurs in the Old Testament as a geographical term. (See Nebo, Mount.) In cuneiform literature the form is Nabu or Nabium. After Babylon became the centre of the Babylonian Empire, Nebo took rank immediately after Marduk (see Merodach), the head of the pantheon. He appears originally to have been the local patron deity of Borsippa, opposite the ancient city of Babylon, and there are grounds for believing that Borsippa was older than Babylon. This may have been one reason for the prominence which Nebo retained beside the powerful Marduk. In time Borsippa became a suburb of Babylon and the union between the two was symbolized by erecting a shrine to Nebo in Marduk's temple at Babylon to which Nebo was carried in solemn procession on the New Year's Day, while the statue of Marduk was on the return trip carried part way back to E-zida ('the true house'), Nebo's temple in Borsippa. To express further the relationship to Marduk, Nebo was regarded as the son of Marduk. Originally an agricultural deity, Nebo became in time the god of wisdom, and it is in this capacity that he was chiefly worshiped by the Assyrians. To Nebo and his consort Tashmitum Assyrian rulers ascribe the art of writing on stone and tablets, and all learning is eventually traced back to him. In this respect he supplanted an earlier god of wisdom, Ea, whose cult reaches back to a still higher antiquity than that of Nebo or Marduk. Consult Jastrow, *Religion of Babylonia and Assyria* (Boston, 1898).

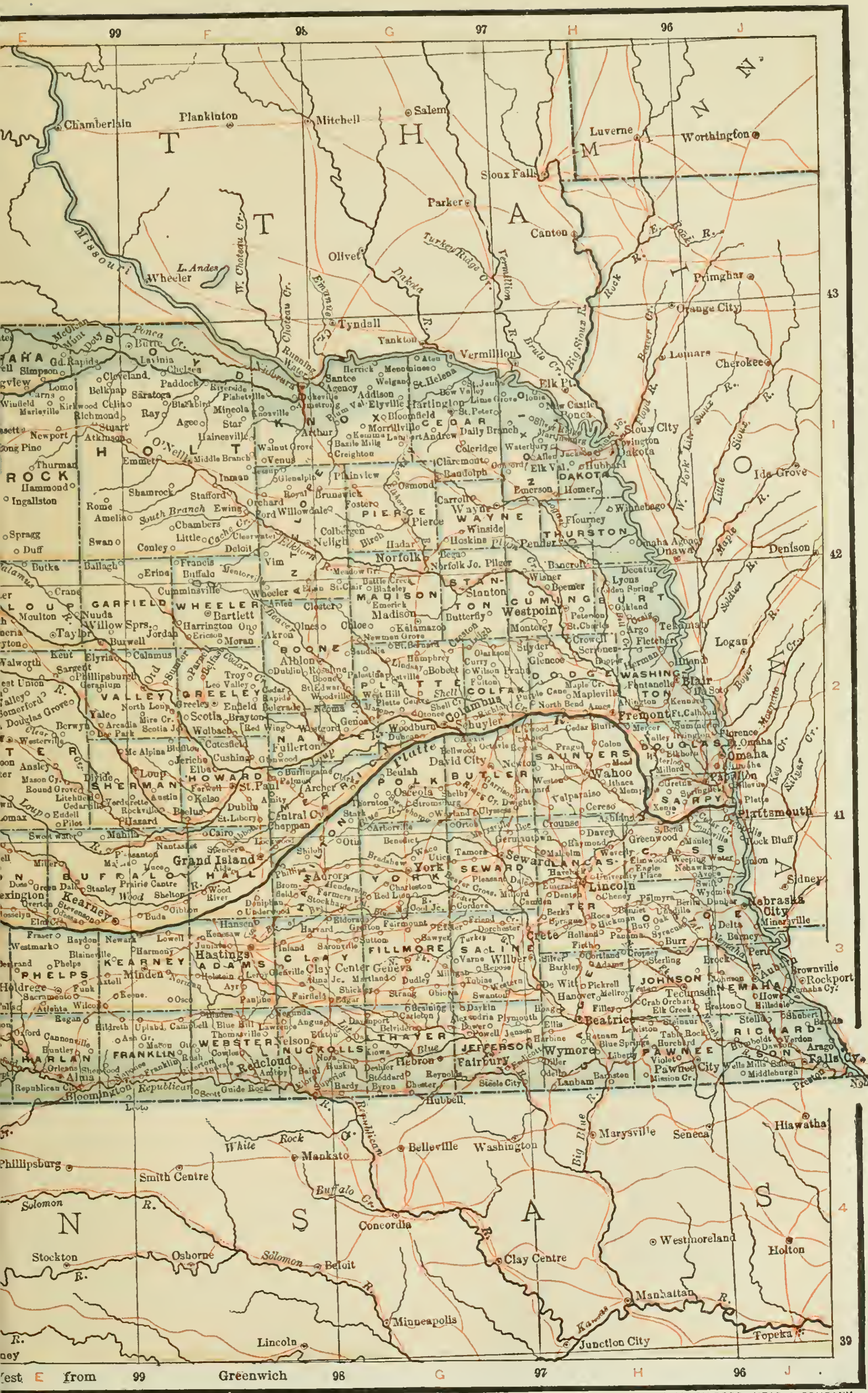
NEBO, Mount. The mountain from which, according to the Book of Deuteronomy (xxxii. 49; xxxiv. 1), Moses viewed the land of Canaan before his death. It has been identified with the mountain Neba—a ridge 2643 feet above the Mediterranean, situated five miles southwest of Heshbon. The name Nebo also occurs as that of a town in Moab (Num. xxxii. 3, and on the Moabite Stone), and a town in Judah (Ezra ii. 29). It is identical in form with the name of a well-known Babylonian god Nabu (see Nebo), whose worship appears to have spread far to the west. The tradition associating the death of Moses with Mount Nebo may have had as a starting-point the existence of a sanctuary on the top of the mount, or, at all events, the sacred character of the mountain.

NEBRAS′KA (North American Indian, shallow water). One of the north central States of the American Union, popularly known as the "Blackwater State." It lies between the parallels of latitude 40° and 43° N., and between longitudes 95° 20′ and 104° W., the latter meridian and the two parallels forming rectilinear boundaries. It is bounded on the north by South Dakota, on the east by Iowa and Missouri, on the

AREA AND POPULATION OF NEBRASKA BY COUNTIES.

County.	Map Index.	County Seat.	Area in square miles.	Population.	
				1890.	1900.
Adams	F 3	Hastings	574	24.303	18.840
Antelope	F 1	Neligh	874	10.299	11 344
Banner	A 2	Harrisburg	744	2.435	1.114
Blaine	D 2	Brewster	711	1,146	603
Boone	F 2	Albion	686	8.683	11.689
Boxbutte	A 1	Alliance	1,078	5.494	5.572
Boyd	F 1	Butte	555	695	7.332
Brown	E 1	Ainsworth	1,223	4.359	3.470
Buffalo	E 3	Kearney	985	22,162	20,254
Burt	H 2	Tekamah	476	11.069	13.040
Butler	G 2	David City	586	15.454	15 703
Cass	H 3	Plattsmouth	540	24.080	21.330
Cedar	G 1	Hartington	725	7.028	12 467
Chase	C 3	Imperial	901	4,807	2.559
Cherry	C 1	Valentine	5,891	6.428	6.541
Cheyenne	A 2	Sidney	2.401	5,693	5.570
Clay	F 3	Clay Center	586	16 310	15.735
Colfax	G 2	Schuyler	405	10,453	11.211
Cuming	H 2	Westpoint	580	12.265	14.584
Custer	D 2	Broken Row	2.595	21.677	19.758
Dakota	H 1	Dakota	264	5.286	6,286
Dawes	A 1	Chadron	1.411	9.722	6.215
Dawson	B 3	Lexington	1.002	10.129	12.214
Deuel	B 2	Chappell	2,097	2,893	2.630
Dixon	H 1	Ponca	450	8,084	10.535
Dodge	H 2	Fremont	529	19.260	22.298
Douglas	H 2	Omaha	341	158.008	140.590
Dundy	C 3	Benkelman	921	4.012	2.434
Fillmore	G 3	Geneva	568	16,022	15.087
Franklin	E 3	Bloomington	568	7.693	9.455
Frontier	D 3	Stockville	980	8,497	8 781
Furnas	D 3	Beaver City	715	9.840	12.373
Gage	H 3	Beatrice	856	36.341	30.051
Garfield	E 2	Burwell	568	1,659	2.127
Gosper	E 3	Elwood	472	4.816	5.301
Grant	C 2	Hyannis	760	458	763
Greeley	F 2	Greeley	580	4,869	5.691
Hall	F 3	Grand Island	562	16.513	17.206
Hamilton	F 3	Aurora	550	14.096	13.330
Harlan	E 3	Alma	562	8,158	9.370
Hayes	C 3	Hayes Center	725	3.953	2.708
Hitchcock	C 3	Trenton	723	5.799	4.409
Holt	F 1	O'Neill	2.410	13.672	12.224
Hooker	C 2	Mullen	725	426	432
Howard	F 2	St. Paul	574	9.430	10.243


NEBRASKA
SCALE OF MILES
0 5 10 20 30 40 50 60
County Towns
Railroads
Longitude
103
102
101
100
A
B
C
D
43
42
41
40
39
1
2
3
4
S O U T H D A K O T A
W Y O M I N G
C O L O R A D O
K A N S A
White R.
South Fork White R.
Keya Paha
Custer
Hot Springs
SIOUX
DAWES
SHERIDAN
CHERRY
BOX BUTTE
SCOTTS BLUFF
BANNER
KIMBALL
CHEYENNE
DEUEL
GRANT
HOOKER
THOMAS
BLAINE
MC PHERSON
LOGAN
KEITH
LINCOLN
PERKINS
CHASE
HAYES
FRONTIER
DUNDY
HITCHCOCK
RED WILLOW
FURNAS
KEYA PAHA
BROWN
CUSTER
Niobrara R.
Snake R.
North Platte R.
South Platte R.
Lodge Pole Cr.
Pumpkinseed Cr.
Republican
Frenchman
Dismal River
Middle Loup
Harrison
Chadron
Rushville
Hay Springs
Gordon
Valentine
Alliance
Hemingford
Gering
Harrisburg
Kimball
Sidney
Chappell
Big Spring
Ogallala
North Platte
Grant
Imperial
Hayes Center
Culbertson
McCook
Benkelman
Trenton
Stockville
Tryon
Gandy
Thedford
Mullen
Hyannis
Brewster
Ft. Robinson
Crawford
Ft. Sedgwick
Bird City
Atwood
Oberlin
Norton
Colby
Goodland
Hoxie
Hill City



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AREA AND POPULATION OF NEBRASKA BY COUNTIES.

(*Continued.*)

County.	Map Index.	County Seat.	Area in square miles.	Population.	
				1890.	1900.
Jefferson	G 3	Fairbury	566	14.850	15,196
Johnson	H 3	Tecumseh	382	10,333	11,197
Kearney	E 3	Minden	503	9.061	9,866
Keith	C 2	Ogallala	1.113	2.556	1,951
Keyapaha	E 1	Springview	772	3.920	3.076
Kimball	A 2	Kimball	960	959	758
Knox	F 1	Niobrara	1,125	8,582	14.343
Lancaster	H 3	Lincoln	868	76,395	64.835
Lincoln	C 2	North Platte	2.570	10,441	11.416
Logan	D 2	Gandy	576	1,378	960
Loup	E 2	Taylor	574	1.662	1,305
McPherson	C 2	Tryon	1.685	401	517
Madison	G 2	Madison	576	13.669	16,976
Merrick	F 2	Central City	460	8.758	9,255
Nance	F 2	Fullerton	456	5.773	8.222
Nemaha	J 3	Auburn	407	12,930	14.952
Nuckolls	F 3	Nelson	572	11.417	12.414
Otoe	H 3	Nebraska City	615	25.403	22.288
Pawnee	H 3	Pawnee City	437	10,240	11,770
Perkins	C 3	Grant	895	4.364	1.702
Phelps	E 3	Holdrege	564	9.869	10,772
Pierce	G 1	Pierce	568	4.864	8.445
Platte	G 2	Columbus	686	15.437	17.747
Polk	G 2	Osceola	432	10,817	10,542
Redwillow	D 3	McCook	720	8,837	9.604
Richardson	J 3	Falls City	548	17.574	19,614
Rock	E 1	Bassett	1.000	3 083	2,809
Saline	G 3	Wilber	576	20,097	18.252
Sarpy	H 2	Papillion	225	6,875	9.080
Saunders	H 2	Wahoo	764	21.577	22.085
Scotts Bluff	A 2	Gering	725	1,888	2.552
Seward	C 3	Seward	588	16.140	15,690
Sheridan	B 1	Rushville	2.179	8.687	6.033
Sherman	E 2	Loup	568	6.399	6,550
Sioux	A 1	Harrison	2,077	2.452	2,055
Stanton	G 2	Stanton	431	4.619	6.969
Thayer	G 3	Hebron	572	12,738	11,325
Thomas	D 2	Thedford	720	517	628
Thurston	H 1	Pender	396	3,176	8,756
Valley	E 2	Ord	578	7,092	7.339
Washington	H 2	Blair	392	11.869	13.086
Wayne	G 1	Wayne	441	6,169	9,862
Webster	F 3	Redcloud	578	11.210	11.619
Wheeler	F 2	Bartlett	582	1.683	1.362
York	G 3	York	588	17,279	18,205

south by Kansas and Colorado, and on the west by Wyoming. Its shape is that of a rectangle whose eastern end is cut off diagonally by the Missouri River, and whose southwestern corner is overlapped by the northeastern corner of Colorado. Its extreme length from east to west is 420 miles, and its breadth from north to south 208 miles. Its area is 77,510 square miles, of which 670 square miles are water, and 76,840 square miles, or 49,177,600 acres, land. It ranks thirteenth in size among the States.

Topography. Nebraska lies in the region of the great plains skirting the eastern slope of the Rocky Mountains, toward whose foothills it rises in a gentle, undulating incline. The whole western half of the State lies at an elevation of more than 2500 feet above the sea. On the other hand, there are but few eminences rising much above the general level of the plain, except in the extreme west, where the foothills of the Rocky Mountains begin to appear. The highest point here is Wildcat Mountain, 5038 feet above the sea. As the rivers are deeply trenched in the soft drift material, their flood-plains in the east along the Missouri, the Platte, and their larger tributaries are lined with steep or rounded bluffs sometimes of considerable height. Nebraska is a prairie State.

Hydrography. The State is drained entirely by the Missouri River and its tributaries. Owing to the gentle and regular slope of the land, most of these rivers flow in nearly straight parallel lines east or southeastward, and they are for the most part wide and also shallow. The three principal rivers, besides the Missouri (on the boundary), are the Platte in the centre, the Niobrara in the north, these two flowing through the whole length of the State, and the Republican in the south, the latter coming from Kansas, and returning to that State to form the Kansas River.

Climate. The climate is continental, dry, and exhilarating. The mean temperature for January is 19.7° and for July 74.8°. The extremes are very great, the mercury sometimes falling to —42° and at times rising to 114°. The nights are cool. The climate of the western third of the State is, however, quite arid, and differs considerably from that of the eastern third, where agriculture is wholly successful. The annual rainfall is 23 inches, but this is very unevenly distributed. In the east it is sufficient to support agriculture, ranging from 30 inches on the average to a local maximum as high as 50 inches. In the western half it is below 20, and in the extreme west as low as 12 inches, so that here agriculture cannot be carried on successfully without irrigation. The greatest amount of rain falls in May and June, and more than three-fourths of the annual rain falls during the six months of the growing season, April to September. The prevailing winds are from the northwest, and these generally temper the summer heat, but occasionally the heat is aggravated by the hot winds from the southwest.

Soil. More than half of the State is covered with glacial drift and loess, the drift being confined to the eastern counties. The loess forms a soil of inexhaustible fertility. Its deposits range in thickness from 5 to 150 and even 200 feet, and though soft and easily excavated, it is very compact and able to withstand moisture and exposure. The bluffs along the bottom-lands are composed of this material. The alluvial lands of the river valleys also afford excellent soil, though scarcely exceeding the loess in quality, and as the State was anciently a lacustrine bed, and later a region of peat bogs, large areas are covered with a very black vegetable mold which in some places becomes true peat, and which has given the dark color to the rivers, whence the popular name of the State is derived. Considerable areas in the west, as much as 20,000 square miles, are covered with sand dunes. These are found partly in the southwestern corner, but chiefly in the large and arid area north of the Platte and west of the 100th meridian. In the extreme west the Tertiary marls, even in the Bad Lands, can be made productive by irrigation.

For Flora and Fauna, see the articles Rocky Mountains and United States.

Geology and Minerals. Except in the Bad Lands of the northwest and in some other isolated localities, formations older than the Pleistocene are nowhere exposed. They are composed of nearly horizontal strata outcropping below the drift in wide bands running southwest to northeast. Four principal formations are represented, which in order from southeast to northwest are the Upper Carboniferous, Permian, Cretaceous, and the Miocene and Pliocene Tertiary. The Miocene is the one which crops out in the Bad Lands. Glacial drift covers the eastern third of the State, the remaining Pleistocene formation consisting of alluvial deposits laid down in the lakes which were formed at the close of the glacial period. Clay and a little building stone are the only important minerals. The clay deposits afford material for the production of brick and tile; the product for 1900 was valued at $683,958, three times the value of the product in 1895.

Agriculture. In agricultural development the State advanced rapidly during the last three decades of the nineteenth century, and at the end of the period ranked as one of the most important agricultural States. In 1900, 60.8 per cent. of the total land area was included in farms, and of this 61.6 per cent. was improved. Efforts at irrigation in the arid areas of the west have been attended with some success, the irrigated acreage reported in 1899 being 148,538, of which about 90 per cent. was watered from the North Platte River. In some regions there are supplies of underground water, which can be utilized by means of windmills and small reservoirs—a system which promises to be of some importance in the agricultural development of the arid regions. Since 1880 the average acreage of farms increased from 156.9 acres to 246.1 acres. This is due to the establishment of extensive live-stock ranches in the western part of the State and the cultivation of large corn-producing areas, and is in spite of the tendency to divide farm holdings which has characterized the same period in the eastern part of the State. The number of tenant-operated farms is increasing very rapidly, and amounted in 1900 to 36.9 per cent. of the total number of farms.

Corn is the leading crop, nearly one-half of the cultivated acreage of the State being devoted to it. In 1880 the acreage of wheat was only slightly less than that of corn, but in the following decade there was an actual decrease of more than two-fifths in the area devoted to it, which, however, revived in the last decade of the century, amounting in 1900 to three times that of 1890. There were large increases in the area devoted to oats and rye respectively during each of the last two decades of the nineteenth century; rye, however, is of only minor importance. Grasses cut for hay are chiefly wild, salt, or prairie grasses, but millet, alfalfa, and other cultivated grasses are also grown. Potatoes and other vegetable crops are extensively grown. In the last decade of the past century a rapid increase was made in the cultivation of sugar beets, the census of 1900 reporting a total of 8662 acres devoted to them. The growing of orchard fruits is mainly confined to the southeastern part of the State. Between 1890 and 1900 the number of fruit trees increased from 1.840.704 to 6.240,118, considerably over half of this number being apple trees.

The acreage of the principal farm crops for the census years indicated is as follows:

CROP	1900	1890
Corn	7,335,187	5,480,279
Wheat	2.538,949	798,855
Oats	1,924,827	1,503,515
Rye	178,920	81,372
Barley	92,098	82,590
Hay and forage	2,823,652	2,462.245
Potatoes	79,901	106,722

Stock-Raising. Every decade since the settlement of the State has witnessed an increase in the number of every variety of domestic animals. In general, the increase was greatest during the ten years from 1880 to 1890. The most noteworthy gain in the last decade of the century was that made in the number of cattle other than dairy cows, amounting to 62.7 per cent. In the census year 1900, $4,137,000 was realized from the sale of dairy products, and the value of the product consumed on farms was nearly as great. In the same year only three States exceeded Nebraska in the number of swine reported.

The following table gives the number of the principal species of domestic animals for the years indicated:

	1900	1890
Dairy cows	512,544	505,045
Other cattle	2,663,699	1,637,552
Horses	795,318	626,789
Mules and asses	55,856	46,512
Sheep	335,950	209,243
Swine	4,128,000	3,815,647

Manufactures. In manufacturing Nebraska is one of the least developed States. In 1900 there were 24,461 wage-earners, or only 2.3 per cent. of the total population, engaged in manufactures. The State's industries have developed almost wholly since 1880. In the two decades beginning with that year the number of wage-earners more than quintupled, and the value of products ($143.990.000 in 1900) increased over eleven fold. The lack of cheap fuel has been a serious handicap, but the development of coal fields in adjoining States is helping to overcome this obstacle. The advantages of cheap transportation are afforded by the Missouri River, and Omaha in particular has unusual railroad facilities. As yet the industries are limited mainly to those manufactures that are based upon agricultural and stock-raising products. Thus four industries—viz. slaughtering and meat-packing, and the manufacture of malt liquors, flour and grist-mill products, and cheese, butter, and condensed milk—yielded 89.6 per cent. of the total value for the nine leading industries given in the table below. The value of the products of the slaughtering industry alone was nearly equal to that of all other industries combined. The rapid growth of the industry began in 1884, and South Omaha, as a slaughtering centre, is surpassed only by Kansas City and Chicago. The factory production of butter has developed wholly since 1881. Other leading industries are printing and publishing, and car and other railroad shop construction, the manufacture of saddlery and harness, brick and tile, and lumber and planing mill products. The last two suffered a decrease during the last decade of the century. South Omaha and Omaha are the only large manufacturing centres. The following table shows the relative importance of the leading industries, and their development during the decade 1890-1900:

INDUSTRIES	Year	Number of establishments	Average number of wage-earners	Value of products, including custom work and repairing
Total for selected industries for State	1900	1.520	13.386	$92.372,460
	1890	1,045	10,467	42.260,093
Increase, 1890 to 1900	......	475	2.919	50,112,367
Per cent. of increase	......	45.5	27.9	118
Per cent. of total of all industries in the State	1900	28.1	54.7	64
	1890	34.7	51.2	45
Slaughtering and meat-packing, wholesale	1900	8	6,083	71,018,339
	1890	6	1,863	24.026.876
Cheese, butter, and condensed milk, factory product	1900	93	333	2,253,893
	1890	58	428	1,183.000
Flouring and grist-mill products	1900	305	698	8,100,794
	1890	185	690	6,365.492
Liquors, malt	1900	19	200	1,433.501
	1890	14	172	1,079,865
Brick and tile	1900	106	855	839,815
	1890	155	2,586	2.173,632
Cars and general shop-construction and repairs by steam railroad companies	1900	23	2,458	2.624.461
	1890	9	2,041	2,067,908
Lumber, planing-mill products, including sash, doors, and blinds	1900	21	293	886,333
	1890	24	497	1,112.412
Printing and publishing	1900	554	1,883	3,431,582
	1890	443	1,771	3,222,368
Saddlery and harness	1900	391	583	1,783,742
	1890	151	419	1,028,540

Transportation. The eastern part of Nebraska enjoys adequate railroad facilities, and three lines, the Burlington and Missouri River, the Union Pacific, and the Fremont, Elkhorn and Missouri Valley, cross the State from east to west. The western part of the State has no north and south lines. The principal era of construction was in the decade 1880-90, during which the mileage increased from 1953 miles to 5407 miles. There were in 1900 5695 miles in operation. There is a State Board of Railroad Commissioners. The Missouri River is not used for purposes of navigation.

Banks. The first session of the Territorial Legislature in 1855 pronounced currency banking a crime, and no banks were chartered. The necessity for currency, however, was such that insurance companies issued a disguised form of paper money. In 1856, under special charters, certain institutions did a banking business, in spite of the laws to the contrary. The general panic of 1857 swept all such institutions out of existence. For almost a decade all the banking business was performed by private banks; then national banks began to be organized.

A considerable increase in the number of banks came about in 1880, when the era of railroad building commenced. The number of State banks almost doubled in one year, and in the following decade (1880-90) increased from 83 to 513, but diminished somewhat after the panic of 1893. The national banks during the same period increased from 10 to 120. An act regulating banks was passed in 1889, establishing a State Banking Board, and providing for reports and examinations. In 1893 there were eight savings banks in Omaha, but only one existed in 1900. The following table is compiled from the official reports of 1902:

	National banks	State and private banks
Number of banks	124	458
Capital	$10,088,000	$7,521,000
Surplus	2,068,000	1,271,000
Cash, etc	4,436,000	2,437,000
Loans	44.198,000	28,527,000
Deposits	41,093,000	35,069,000

Finances. The State Constitution forbids any bonded debts of over $50,000 except in case of war, but when the disbursements have exceeded the receipts, State warrants have been issued which drew interest. In 1891 an act was passed by the Legislature relating to registration of unpaid warrants, which practically made them a bonded debt. Besides, special relief bonds were authorized and so a funded State debt created which in 1894 amounted to more than $500,000. This funded debt was paid out by 1898. On December 1, 1902, the floating indebtedness of the State was $1,989,328, but the educational trust funds held $1,457,351, so that the net indebtedness was small. The income for the preceding twenty-four months was $6,742,551, and the expenditures $6,925,315. The educational expenditures constituted almost two-thirds of the whole.

Government. The present Constitution was adopted in 1875. If three-fifths of the members of each House approve a proposed amendment, it is submitted to a vote of the people, and if approved by a majority of the electors voting, it becomes a part of the Constitution. Every male person of the age of twenty-one years and upward who is a citizen of the United States, or has declared his intention thirty days previous to an election to become a citizen, and who is neither insane, an idiot, nor an unpardoned felon, shall be entitled to vote, provided he has resided in the State six months and in the minor districts a term prescribed by law. Registration of voters is required by law in cities of over 2500 inhabitants. The State elections are held biennially on the Tuesday after the first Monday in November.

Legislative. The Constitution places a maximum limit on the Legislature of 33 Senators and 100 Representatives. It meets biennially in odd-numbered years on the first Tuesday in January. Each member is elected for two years and receives $5 a day and mileage, but salary is allowed for only sixty days at any one sitting. Unless at the request of the Governor, bills cannot be introduced after the fortieth day of the session. The power of impeachment rests with the Senate and House in joint convention; the trial of impeachment, with the judges of the State district courts.

Executive. The Governor, Lieutenant-Governor, Secretary of State, Auditor, Treasurer, Superintendent of Public Instruction, Attorney-General, and Commissioner of Public Lands and Buildings each hold office for two years. The Governor's veto extends to any item or items of appropriation bills. He has the usual pardoning power, subject to legislative regulation.

Judiciary. The judicial power is vested in a Supreme Court, district courts, county courts, justices of the peace, police magistrates, and inferior courts created by law for cities and incorporated towns. The three Supreme Court judges are elected by the State at large for six years. The State is divided into six districts, in each of which a district judge is elected for four years. The county judges are elected for two years.

Local Government. No county can be created with or reduced to a less area than 400 square miles, nor can any county be divided without the approval of a majority vote of the people. The Legislature provides by law for township organization.

Statutory Provisions. Property acquired by a wife after marriage remains separately hers. Women who own assessed property, or who have children of school age, may vote in school meetings. The liquor laws provide for high license. The legal rate of interest is seven per cent., ten being allowed by contract, and the penalty for usury is forfeiture of interest and cost.

The State has six Representatives in the National Congress. The capital is Lincoln.

Population. The population of Nebraska by decades was: 1860, 28,841; 1870, 122,993; 1880, 452,402; 1890, 1,058,910; 1900, 1,066,300. In the decade 1880-90 Texas was the only State west of the Mississippi whose absolute growth was as great as that of Nebraska, but in the following decade the population remained almost stationary, its increase being exceeded by that in every other State in the Union but one. Many of the northeastern counties of the State made large gains in the last decade of the century, but elsewhere decreases were common. Owing to its aridity, the western half of the State contains but few people. The foreign-born population in 1900 numbered 177,347, the Germans exceeding any other nationality. In the same year there were 6269 negroes and 3322 taxed Indians. There are 13.9 inhabitants to the square mile. Nebraska is one of the two States which suffered an actual decrease in urban population during the last decade of the past century. In 1900 there were eleven cities which exceeded 4000 inhabitants each, and together constituted 20.8 per cent. of the total population. The largest three cities in 1900 were: Omaha, 102,555; Lincoln, 40,169; South Omaha, 26,001.

Charitable and Penal Institutions. The Governor, Commissioner of Public Lands and Buildings, and the State Superintendent of Public Instruction constitute a Board of Charities and Correction. The State institutions are as follows: Asylums for the insane at Lincoln and at Norfolk, Asylum for Incurable Insane at Hastings, Soldiers and Sailors' Home at Grand Island, Soldiers and Sailors' Home at Milford, Home for Friendless at Lincoln, State Industrial School at Kearney, Girls' Industrial School at Geneva, Industrial Home at Milford, State Penitentiary at Lincoln, Institution for Feeble-Minded at Beatrice, Institution for Deaf and Dumb at Omaha, Institution for Blind at Nebraska City. About one-half of the counties have poor farms (1902), the inmates at these aggregating about 800, while half as many other persons receive continuous aid from the counties, and as many more receive partial aid.

Education. Nebraska bears the distinction of having the lowest proportion of illiteracy in the United States (2.3 in 1900). In 1902 the State had 6813 public schools (465 graded), with 9629 teachers, of whom 1862 were males. The school population (five to twenty-one years of age) amounted, in 1902, to 375,340, the enrollment to 290,543, and the average daily attendance to 185,755. The average length of the school term in the same year was 138 days. The average monthly salary for male teachers increased from $39.24 in 1871 to $49.15 in 1902; of female teachers, from $36.64 to $38.51. The expenditures on education in 1902 amounted to $4,435,338, or about $23.90 per pupil in average attendance. It is reported that only about 5.5 per cent. of the teachers of the State are graduates of a college or a university, about 40 per cent. have a high-school education or its equivalent, 29 per cent. are without high-school training, and less than 16 per cent. have any professional training. To improve the professional standing of the teachers, a number of union normal institutes have been organized, giving a four weeks' summer course for teachers. The only normal school of the State (at Peru) has an attendance of about 400.

In 1900 there were in the State for purposes of secondary education 250 public high schools, with 15,208 secondary scholars, and 19 private high schools and academies, with 684 students. The chief institutions for higher education are the University of Nebraska (q.v.), at Lincoln; the University of Omaha (Presbyterian), at Bellevue; Cotner University (Christian), at Bethany; Doane College (Congregational), at Crete; Nebraska Wesleyan University (Methodist Episcopal), at University Place.

Religion. The church members or communicants in the State form only about 20 per cent. of the total population. The principal denominations, in order of their importance, are the Methodist, comprising over one-fourth of the church members, the Roman Catholic, the Lutheran, the Presbyterian, the Baptist, and the Congregational.

Militia. In 1900 the State had a population of militia age amounting to 235,572. The aggregate strength of the militia in 1901 was 1595 men.

History. The territory now constituting the State was originally a part of the Louisiana Purchase, and afterwards a part of Missouri Territory. Coronado (q.v.), setting out from Mexico in search of the seven cities of Cibola and of Quivira, claimed that in 1541 he journeyed on the great plain as far as latitude 40° N., the southern boundary of the State. There are stories of other Spanish explorations, but little is known of them. In 1673 Marquette passed the mouth of the Missouri and marked the Platte from Indian stories. Pierre and August Choteau, brothers engaged in the fur trade, went beyond the forks of the Platte in 1762. Lewis and Clark, in 1804-06, skirted the boundary of the present State. The first known settlement was a trading post founded at Bellevue by Manuel Lisa in 1805. The American Fur Company placed a post here in 1810, and posts were established at Omaha in 1825 and at Nebraska City in 1826. Fort Atkinson was established in 1821, but abandoned in 1827. With the admission of Missouri as a State in 1821, the territory was left practically without government. In 1834 part of the region was attached to Arkansas, the jurisdiction of the district court of Missouri was extended over another part, and a third portion was joined to Michigan Territory. The next year Col. Henry Dodge, with a force of dragoons, encamped at what is now Fort McPherson, and commenced negotiations with the Indians looking toward their removal to reservations. Many tribes of the Eastern Indians were then being transferred to this 'Indian country.' The Mormons in 1845-46 wintered within the territory, and the next year troops destined for service in New Mexico spent the winter at old Fort Kearney. New Fort Kearney was established on the Oregon trail in 1848. Thousands of gold seekers passed through the territory in 1849-50, and some stopped on the way in defiance of the law which forbade settlement among the Indians. In 1844 Stephen A. Douglas, then a member of the House of Representatives, introduced a bill to organize a Territory, but the bill was never reported from the committee. Another unsuccessful attempt was made in April, 1848, and still another in December. The Indians, who foresaw the inevitable extension of white settlement, wished for a Territorial government in order to sell lands to better advantage. The Wyandots, led by their half and quarter bloods, in 1851-52 petitioned Congress to establish a Territory, with no success. A Territorial Delegate, Abelard Guthrie, was chosen in October, 1852. A bill to organize Nebraska Territory passed the House February 2, 1853, but did not reach a vote in the Senate. In order to force action, a Provisional Government was organized by the residents, and William Walker was elected Governor July 25, 1853. Senator Douglas reported a bill in January, 1854, providing for the erection of a Territory, based on his principle of 'squatter sovereignty.' It was amended to provide for two Territories (see KANSAS-NEBRASKA ACT), passed both Houses, and was signed by the President May 30th. By this act the boundaries of the Territory of Nebraska were defined as the 40th and 49th parallels of latitude, from the Missouri to the summit of the Rocky Mountains. In 1861 all the region north of the 43d parallel was constituted part of Dakota Territory, a small part from the southwest corner was added to Colorado, and the western boundary was extended to the 110th meridian. With the creation of Idaho Territory in 1863, the State was reduced to its present limits except for a slight addition in the northwest in 1882.

The question of Statehood came up with the organization of the Territory. In 1860 the people voted down a proposal to call a constitutional convention. Congress passed an enabling act in 1864, but not until 1866 was a constitution adopted. The act of admission passed by Congress July 18th was not signed by the President. In February, 1867, he again vetoed a similar bill, but it was passed over the veto, and on March 1st the State was admitted. The history of the Territory and State has been one of peaceful development, though during the Civil War the Indians were restless, and in August, 1864, a notable rising occurred.

Politically Nebraska has been Republican in national elections, with the exception of the year 1896, when it was carried by the Democratic candidate, William Jennings Bryan, a resident of the State. The following is a list of the Governors of the State, with their party affiliations:

TERRITORIAL

Francis Burt	1854
T. B. Cuming (acting)	1854-55
Mark W. Izard	1855-57
T. B. Cuming (acting)	1857-58
William A. Richardson	1858
J. S. Morton (acting)	1858-59
S. W. Black	1859-61
A. S. Paddock (acting)	
Alvin Saunders	1861-67

STATE

David Butler	Republican	1867-71
W. H. James (acting)		1871-73
Robert W. Furness	Republican	1873-75
Silas Garber	"	1875-79
Albinus Nance	"	1879-83
James W. Dawes	"	1883-87
John M. Thayer	"	1887-91
James E. Boyd	Democrat	1891 *
John M. Thayer	Republican	1891-92
James E. Boyd	Democrat	1892-93
Lorenzo Crounse	Republican	1893-95
Silas A. Holcombe	Dem.-Populist	1895-99
William A. Poynter	"	1899-1901
Charles H. Dietrich	Republican	1901
Ezra P. Savage	"	1901-03
John H. Mickey	"	1903 —

* Ousted by decision of Supreme Court Nebraska, May 5, 1891; restored by decision of Supreme Court United States, Feb. 1, 1892.

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NEBRASKA. A river of Nebraska. See PLATTE.

NEBRASKA, UNIVERSITY OF. A co-educational State university at Lincoln, Neb., founded in 1869. It comprises the Graduate School; the College of Literature, Science, and Arts; the Industrial College; the College of Law; the College of Medicine; the School of Fine Arts; and the Affiliated School of Music. There is also a summer session. The regents have intrusted to its charge the United States agricultural experiment station, the State Museum, the Botanical and Geological Surveys, and the superintendency of farmers' institutes. Students are admitted on examination or on certificates from accredited schools. Military drill is compulsory for first and second year male students in the college, and physical training for all first and second year woman students. The students in 1903 numbered 2500, and the faculty consisted of 180 professors and instructors. The library contains 51,000 volumes, supplemented by eleven departmental libraries, including the departments of pure and applied sciences, law, and classical philology. The campus occupies twelve acres in the heart of Lincoln, and with the buildings is valued at $1,000,000. The endowment lands of the university were in all 136,080 acres, of which about 11,000 acres remain unsold. The principal accruing from former sales is paid into the permanent endowment funds. The income of the university for all purposes amounted in 1903 to $402,000.

NEBRASKA CITY. A city and the county-seat of Otoe County, Neb., 56 miles south of Omaha; on the Missouri River, here spanned by a fine steel railroad bridge, and on the Burlington and Missouri River (Burlington Route) and the Missouri Pacific railroads (Map: Nebraska, J 3). It has a United States Government building, the State Institute for the Blind, and a public library. The city is the centre of a noted fruit belt, also of a rich corn region. The principal industrial plants include large stock yards, grain elevators, cereal and flour mills, lumber and planing mills, foundries, press drill works, a starch factory, packing and provision house, plow works, breweries, brick works, a distillery, a cannery, and a cold storage plant. Laid out and settled in 1855 on the site of old Fort Kearney, Nebraska City was incorporated as a city of the second class in 1871. Twenty years later it received a charter of the first class, under the provisions of which it is governed by a mayor, chosen every two years, and a unicameral council, one-half of the members being elected by wards and the other half at large. Population, in 1890, 11,941; in 1900, 7380.

NEBUCHADNEZZAR, nĕb'û-kăd-nĕz'zẽr, or, more correctly, **NEBUCHADREZZAR** (Heb., from Babylonian *Nabu-kudŭrri-uṣur*, Nabu [Nebo] protect the boundary). The great King of the Neo-Babylonian Empire, who ruled c.604-561 B.C. He was the second of the name, Nebuchadnezzar I. having been a distinguished Babylonian monarch of the second half of the twelfth century B.C. He was the son of Nabopolassar, Viceroy of Assyria in Babylonia, who upon the death of Asshurbanipal (B.C. 624) gained control of the

Babylonian portion of the latter's empire. The family was Chaldean, that is, of a South Babylonian race, hence the use of this name for the dynasty and for the land in later ages. Nabopolassar entered into alliance with the other great enemy of Assyria, the Medes, marrying his son to a daughter of the Median King, Cyaxares. At this time a horde of barbarians, commonly called Scythians by historians, appeared upon the scene as assailants of the Assyrian Empire, and about B.C. 607 Nineveh fell before the combined assault. The Assyrian Empire was forthwith partitioned; the Medes took possession of the Upper Tigris Valley and the lands to the north and east of the Euphrates; Nabopolassar made firm his control of the Euphrates Valley; and from the west Necho, King of Egypt, advanced to the great river to reclaim for his land its ancient dominion in Syria. The division of spoils between Media and Babylon seems to have been prearranged, but Egypt's intrusion could not be suffered, and Nabopolassar sent Nebuchadnezzar against Necho. The latter was utterly defeated at Carchemish (B.C. 605), and Nebuchadnezzar advanced as far as Egypt to recover Syria. But he was recalled by the news of the death of his father, and accomplished the remarkable feat of leading his army by a forced march across the desert to Babylon to secure the succession. Unfortunately, we possess but scanty materials for the study of the continuation of Nebuchadnezzar's military and political career. The sources are the partial accounts found in the Bible, Josephus (quoting Berosus; *Ant.*, x. 6-11; *c. Ap.* i. 21), and Herodotus (containing obscure information concerning Egypt; ii. 151 seq.), and a fragment of Menander. The books of Kings, Jeremiah, and Ezekiel enable us to follow clearly Judah's relation to its new lord. At first King Jehoiakim submitted, but about B.C. 600 rebelled. After some delay Nebuchadnezzar sent his army against Jerusalem, which fell in 597, Jehoiakim dying during the siege. His son, Jehoiachin, suffered the Imperial chastisement of exile along with the upper classes, an uncle, Zedekiah, being appointed to the throne by the conqueror. But the new King succumbed at last to the temptations to revolt offered by his neighbors, and especially by Hophra, the ambitious King of Egypt, and drew upon himself the wrath of the Great King. Jerusalem stood a siege of sixteen months, and upon its fall (B.C. 586) was razed to the ground, while a second deportation was made, Zedekiah undergoing a cruel physical punishment. This campaign broke for good the refractory spirit of the Syrian States, Tyre alone holding out and suffering a famous siege of thirteen years, the end of which was an honorable capitulation. In B.C. 567 occurred a campaign which carried Nebuchadnezzar into the heart of Egypt, where, however, he obtained no permanent results. But it is the glory of this King that he prided himself not on the arts of war, in which he was so illustrious (he seems to have prosecuted them only at necessity), but on his works of peace. With two fragmentary exceptions, his inscriptions are devoted to his building operations, especially in Babylon, which, destroyed as it had been by Sennacherib and since then racked by civil war, he rebuilt and restored to more than its pristine glory. The excavations of the Germans under Dr. Koldewey are now uncovering the extent and grandeur of the fortifications, the palace, the temple of Marduk, and the great Procession Street, which Nebuchadnezzar reared out of patriotism and an eminent devotion to the gods. The sister city Borsippa shared in his benefactions. Nebuchadnezzar's outward successes seem to have been based upon noble kingly qualities, to which the contemporaneous Jewish prophets and even the tradition of the late Book of Daniel bear witness. According to the latter book, his life was for a time clouded by a madness (lycanthropy), for which tradition there exists some other slight testimony. His dynasty ended with his son, Evil-merodach, whose reign of two years was terminated by assassination. The collapse of the ancient Semitic empire immediately followed. For Nebuchadnezzar's inscriptions, consult: Winckler, *Keilinschriftliche Bibliothek*, vol. iii., part 2 (Berlin, 1892), and Ball in the *Proceedings of the Society for Biblical Archæology*, vols. x.-xi. (1888-89). For excavations in Babylon, consult the current *Mittheilungen der deutschen Orient-Gesellschaft.* Also consult Rogers, *History of Babylonia and Assyria*, vol. ii. (New York, 1900).

NEBULA (in Medicine). See LEUCOMA.

NEBULÆ (Lat. nom. pl., clouds, vapors, mists). Patches of luminous matter occurring in considerable numbers in various parts of the sky, and differing from the stars in that they do not present simply small definite points of light, but rather large surfaces of widely varying brilliancy. We have acquired much exact knowledge about the nebulæ, especially in recent years, since the application of photographic processes to astronomical observation; and they have also been made the subject of extensive philosophical theories as to the origin, development, and construction of the universe, of which some are based upon too many hypothetical considerations to receive the unqualified assent of astronomers.

Only two nebulæ are visible to the naked eye: that in Andromeda and the great nebula in Orion. The former consists of an oval mass of light, about three times as long as it is broad, and surrounded with several more or less distinct disconnected oval rings. There is also a central condensation in the middle of the whole mass. The Orion nebula, on the other hand, is of quite irregular shape, contains a number of stars, and is indented with at least one very large non-luminous break known as the 'fish-mouth.' Both these large nebulæ, in the telescopic field of view, cover a space of more than one square degree on the sky's surface. When tested by long-exposure photographs, they are found to be of truly gigantic size. It is now admitted that the entire constellation of Orion is included in the outlying parts of the great nebula. Condensations appear to fasten about the stars of the constellation; and indeed the conclusion seems irresistible that we are looking upon a universe in course of formation out of plastic and gaseous material. Many of the less conspicuous nebulæ are round or oval; often have a stellar central condensation, and sometimes one of a disk-like form with uniform surface luminosity. These are the so-called 'planetary nebulæ.' Then there are 'annular' or ring-shaped nebulæ, and spiral nebulæ. These last look like great whirlpools of matter apparently rotating rapidly and trailing long streamers of light. The very latest researches in photographing nebulæ seem to indicate that the spiral form is in fact the most prevalent one. The application of the spectroscope, and especially the photographic spectroscope, to nebulæ study has proved that many nebulæ are really gaseous in constitution, and not simply aggregations of stars too small and close together to be separated even by our most powerful telescopes. It has also been possible to measure with the spectroscope the velocity with which some of the nebulæ are moving through space in the direction of our solar system; and it is found that nebular velocities are of about the same order of magnitude as those observed in the case of ordinary stars. As to the changes of the shape and form of individual nebulæ we have no decisive evidence. Indeed, the outlines of these objects are so hazy that no reliance can be placed upon ordinary drawings; and even photographs can mislead us, since what we see upon them depends in great measure upon the length of time during which the sensitive plate was exposed to the nebula's light. The number of the nebulæ at present known is not far from 10,000; and the best catalogue of them is by Dreyer, published in the *Memoirs* of the Royal Astronomical Society of London.

As to their distance our knowledge is still in the conjectural stage. No one has yet measured a nebular parallax (see PARALLAX) successfully; but it is extremely probable that their distances, like their velocities of motion, are of the same order of magnitude as the corresponding quantities for the fixed stars.

The theory of cosmic evolution known as the nebular hypothesis of Laplace intends to account for the origin and development of our solar system, beginning with a presupposed mass of formless matter. This mass, assuming a rotation under the influence of natural forces, might be expected to take upon itself the form of a flattened sphere; and if a contraction of its bulk should occur after the lapse of ages of time, certain rings of matter might be left behind, as it were, by the contracting mass. Such rings have indeed a certain analogy in the Andromeda nebula; and their possible formation once granted, there is nothing to prevent the gradual breaking up of a ring under the action of gravitational forces. Its matter might then be gathered into a single ball, and thus would be formed a planet circulating in an orbit around the central condensing mass destined in later ages to form the sun itself. It will be seen that this hypothesis, while plausible, rests upon a basis of imagined possibilities rather than ascertained facts. While, therefore, it is most interesting, it must on no account be reckoned among those astronomical theories (such as gravitation) whose foundation is as strong as that underlying any of the scientific truths coming within the range of human knowledge. See COSMOGONY.

NEB'ULY, or **NEBULÉ** (Fr. *nebulé*, from OF. *nebule*, cloud, from Lat. *nebula*, Gk. *νεφέλη*, *nephelē*, Skt. *nabhas*, OChurch Slav. *nebo*, OIr. *nél*, cloud; connected with OHG. *nebul*, Ger. *Nebel*, mist). One of the partition lines in heraldry (q.v.).

NECESSARIES (Lat. *necessarius*, requisite, indispensable, from *necesse*, OLat. *necessum*, indispensable, from *ne*, not + *cessus*, p.p. of *cedere*, to yield). In its technical legal sense, the term denotes such articles as are reasonably suitable or necessary to maintain a person in the station or condition in life which he occupies at the time they are furnished. The origin of the above signification of the term was in the doctrine of the common law that married women, infants, lunatics, or any incompetent persons cannot be held on their contracts; and in order to obviate the harsh effect of this rule, the courts adopted the policy of holding such persons for any articles furnished them which were actually necessary to sustain life. The courts continued the use of the word necessary, but have extended its legal meaning until to-day it is a very elastic term. It is not limited only to food and clothing sufficient to sustain life, but may include articles which might be considered luxuries by persons in some stations in life, according to the circumstances of the case. In order to determine whether an article is a necessary, the character of the article itself, the use for which it was designed, the age, social position, wealth, and previous mode of living of the person to whom it was furnished must be considered. These are questions of fact, and must, therefore, be submitted to a jury. See BANKRUPTCY; CONTRACT; INFANT; LUNATIC; HUSBAND AND WIFE; and consult authorities referred to under CONTRACT; INFANT; etc.

NECHES, nĕch'ĕz. A river of eastern Texas, rising in Van Zandt County, and flowing southeast into Sabine Lake, whence its waters, with those of the Sabine River, find their way by Sabine Pass into the Gulf of Mexico (Map: Texas, G 4). It is about 350 miles long, and waters a wide and fertile portion of Texas.

NECHO, nē'kō (Egyptian *Nekau*). The second King of the twenty-sixth Egyptian dynasty, called Pharaoh-nechoh in the Bible (II. Kings xxiii. 29 et seq.), and Nechos, Nechaus, etc., by Greek writers. He succeeded Psammetichus I., and reigned from B.C. 610 to 594. On the downfall of the Assyrian Empire, Necho attempted to gain possession of Syria, and, at the outset of his campaign, defeated and slew Josiah, King of Judah, who opposed him at Megiddo. Jehoahaz, the son of Josiah, after a brief reign of three months, was deposed by the Egyptians. Eliakim, who changed his name to Jehoiakim, was made King by Necho in place of Jehoahaz, and Judah was subjected to a tribute of 100 talents of silver and one of gold. Necho conquered Syria as far as the Euphrates, but was completely defeated at Carchemish by the Babylonian Crown Prince, Nebuchadnezzar (B.C. 605), and lost all his conquests. Although unable to cope with the Babylonian Empire, Necho was an active and energetic ruler. He constructed the first canal from the Nile to the Red Sea, a precursor of the modern Suez Canal. The statement of Herodotus that he left it unfinished is incorrect. Necho also built a fleet and sent it, manned by Phœnician sailors, on an exploring expedition around Africa. Consult: Wiedemann, *Geschichte Aegyptens von Psammetich I. bis auf Alexander den Grossen* (Leipzig, 1880); Budge, *A History of Egypt* (New York, 1902).

NECK (AS. *hnecca*, OHG. *hnac*, *nac*, Ger. *Nacken*, neck; probably connected with OIr. *cnocc*, OBret. *cnoch*, hill, elevation). The portion of the anatomy between the head and the shoulders. In the human being there are several muscles that pass from the skull to the thorax, which, together with the œsophagus and the trachea, form the principal bulk of the neck. Through the neck run very important blood-vessels between the brain and the thorax, among these being the carotid arteries and the jugular veins, an incision into either of which usually causes death very promptly. Through the œsophagus the food passes into the stomach, and through the trachea the air passes into the bronchi and thence into the lungs. The principal muscles of the neck are the platysma myoides, the sterno-cleido-mastoid, the infra-hyoid and supra-hyoid, the muscles of the tongue, the muscles of the palate and of the pharynx, and the prevertebral muscles, as well as certain of the muscles of the back which are inserted into the skull; as the trachelo-mastoid, complexus, transversalis cervicis, the rectus group, the longus colli, the three scaleni, and the cervicalis ascendens. Several of these muscles form important triangles, with the aid of the ramus of the jaw, the clavicle, the hyoid bone, and the imaginary centre line of the body. These triangles are of use to the surgeon in locating and describing important structures. For instance, the digastric triangle is bounded by the jaw, above, and on either side by a belly of the digastric muscle, attached (at the apex of the triangle) to the hyoid bone below. Within this triangle are to be found a portion of the facial artery and of the lingual artery; and it is the site chosen for ligating the last-named artery.

In man there is present at the back of the neck a rudiment of an important elastic ligament, which in some of the lower animals serves to sustain the weight of the head. It is called the *ligamentum nuchæ*, and is a yellow elastic ligament, which represents in the neck the supraspinous and inter-spinous ligaments of the vertebræ of the lower part of the spine. It extends from the external occipital protuberance to the spinous process of the seventh cervical vertebra.

NECK′AM, Alexander (1157-1217). An English Latinist, born at Saint Albans, Hertfordshire, foster brother of King Richard I. Neckam studied in Paris, returned to England, and entered an Augustinian monastery at Saint Albans, where he did most of his writing. He wrote, on natural science, a prose essay, *De Naturis Rerum*, and *De Laudibus Divinæ Sapientiæ*, a treatment of the same subject in elegiac verse (both edited by Wright in the *Rolls Series of Chronicles and Memorials*, 1863); also forty-two fables. The fables are edited and Neckam's life sketched by Hervieux, *Les fabulistes latins* (3 vols., Paris, 1883-93).

NECKAR, nĕk′är. One of the principal right affluents of the Rhine. It rises in the Swabian Jura in the southwestern part of Württemberg, near the source of the Danube, flows northward through Württemberg, then west through Baden, and enters the Rhine at Mannheim, 30 miles south of the mouth of the Main (Map: Germany, C 4). It is 247 miles long, and flows for the greater part of its course through a series of lake basins surrounded by vine-clad hills. It is navigable for steamers to Heilbronn, 71 miles, and for smaller vessels to Cannstatt, 116 miles. Heidelberg lies on its banks near its mouth, where the river is flanked by picturesque hills crowned by ruined castles.

NECKER, nå′kâr′, Jacques (1732-1804). A French statesman and financier. He was born September 30, 1732, at Geneva, where his father was professor of public law. In 1747 Necker went to Paris and entered a banking house, where he served his apprenticeship in finance. In 1762 he established a banking business of his own in Paris and acquired a large fortune during the Seven Years' War. After retiring from business he became the representative of Geneva at the French Court and also a syndic of the French East India Company. He likewise began his career as a writer, and in 1773 gained the prize at the French Academy by his *éloge* on Colbert. He acquired a further reputation by his publications on political economy and finance, particularly his *Essai sur la législation et le commerce des grains* (Paris, 1775). On the removal of Turgot from office in June, 1776, Necker was called to assist in financial affairs, and after the brief administration of Clugny he was made Director-General of Finances in June, 1777. Necker succeeded in restoring to some degree of order the general financial affairs of the country, though mainly by the perilous expedient of borrowing, which he was enabled to do to an almost unlimited extent, owing to the confidence reposed in his financial dexterity. He reformed and systematized the financial administration, made taxation more equitable, and restored public confidence in the Government. This was the most brilliant period of his life, and the *salon* of Madame Necker was the rendezvous for all the brilliant literary and political lights of the day. Necker's Protestantism, however, his extraordinary vanity, and some retrenchments which he had made in the royal household, together with his publication on the financial affairs of France, *Compte rendu au roi* (1781), made him an object of great dislike to both Queen and Court, and on May 12, 1781, he was suddenly dismissed. He retired to Geneva, and while living in retirement on his estate of Coppet he wrote his famous *Administration des finances*, published in 1784. He returned to Paris in 1787, but was soon banished on account of an attack which he published on the financial policy and management of Calonne. In the financial crises which followed upon the administration of Loménie de Brienne, Louis XVI. found himself under the necessity of calling Necker to the office of Director-General of Finances and Minister of State. This was in the summer of 1788, and Necker recommended the calling of the States-General, and thereby acquired his great popularity. When the Court, on June 23, 1789, determined upon nullifying the resolutions of the Third Estate, Necker seemingly objected and the King dismissed him on July 11th, and required him to leave the French dominions. He obeyed, but the disturbances of July 12th, 13th, and 14th, culminating in the storming of the Bastille, were the result of his dismissal, and the King was under the necessity of recalling him. On the rejection by the Constituent Assembly of his scheme of a loan, and the adoption instead of it of Mirabeau's scheme of assignats, he resigned his office in September, 1790, and again retired to Coppet, where he died, April 9, 1804. Necker was able and honest, but he was a business man rather than a statesman. His daughter was the celebrated Madame de Staël (q.v.). A complete edition of Necker's writings, edited by his grandson, August de Staël-Holstein, was published in 15 volumes (1820-21). Consult also: Mme. de Staël, *La vie privée de M. Necker* (Paris, 1804); Nourrisson, *Trois révolutionnaires: Turgot, Necker et Bailly* (2d ed., ib., 1886); Gomel, *Les causes financières de la révolution française: les ministères de Turgot et de Necker* (ib., 1892); Hermann, *Zur Geschichte der Familie Necker* (Berlin, 1886).

NECKER, Suzanne (Curchod) (1739-94). The wife of Jacques Necker (q.v.), born at Crassier in the Swiss Canton of Vaud. Her father, a Protestant minister, gave her an excellent education. She was at one time engaged to Gibbon, the historian, but after her father's death she went to Paris, and there met Necker, then a wealthy banker, who married her in 1764. Under her influence, Necker entered public life, and became the Finance Minister of Louis XVI. She herself founded a hospital in Paris, which still bears her name, and she wrote a number of books, including: *Réflexions sur le divorce* (1794); *Des inhumations précipitées* (1790); and five volumes of miscellanies, which appeared after her death (1798 and 1802). Consult: D'Arvor, *Madame Necker, 1737-94* (Paris, 1897); and D'Haussonville, *Le salon de Madame Necker* (Paris, 1882).

NECKER DE SAUSSURE, de sȯ'sụr', Adrienne Albertine (1766-1841). A French author, born in Geneva. She was the daughter of the naturalist Saussure, and married Jacques Necker, the botanist, and nephew of the great statesman of the same name. Her cousin, Mme. de Staël, was credited with the translation (1814) of Schlegel's *Vorlesungen über dramatische Kunst und Litteratur* (1809-11), now known to have been written by Mme. Necker herself. The book on which her reputation rests is *L'éducation progressive, ou étude sur le cours de la vie* (1828-32), for which the Academy gave her the Montyon Prize in 1832. It is a pedagogical work, treating of the importance of child-training, in the preparation for after life.

NECK-MOLDING. A molding at the junction of the capital and shaft of a column. It is also called *neck* or *necking*, as in the case of the plain space between the astragal of the shaft and the moldings of the cap of the Doric order.

NEC'ROMAN'CY (Lat. *necromantia*, from Gk. νεκρομαντεία, *nekromanteia*, from νεκρός, *nekros*, corpse + μαντεία, *manteia*, divination). A method of divination by which the dead were supposed to be conjured up and to answer questions concerning the future. Its practice was certainly extremely ancient. It was condemned in the Old Testament, and among the Greeks it was familiar in Homer's day. In historical days necromancy was practiced by priests or consecrated persons at many shrines in Greece. It was also current among the Romans, although banned by the Church under Constantine. It was also employed by the northern peoples, and in the mediæval and later period passed over into sorcery. See Spiritualism.

NECROP'OLIS (Neo-Lat., from Gk. νεκρόπολις, *nekropolis*, cemetery, from νεκρός, *nekros*, corpse + πόλις, *polis*, city). A term originally applied to the cemeteries in the vicinity of ancient cities, and in particular to a suburb of Alexandria largely devoted to the reception and embalming of the dead. The term necropolis is now, however, used in a much more extended sense, and applied to any extensive burial-region of ancient date. The most remarkable of these are in Egypt, where they extend for miles along the left bank of the Nile. The Pyramids are the most conspicuous features of the Ghizeh necropolis, the 'Valley of the Kings,' near Thebes, the necropolis of El-Kab, and those of Beni Hassan and Abydos are other examples. In Africa the extensive necropolis of Cyrene; in Italy the ancient Etruscan tomb-groups of Vulci, Tarquinii, and Capua, distinguished for their painted tombs; the remarkable necropolises of Myra and Antiphellus in Lycia, and that of Petra in Syria are among the important examples belonging to classical antiquity. The extraordinary collection of domed and minareted tombs and sepulchral mosques in Cairo, known as the Karafah (tombs of the Khalifs), and dating from the twelth to the fifteenth century, is often and justly called a necropolis; but the term is seldom applied to either mediæval or modern cemeteries. The burial places of antiquity have been especially important sources of archæological discovery, owing to the universal custom in early ages of burying, with the deceased, utensils, arms, money, and jewelry, for his use in the nether world.

NECRO'SIS (Lat., from Gk. νέκρωσις, *nekrōsis*, a killing, deadness, from νεκροῦν, *nekroun*, to kill, from νεκρός, *nekros*, corpse). A term employed to denote the absolute death of a circumscribed portion of any tissue. Specifically, in surgery, it is applied to the death of a bone, wholly or in part. The dead portion separates from the surrounding healthy tissue by an inflammatory process, the cast-off part being known as the *sequestrum*, and the boundary between the living and dead tissue as the *line of demarcation*. Bony necrosis is due usually to direct injuries, inflammations, and infections, which attack either the periosteum (the membrane covering the bone) or the marrow, the immediate cause being interference with the circulation and nutrition. Necrosis of the soft parts is termed gangrene, and the dead portion, known as the *slough* or *sphacelus*, separates in the same way as in bone, by a line of demarcation. See Gangrene.

NECTAN'EBO, or **NECTAN'EBUS.** The name of two kings of Egypt. Nectanebo I. (Egyptian *Nakht-Hor-hebt*), the Νεκτανέβης (*Nektanebes*) of Manetho, was the first King of the Thirtieth Dynasty, and reigned from B.C. 382 to 364. The native monuments give little historical information in regard to his reign, but the accounts of Greek writers, especially Diodorus, show that he was a capable and energetic monarch. In the earlier part of his reign he supported Evagoras, King of Cyprus, against the Persians, and when the latter invaded Egypt, succeeded in repelling them, aided by an inundation of the Nile. Nectanebo endeavored to restore the old sanctuaries of the land, and he built or restored temples in many parts of Egypt. His stone sarcophagus, inscribed with religious texts, is in the British Museum. He was succeeded by Teher or Tachus, after whom Nectan-

EBO II. (Egyptian *Nakht-nebof*), the Νεκτανεβός (*Nectanebos*) of Manetho, reigned from B.C. 361 to 343. He was a great builder. For a long time he repulsed the attempts of the Persians to conquer Egypt, but they finally made themselves masters of the Delta, and Nectanebo fled to Ethiopia. He was the last native King of Egypt. After his flight, Egypt was subject to Persian rule until B.C. 332, when it came into the possession of Alexander the Great. Consult: Wiedemann, *Geschichte Aegyptens von Psammetich I. bis auf Alexander den Grossen* (Leipzig, 1880); Budge, *A History of Egypt* (New York, 1902).

NECTAR (Lat., from Gk. νέκταρ, *nektar*). In Greek mythology, the drink of the gods, as ambrosia is their food. In the *Iliad* only nectar is mentioned as the nourishment of the gods, and originally both words seem to have been used without distinction. Consult Roscher, *Nektar und Ambrosia* (Leipzig, 1883), though his identification of them with honey is open to grave doubts.

NECTAR. The sweet secretion formed by glands located on various parts of a plant, but especially in the flower. Sometimes it is called honey, but honey is nectar after partial digestion in the crop of insects, such as bees or wasps. See NECTARY; GLAND.

NECTARINE. A smooth-skinned stone fruit. See PEACH and Colored Plate of DRUPES.

NECTARY. A surface gland which secretes nectar (q.v.). The name is also applied to abortive floral organs (see below). Nectaries are most common in the flowers of seed plants, but are found also in regions remote from the flower (Fig. 1). Extra-floral nectaries are found on the leafstalks and at the base of the leaf-blade, upon stipules and other portions of the leaf-base, and more rarely upon the blade itself.

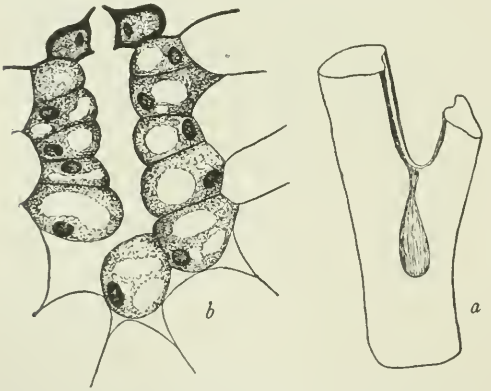


FIG. 1. EXTRA-FLORAL NECTARY OF THE BRACKEN FERN.
a, diagram showing location of gland in the axil of a leaflet; *b*, section showing the secreting cells beneath a stoma. (After Lloyd.)

The forms of nectaries are very various. The secreting surface frequently covers a more or less pronounced swelling or cushion of tissue, which may develop on the base of the flower leaves, or on the axis of the flower between them. Sometimes a nectary stands in the place where in other related flowers well-formed and functional floral organs stand. This fact has led to the application of the term nectary to abortive floral organs even when they do not secrete nectar. Sometimes the nectar gland forms a continuous ring about the base of the pistil. In other cases the nectar gland lines the concave surface of depressions in the floral organs or the floral axis. When these pits deepen they constitute efficient receptacles for the secreted nectar. Thus, spurred petals and sepals are often furnished with nectar glands on the inner side or at the base of the spur, and the whole cavity may become filled with their secretion. Nectar glands sometimes line deep and narrow pits of small capacity, opening at the surface by a pore or cleft from which the nectar oozes. These passages may be branched, so that a complex gland is formed, such as is found in the pistils of some lilies (Fig. 2).

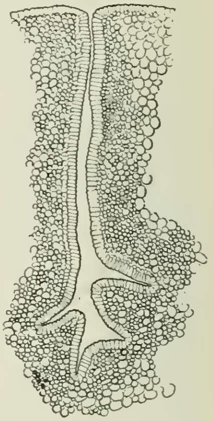


FIG. 2. SEPTAL NECTARY FROM FRUIT OF DAY-LILY.
The columnar cells lining the tube are the secreting cells.

Nectar varies greatly in composition in different plants. The greater part of it is water, which is withdrawn from the gland cells by the osmotic action of the sugar. (See SECRETION.) In addition to sugars (glucose and saccharose) small amounts of proteids and various other carbon compounds give the peculiar odor and flavor to the nectar. Nectar is eaten by bees, wasps, butterflies, and other insects, which in their search for it are utilized as unconscious carriers of pollen. See POLLINATION.

NEDJED, nĕj′′d, or **NEJD**. A region of Arabia, lying between latitudes 24° and 27° N., and bounded by El-Hasa on the east and Hedjaz on the west (Map: Asia, D 6). It has a hilly surface, intersected by many streams, which dry up during the summer. The climate is healthful. Politically Nedjed is a dependency of Jebel-Shammar. The inhabitants are Wahabis.

NEEDFIRE. In folk-custom, a fire kindled by the friction of two sticks of wood or of a rope on a wooden stake to ward off demons of disease. Among the many customs and beliefs connected with fire one of the most important is that of ritual purification. This idea arose at an early stage of man's acquaintance with fire from a simple observation of the effects of flame, the most mysterious phenomenon which he knew. Later, fire was differentiated into a number of varieties partly good and partly evil with regard to position and use, thus implying that all flame was not equal in efficacy. Still further it was thought that by age or contamination fire became ineffective and must be renewed, hence the kindling of new fire, which was an accompaniment of widely diffused cults, as that of Thor in Scandinavia and of nature gods in ancient Mexico. The new fire is supposed to regenerate, as fire sacrifice is designed to sustain, the invisible beings. Needfire is a practice usually of shepherd peoples to ward off disease attacking the flocks. In historic times the sparks for kindling the needfire were sometimes obtained by twirling a wooden peg around in a wooden post. As in the case of new fire, the needfire was almost always accompanied with the extinguishing of the fires of the locality and the neighbors also rekindled their fires from it as in the new fire ceremony. In practice the people passed or the herds were driven through or between the flames of the needfire for purification. The needfire custom survived well into the nineteenth century, and it is probable that traces of it still exist in parts of Europe.

NEED'HAM, JOHN TURBERVILLE (1713-81). An English naturalist, born in London. He studied at Douai, and was ordained to the priesthood in 1738. In 1769 he became director of the Academy of Sciences of Brussels. Needham was a friend of Buffon, and in his time well known as a scientist. His great 'discovery' was that all life proceeds from vegetation; it is contained in his *Observations upon the General Composition and Decomposition of Animal and Vegetable Substances* (1749), and *Nouvelles observations microscopiques* (1750).

NEEDHAM, or **NEDHAM,** MARCHAMONT (1620-78). An English journalist and pamphleteer, born at Burford, Oxfordshire. He was educated at All Souls' College, Oxford, and after studying medicine and law turned to journalism, and founded in 1643 the *Mercurius Britannicus* (*sic*), to which he was frequently the sole contributor. The boldness of his scurrilous attacks upon Charles I. led to his incarceration in the Fleet Prison in 1645 and in 1646, but the following year he became a Royalist himself and began the publication of *Mercurius Pragmaticus*, wherein he defended the King and turned his venomous pen against the Scots and Oliver Cromwell. Afterwards he rejoined the popular party, and signalized his conversion by the publication of *The Case of the Commonwealth of England Stated* (1650). After the Protector's death he went to Holland and continued the publication of his abusive pamphlets, such as *A Short History of the English Rebellion, Completed in Verse* (1661), and *Christianissimus Christianandus; or, Reasons for the Reduction of France to a More Christian State in Europe* (1678).

NEEDLE (AS. *nædl*, Goth. *nēala*, OHG. *nādela*, *nādla*, Ger. *Nadel*, from OHG. *nājan*, Ger. *nähen*, to sew; ultimately connected with OIr. *snāthad*, thread, AS. *snear*, Eng. *snare*, Lat. *nere*, Gk. νέειν *neein*, to sew). An instrument of metal, or other material, used to carry the thread in sewing, embroidering, knitting, netting, and other similar operations. Needles are generally made of metal, but bone, ivory, and wood are also used; for ordinary needlework, called sewing, they are made of fine steel, and are too well known to need description; for other kinds of work they are often much larger and differently formed. The earliest needles were not pierced, but were like awls, and were used for making holes in skins, through which the long roots of plants or leather thongs were passed. Later, a hole was bored in one end of the stone or bronze needle through which the root or thong was passed and this was dragged through the leather as it was punched. Stone needles, with a hole in the end opposite the point, are found in the remains of the Stone Age. Bone needles with eyes are found in the reindeer caves of France and lake dwellings of Central Europe. The needles that have come down to us from ancient Egypt are very coarse, but finer needles must have been made to execute the delicate embroidery that was produced by that people. The ancient Greeks must have been skilled in needlework, judging from the descriptions of embroidery in Homer. Ordinary needles and surgeons' needles have been found in the ruins of Pompeii.

The Chinese are believed to have been the first to use needles of steel, and these implements gradually found their way westward until they were brought into Europe by the Moors. By 1370 the needle-making industry was established in Nuremberg. In England it was not until the reign of Queen Elizabeth that their manufacture was taken up on any considerable scale in small shops, and after 1650 it gradually developed until the greater part of the hand-sewing needles are now made in England. Subsequent developments included the introduction of the needle with the eye and the gradual development of machines for their manufacture. The first drill-eyed needles were made in 1826.

Needle-making is an important industrial art, and it has attained to extraordinary perfection. The first operation, after the wire has been selected and its thickness accurately gauged, is to cut it into eight-foot lengths; this is done by winding it in a coil of sixteen feet circumference, and then cutting this coil into exact halves with powerful cutting shears. The coiling of the wire is so managed that there are 100 pieces in each half when cut; the bundles of 100 wires are again cut into the necessary lengths for two needles. The pieces cut from a coil, although now reduced to the length of two small needles, are nevertheless somewhat curved; they are therefore collected into bundles and placed in two iron rings, which hold them loosely together; they are then slightly softened by firing, and are laid on an iron plate or bench, and are pressed with a small curved bar in two or three positions, by which the operator manages to make them all perfectly straight. The blanks after being removed from a hopper in regular succession are next pointed at both ends by a grindstone to whose face they are held by a rubber band.

The eyes are next punched by means of dies. (See DIES AND DIE-SINKING.) The blanks or double needles are now placed on two wires and the two sets broken apart to form separate needles. The roughly formed needles still have to be polished, tempered, and have the heads ground into shape, operations which are mechanically performed.

Besides the ordinary sewing needle already described and other hand needles—such as those used in sail-making, leather work, upholstery, and surgery—many forms of sewing-machine needles are manufactured. The most familiar of these is the needle used in the domestic sewing machine, with the point in the eye and grooves on each side to protect the thread from being worn or cut in passing through the fabric. The latched needles used in stocking machinery are very delicate pieces of mechanism, as the latch is held by a rivet about $\frac{1}{100}$ inch in diameter between walls which are no thicker. For leather-sewing machines the needles must be adapted for use with waxed thread, and often are made with a hook at the end, instead of a hole; while the welting-machine needle, for sewing welts in boots and shoes, is the shape of a segment of a circle, Hand needles are largely made in Germany and England. Aix-la-Chapelle is the centre of the industry in Germany, and it is said that the factories of that city alone produce 50,000,000 weekly.

Needles for use in various machines are made in the United States, especially those for the ordinary domestic sewing machine. At first these needles were made by processes similar to those employed for making ordinary hand-sewing needles, but gradually special machinery has been invented for their manufacture. The process is essentially as follows: The wire is cut into a blank, which is then reduced and pointed, grooved, has its eye punched, is hardened and tempered, hard burr dressed, brass brushed, has its eye polished, undergoes a first inspection, is hard straightened, and then receives the final pointing. In one method of making sewing-machine needles by machinery the crucible steel wire from which the needle is formed is first straightened and then fed into a machine which makes the large end of the needle and cuts off the blanks of the lengths required. These blanks after being ground and polished with emery wheels and an emery belt pass from a hopper on to a grooved endless traveling carrier, where the shank of the needle is formed by the grinding action of an emery wheel. By successive wheels the needles are ground and pointed and then grooves are cut by steel saws and the eyes punched. They are then heated and hardened and cleaned first by emery and then by wire brushes and burnishing powder applied from a bristle brush. The final pointing is done on a fine emery wheel and the last polishing is accomplished with crocus and alcohol. A second method differs from that just described in that the steel wire is cut into blanks of about one-third the length of the finished needle. After a thorough cleaning these blanks are fed from a hopper into a machine where they are acted upon by steel dies which compress and extend the blank. This process is known as swaging and produces needles which vary slightly in length. This defect, however, is remedied by the action of a clipping and straightening machine which reduces the needles to a uniform size.

STATISTICS. According to the *United States Statistical Abstract* for 1900 the value of the needles imported into the United States is as follows: 1891, $314,033; 1892, $337,272; 1893, $369,465; 1894, $278,101; 1895, $291,026; 1896, $312,298; 1897, $309,754; 1898, $362,606; 1899, $407,746; 1900, $367,568. According to the Twelfth United States Census, 1,120,532 gross of needles were manufactured in the United States in 1900. The total value of this product is given as $1,027,949, which is distributed as follows: Latch knitting-machine needles, 276,141 gross, valued at $414,504; common household sewing-machine needles, 324,476 gross, valued at $399,252; wax-thread sewing-machine needles, 212,649 gross, at $99,533; knitting spring needles, 307,266 gross, at $114,660. In addition, about 277,000 gross of needles, valued at $327,000, are annually produced incidentally in factories not specially engaged in their manufacture in connection with other industries. It will be noticed that this list does not include common hand sewing and darning needles, crochet, tape, and hand-knitting needles, and it appears that none of these varieties were included in the 1900 census returns of manufactures in the United States. Consult article on "Needles and Pins," in *Twelfth Census of U. S.*, vol. x., Manufactures, part iv. (Washington, 1902).

NEEDLEFISH (so called from the shape of the snout). A gar-like fish of the synentognathous family Esocidæ, and especially of the genus Tylosurus. They are slim, long-jawed, voracious, carnivorous fishes found in all warm seas, and sometimes entering rivers. Their habits are ordinarily much like those of a pike. (See Plate of NEEDLEFISH, PIKES, ETC.) Their flesh is good. Some species are numerous on the South Atlantic and Gulf coasts, where they are confounded with the true gars, under the names 'garfish' and 'bill-fish' (especially *Tylosurus marinus*), and are also called 'aguja' (q.v.), 'long-jaws,' 'houndfish,' and 'guardfish.' Consult, further, Jordan and Fordice, *Proceedings of the United States National Museum* for 1886.

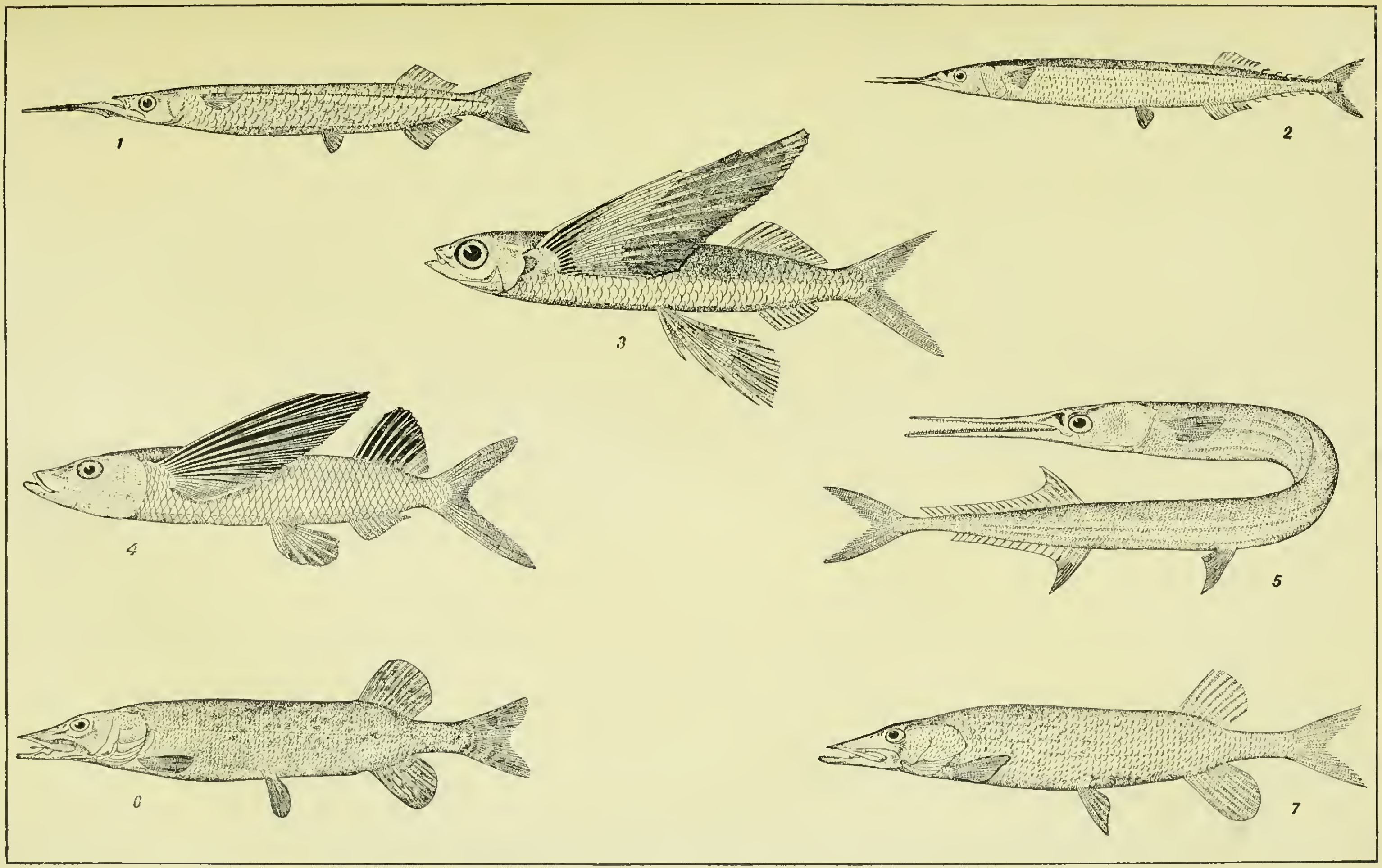
NEEDLE GUN. See SMALL ARMS.

NEEF, nāf, or **NEEFS**, nāfs, PIETER the Elder (c.1580-c.1661). A Dutch architectural painter. He was born at Antwerp, and was there a pupil of Hendrick van Steenwyck. His numerous architectural paintings usually represent church interiors illuminated with the glow of torches or of candles. His treatment was delicate, refined, and extraordinarily clear; he understood the harmonious modulation of colors and the power of chiaroscuro, but he generally intrusted the painting of the figures introduced into his pictures to Teniers, Franks, Breughel, and Van Thulden. His works are to be found in the galleries of Dresden, Vienna, Paris, and Gotha.

NEELE, nēl, HENRY (1798-1828). An English writer, born in London. He was admitted to the bar, and practiced as a solicitor. From the successful appearance of his *Odes and Other Poems* (1817), printed during his clerkship, he was a busy contributor to various journals and the annuals. In 1827 he gave first at the Russell Institution, and later at the Western Literary Institution, his *Lectures on English Poetry*, extending from Chaucer to Cowper. His most important publication was the *Romance of English History* (3 vols., 1827), a collection of stories based on occurrences in each reign from the Conquest to the Reformation, marred by a stilted style and historical inaccuracies. In the same year his poems were gathered in a two-volume edition. His verse has no higher qualities than spontaneity and ease. His stories, at their best, are marked by considerable imaginative skill. His *Literary Remains*, including the *Lectures*, appeared posthumously (1829), with a memoir. The *Winter Nights* (London, 1820) of Nathan Drake contains (No. xiii., vol. ii.) "Critical Observations" on the *Odes and Other Poems*, associating Neele with Chatterton and Kirke White.

NEENAH, nē′nȧ. A city in Winnebago County, Wis., 14 miles north of Oshkosh, the county-seat; on the Fox River, at the outlet of Lake Winnebago, and on the Chicago and Northwestern, the Chicago, Milwaukee and Saint Paul, and the Wisconsin Central railroads (Map: Wisconsin, E 4). It is an attractive summer resort, well known for its fishing, and has a public library, a handsome opera house, and several public parks, the most notable being Riverside Park. The river, which affords fine water

NEEDLE-FISH, PIKES, ETC.



1. HALFBEAK (Hyporhamphus unifasciatus).
2. SAURY (Scomberesox saurus).
3. FLYING FISH (Exocœtus volitans).
4. SHARP-NOSED FLYING FISH (Fodiator acutus).
5. NEEDLE-FISH or HOUNDFISH (Tylosurus acus).
6. PIKE (Esox lucius).
7. POND PICKEREL (Esox reticulatus).

power, divides, as it leaves the lake, into two streams, inclosing a large island, half of which belongs to Neenah and half to Menasha, the two cities forming practically one industrial community. Manufacturing enterprises are well developed and include paper, lumber, and flour mills, stove works, foundries and machine shops, brick works, a boot and shoe factory, etc. Settled in 1846, Neenah was incorporated in 1850 as a village, and in 1873 was chartered as a city. The government, under a charter of 1883, is administered by a mayor, chosen every two years, and a unicameral council. The municipality owns and operates the water-works. Population, in 1890, 5083; in 1900, 5954.

NEER, nār, AART VAN DER (1603-77). A Dutch landscape painter, born at Amsterdam. He was a friend of Albert Cuyp, who occasionally supplied the figures and animals in his pictures, which were for the most part moonlight scenes, depicted with a prevailing warm tone. At times he represented the same scenes, usually towns or groups of cottages on the banks of a canal or river, under the effect of sunlight. Fine specimens of this kind are in the National Gallery, London, in the Louvre, and in the Metropolitan Museum, New York. Three remarkable examples of his conflagration effects, which he depicted with great truth, are in the Berlin Museum, which, besides four other examples of his work, contains one of his most effective moonlight pieces. Among the best of the latter variety are two in the Dresden Gallery and one in the Vienna Museum. The warmth and glow of his coloring extends even to his winter landscapes, which may be seen to best advantage in the museums of Amsterdam and Brunswick. He died at Amsterdam, November 9, 1677.

His son, EGLON HENDRIK VAN DER NEER (1643-1703), a genre and landscape painter, was born at Amsterdam. He was at first instructed by his father, who, on his showing preference for figure painting, placed him under Jakob van Loo. From 1663 on he spent about three years in France, then lived successively in Rotterdam, Amsterdam, and Brussels, and in 1687 became Court painter to the Elector Palatine at Düsseldorf, where he died on May 3, 1703. His favorite subjects were single figures, especially ladies in elegant attire, engaged in domestic occupations, in the manner of Terborch and Netscher, with whom the fine taste shown in his compositions, and pervading all details, entitles him to be ranked. A harmonious example of this kind is a "Lady Tuning Her Lute" (1678), in the Pinakothek at Munich. Similar pictures are in the Rotterdam Museum (dated 1669), and in the galleries at Karlsruhe (1677) and Dresden. Occasionally he painted, but less successfully, biblical subjects, such as "Tobias with the Angel" (1690), in the Amsterdam Museum, and later also landscapes, taking Elsheimer for his model. Two examples of these (dated 1697) are in the Uffizi Gallery at Florence, which also contains the artist's portrait (1696).

NEERWINDEN, nâr'vĭn'den. A village of Belgium, in the Province of Liège, five miles southeast of Tirlemont, celebrated in history for the great victory gained by the French under the Duke of Luxembourg over the English and Dutch under William III. (July 29, 1693). It was also the scene of the defeat of the French under Dumouriez by the Allies under the Prince of Coburg (March 18, 1793).

NEESIMA, nē'shĭ-mȧ, JOSEPH HARDY (1845-90). A Japanese educator, born in Yedo, of a good *samurai* family. He received an excellent education and went to Boston, where he found a patron in Alpheus Hardy. He graduated at Amherst College and at Andover Theological Seminary. Returning home in 1874, with funds obtained from friends of the American Board of Foreign Missions, he succeeded in carrying out his educational plans. His college in Kioto, the Doshisha, became the largest and best equipped Christian institution in the Empire.

NEES VON ESENBECK, nās fôn ā'zen-bĕk, CHRISTIAN GOTTFRIED (1776-1858). A German botanist and naturalist. He was born at Erbach in the Odenwald; studied medicine at Jena, and in 1818 became professor of botany at the University of Erlangen. He subsequently was professor of botany at Bonn, and in 1830 accepted the posts of professor of botany and director of the botanic garden at Breslau. In 1848 he went to Berlin and took an active interest in the agitations of that and the following year. His deposition from the chair of botany in 1852 was the consequence of his political activity. In his *Handbook of Botany* (1821), he developed the theory advanced by Goethe in his *Metamorphose der Pflanzen*, that all the parts of the flower are only variations of the leaf. This work had been preceded by *Die Algen des süssen Wassers* (1814); by *Das System der Pilze und Schwämme* (1816); and by *Substanz der Pflanzen* (1819), in which he was assisted by Rothe and Bischof. He published, in 1833, *Genera et Species Astercarum*; in 1836, *Systema Laurinarum*; and in 1841, *Floræ Africæ Australiaris Illustrationes Monographicæ*. In 1852 appeared the first volume of *Die allgemeine Formenlehre der Natur*. He was a specialist on cryptogamous plants, and in this branch of botany his chief work is *Naturgeschichte der europäischen Lebermoose* (1833-38).

NE EXEAT (Lat., let him not go out). A writ or order issued by a court of equity, directed to a sheriff and commanding him to arrest the defendant in an action and detain him until he furnishes a certain bail, on condition that he will not leave the jurisdiction without permission of the court. About the time of Queen Elizabeth, this writ came to be employed by the Court of Chancery to restrain a person who was under some equitable obligation to another from leaving the country. This practice became common in England, and was adopted into equity or chancery practice in the United States, where it still obtains in many States.

This equitable remedy of *ne exeat* corresponds in its purposes to the legal process of arrest and bail in civil cases, and has been abolished by some modern codes of procedure, as in New York, and the legal remedy substituted in its stead. See ARREST; BAIL; EQUITY. Consult the authorities referred to under EQUITY; PROCEDURE; WRIT.

NEF, JOHN ULRIC (1862—). An American chemist, born at Herisau (Appenzell), Switzerland. He graduated at Harvard University in 1884, held a fellowship there in 1884-87, studied also at Munich (Ph.D., 1886), and in 1887-89 was professor of chemistry in Purdue University (Lafayette, Ind.). In 1889-92 he was assistant professor of chemistry and acting director of the chemical laboratory in Clark University (Worcester, Mass.), in 1892-96 was professor of chemistry in the University of Chicago, and in 1896 became head of the department of chemistry in that institution.

NEGAPATAM, nĕg'*a*-*pa*-täm′. A seaport city on the Coromandel coast, in the district of Tanjore, Madras, British India, and the terminus of a branch line from Tanjore, 48 miles to the west (Map: India, D 6). It has regular steamer communication with Ceylon, Burma, and the Straits Settlements, and carries on an active trade exporting rice and paddy, and importing cotton goods and betel nuts. The extraction of oil from cocoanuts and oil seeds is an important industry. The extensive building and repairing plant of the Great Southern Railway of India is located here. Negapatam was one of the earliest Portuguese settlements on the Coromandel coast; it was taken by the Dutch in 1660, and was the capital of their Indian possessions until captured by the English in 1781. Population, in 1891, 59,221; in 1901, 57,190.

NEGATIVE (from Lat. *negativus*, negative, from *negare*, to deny, from *nec*, not + *aiere*, Skt. *ah*, to say, Gk. ἠμι, *ēmi*, I say). A photographic picture in which the lights and shades of the object are reversed. A negative is usually produced in a camera by the action of light upon the sensitized surface of a glass plate, celluloid film, or paper. (See PHOTOGRAPHY.) When the plate is developed, the portions most affected by the light receive the densest deposits, and are rendered nearly if not quite opaque, while the portions corresponding to the shadows appear transparent. A good negative should show the gradations of light and shade, and should be distinct in all its detail. The presence of as many tones, or values of light and shade, as possible, is desired, while at the same time the high lights and shadows must be marked. The production of a good negative, outside of questions of the preparation of the plate or film, depends chiefly upon a proper length of exposure and successful development. A negative is used for making positives by contact printing or with an enlarging or copying camera. For contact printing the negative is placed film side upward in a printing frame, and on it is laid a sheet of sensitized paper with its coating next to the film. The printing frame is then exposed to the light and the rays passing through the clear or transparent portions of the negative affect the paper beneath, while those portions beneath the dark or opaque parts of the negative are protected and remain white. In this way a large number of positives or correct reproductions can be obtained from one negative.

NEGATIVE QUANTITY. The inverse operations of mathematics, such as subtraction, division, and evolution, often lead to results which cannot be expressed in terms of the same unit as the numbers entering the operation. The interpretation of these results leads to the so-called artificial numbers, and in the particular case of subtraction to the notion of negative number. For example, \$2 — \$3 is impossible if the result is to be expressed in terms of the positive unit \$1, but, since the result of subtraction is the number which added to the subtrahend will produce the minuend, it is easy to see that the number which added to \$3 will make \$2 must be equivalent to the number which subtracted from \$3 will make \$2. In other words, instead of subtracting \$1 from \$3 to reduce it to \$2, a number must be added which will produce the same result. Such a number is called a negative number and is designated by the sign — placed before it. Hence \$2 — \$3 = — \$1. This notion of negative number as the opposite of positive number, and apparently growing out of an arbitrary interpretation of a mathematical process, has its counterpart in concrete magnitudes opposed in function or extent. For example, in the above case, if a man's assets are \$2 and his debts \$3, the number expressing his financial status is \$1 of indebtedness, which may be expressed by — \$1. Similarly, time A.D. is often expressed by positive numbers, and time B.C. by negative numbers. In astronomy north latitude is expressed by positive numbers and south latitude by negative numbers; west longitude is designated as positive and east longitude as negative. Such extensions of the meaning of signs and modes of operation are the natural outgrowths of a constantly progressive science. The introduction of the negative number doubles the number space of arithmetic by adding an infinite series of numbers opposite in meaning and having a 1 to 1 correspondence (see CORRESPONDENCE) with the series of positive numbers.

The negative quantity enters geometry through the phases of motion and direction. For example, the segments AB, BC, and CD, of a horizontal straight line AD thought of as extending to the right are considered positive, but the segments DC, CB, and BA thought of as extending to the left are considered negative. Similarly, many writers regard all angles generated by a line revolving counter-clockwise about a point as positive and those generated by a clockwise motion as negative. The introduction of negative quantities into geometry, especially in connection with the theory of continuity (see CONTINUITY), has greatly increased the power and scope of the subject.

The meaning of negative quantities as employed in the physical sciences may be illustrated from elementary mechanics. A material point confined to a horizontal straight line may move to the right, remain stationary, or move to the left. The first condition may be expressed by a positive velocity toward the right, the second by a zero velocity, and the third by a negative velocity.

By analogy to mathematical usage, the positive and negative notation is sometimes applied to quantities measured by scales like those of the ordinary thermometers, on which an arbitrary point is denoted as the zero-point and all degrees below zero are denoted by negative numbers. Such conventional notations are convenient, but not always well founded. Thus, the temperature — 1° C. is not the physical opposite of + 1° C.; the two temperatures would be the physical opposites of each other only if 0° C. represented a state in which bodies would have no heat at all, and if it were possible that a body should have less than no heat. On the other hand, in the case of physical magnitudes whose character, like that of electricity, may be dual, the positive and negative notation has again a definite natural meaning.

Negative quantities have been thoroughly understood only within recent times. Although Hero of Alexandria (q.v.) in his *Stereometrica* considered the expression $\sqrt{81-144}$ as possible, the result is recorded as $8-1/16$, which shows that negative quantities were not understood by the Greeks. The Hindus were more successful, for Aryabhatta (q.v.), c.530, distinguished between *dhana* (assets), positive quantities, and *kshaya* (liabilities), negative numbers. Bhaskara (q.v.), c.1150, was aware that a square root can be both positive and negative, and that $\sqrt{-a}$ does not exist for the ordinary number-system. Al-Khowarazmi (q.v.), c.830, a celebrated mathematician under the Arab supremacy, obtained two roots for the quadratic equation, but the negative roots were rejected as not valid. Among the early European mathematicians, Fibonacci (1202) went no further than the Arabs. Paccioli (1494) definitely stated the rule, *minus times minus always gives plus;* but this fact was known to the Arabs and Hindus, Bhaskara, for example, having stated that the square of a negative number is always positive. Cardan (1545) recognized negative roots, but called them *æstimationes falsæ* or *fictæ*. Stifel (1544) called negative numbers *numeri absurdi*, and Harriot (1631) was the first to consider such a number capable of forming a member of an equation. Vieta (1591) distinguished between positive and negative numbers, and Descartes (1637) in his geometry used the same letter for both positive and negative quantities.

NEGAUNEE, nē-ga̤′nē. A city in Marquette County, Mich., three miles east of Ishpeming; on the Chicago and Northwestern and the Duluth, South Shore and Atlantic railroads (Map: Michigan, F 2). It is in the great iron region of the State, on a ridge called the 'iron mountain,' at an elevation of about 1400 feet, and has several productive iron mines within the municipal limits. Settled about 1870, Negaunee was incorporated in 1873, the charter of that year, as revised, now operating to provide for a mayor, annually elected, and a unicameral council. The water-works and electric light plant are owned and operated by the city. Population, in 1890, 6078; in 1900, 6935.

NEGLIGENCE (Lat. *negligentia*, from *negligens*, pres. part. of *negligere*, *neglegere*, to neglect, from *nec*, not + *legere*, to gather). The omission to do something which a reasonable man guided by those considerations which ordinarily regulate the conduct of human affairs would do, or doing something which such a prudent and reasonable man would not do. Such is a judicial definition of the term, which is quoted by legal writers and judges more frequently than any other. It assumes, what is often expressly stated in other definitions, that the thing omitted or done was in violation of a legal duty, and resulted in legal damage to the one to whom the duty was owed. The three elements to be considered, then, are: (1) proper care; (2) legal duty; (3) legal harm.

Proper Care. It will be observed that the standard of care recognized by the definition is that which a reasonable man would exercise in a given situation. Whether such care has been taken or not is generally a question of fact for the jury. It is true that if the evidence is not conflicting—if the story of the plaintiff is the same as that of the defendant, and if, in the opinion of the court, reasonable men would draw but one inference from the evidence—the question of negligence will be decided by the court. Hence a court often nonsuits a plaintiff on the ground that his own evidence shows that the harm of which he complains was not caused by any negligent act or omission of the defendant. As a rule, however, the jury are to determine whether the defendant's conduct was reasonably prudent or not. At the same time, the court is bound to explain to the jury the legal rules bearing upon the subject, of which the most important are these:

When a person undertakes the performance of a task which requires special skill, the failure to do all that any skillful person could reasonably be expected to do in such a case, considering all the circumstances, will amount to actionable negligence. If an ordinary mechanic undertakes to clean or repair a watch, he is bound to do the work with the skill and care of the ordinary watch cleaner or repairer.

The law does not presume negligence on the part of any one, and throws upon him who alleges that another has been negligent the burden of proving it. Accordingly, a person who has been injured by a runaway horse, or whose property has been destroyed by a fire which started on his neighbor's land, must show, not only that the horse ran away or the fire started, but that it was through the owner's fault. At times, however, the situation of the parties when the injury occurs is such as to overcome the ordinary presumption of care on the part of the defendant. To such a situation the maxim is applied, *res ipsa loquitur*—"the thing speaks for itself." A railroad train jumps the tracks; a case of goods falls out of a warehouse window; or a peck of live cinders is thrown out of a railroad engine of an elevated road upon a traveler in the street below; in each case we have a situation which would not exist, ordinarily, had the railroad company or the warehouseman exercised ordinary care. Hence the presumption of due care on his part is overcome, and judgment will pass against him unless he can show that, notwithstanding these appearances, he was really without fault.

Another important rule is that the amount of care required varies with the apparent risk. One sets fire to brush or rubbish upon his premises and the fire spreads to his neighbor's land, doing damage and hurting another. Whether he acted negligently will depend upon various circumstances, such as these: Was the weather dry or damp? From what direction and with what velocity was the wind blowing? What vigilance and effort did he exercise in trying to keep the fire on his own land? Again, without warning, one throws an article from a scaffold to the ground, hitting and hurting another. Whether he acted negligently will depend upon the apparent risk incident to the act. If the scaffold was adjoining a city street and the article was thrown into the thoroughfare, the act would be clearly negligent. On the other hand, if the scaffold overhung private premises, and there was no reason to believe that other persons were present, the act would be careful.

In some cases the courts are disposed to hold persons liable for harm caused by their acts or omissions, whether these are negligent or not. The doctrine was laid down by an eminent English judge as follows: "The person who for his own purpose brings on his land, and collects and keeps there, anything liable to do mischief if it escapes, must keep it at his peril, and, if he does not do so, is *prima facie* answerable for all the damage which is the natural consequence of its escape. He can excuse himself by showing that the escape was owing to the plaintiff's default, or was the consequence of the act of God." This view has not been adopted to any extent in the United States, the courts preferring the rule that one who brings dangerous agencies upon his land or under his control is not an insurer of the safety of others, but that he is bound to exercise a care over them commensurate with the apparent risk in each case.

The terms gross negligence, ordinary negligence, and slight negligence are often used, although the modern tendency is to discard them. When employed, the first represents the extreme of negligence—a want of care amounting almost to recklessness; the second is the absence of such care as an ordinarily prudent man exercises; and the third stands for the lack of care required of one who is doing a favor to the injured party, such as keeping his property gratuitously.

Legal Duty. Passing now to the legal duty of exercising care, it should be borne in mind that this is relative, not absolute; and consequently, when it has no existence between particular parties, there can be no such thing as negligence in the legal sense of the term. In other words, a man may be very careless without being negligent. To illustrate: the owner of a sugar orchard left a bucket of hot maple syrup uncovered in his woods. A neighbor's unruly cow jumped the fence, wandered into the woods, and died from drinking the syrup. Leaving the syrup thus was careless so far as protecting it from harm was concerned; but it was not negligence toward the owner of the cow, for the owner of the syrup was under no legal duty to exercise ordinary care toward trespassers, and the act of the cow was a trespass (q.v.). Toward trespassers the duty of a landowner, a common carrier, or the like, is simply to refrain from inflicting willful or wanton injury. Toward a licensee, that is, one whom a person barely permits to be upon his premises or in his vehicle, the licensor owes some duty of care; but the amount of care is slight. As a rule the licensee takes the risk of the situation. There must be something like fraud on the part of the licensor before he can be held answerable for injuries sustained by the licensee in falling into unguarded excavations, or breaking through defective floors, staircases, pavements, or the like, or getting caught by unfenced machinery or being thrown from a collapsing carriage. The licensor is bound, however, not to open new excavations in or near a path which he knows licensees are accustomed to traverse, or to subject them to anything like man-traps or new and serious dangers without giving them warning. An ordinary guest is generally looked upon by the law as a mere licensee. Toward persons expressly or impliedly invited upon one's property in a matter of common interest, the inviter is under a well-defined duty—the duty of making the property reasonably safe. He is not under an absolute duty to prevent harm, but only a duty to make the place as little dangerous as such a place would reasonably be, having regard to the ordinary exigencies of the business there carried on.

Legal Harm. Even when it is shown that the defendant has been guilty of negligence toward the plaintiff, the latter may fail in his action because he cannot show that he has sustained legal harm by such negligence. A striking illustration of this rule is afforded where one is made sick by a nervous shock due to another's negligence. Through the fault of a railroad company, for example, a car takes fire, and several passengers are so badly frightened that they faint and for weeks are confined to their beds by consequent sickness. According to the prevailing doctrine in England and in the United States, they have no cause of action against the company. Various reasons are assigned in its support. One is that such sickness is not the natural and probable consequence of the negligence; that it occurs only when there is an accidental or unusual combination of circumstances which could not have been reasonably anticipated by the defendant, and over which he had no control. Another reason urged is that to hold a defendant liable for mental anguish, or fright, or nervous shock, would cause an alarming increase in the volume of sham litigations. Every passenger in case of a railroad collision could allege fright or nervous shock and thus maintain an action against the company. In a few jurisdictions, however, mental anguish, even without consequent or attendant physical injury, is deemed legal damage. It is generally held that if the defendant's negligence causes injury to one's body, recovery may be had for the pain and suffering which are incident thereto.

Not only must the harm sustained by the plaintiff be of a character which the law deems it wise to recompense, but it must be, in contemplation of law, the natural and probable consequence of defendant's negligence. When negligence is to be deemed the proximate cause, and when the remote cause, is often a question of great difficulty. Ordinarily it is a mixed question of law and fact, to be submitted to the jury under proper instructions from the court, although, if the evidence is not conflicting, and the court thinks that but one inference can be drawn from it by reasonable men, it will decide the question itself. When the inquiry is sent to a jury, they are generally instructed that the proper test to be applied by them is: Was there an unbroken connection between the negligence and the injury? Did the facts constitute a continuous succession of events so linked together as to make a natural whole, or was there some new and independent cause intervening between the wrong and the injury? Applying this test, the plaintiff was beaten in the following case: Defendant, a railroad company, received a quantity of wool for transportation from Buffalo to Albany, N. Y., and for delivery there to another company for transportation to Boston, Mass. It was negligent in starting the wool on its journey, so that it reached Albany ten days later than it would but for such negligence. While in defendant's warehouse awaiting the call of the second carrier the wool was injured by an extraordinary flood. It was held that the immediate and proximate cause of plaintiff's loss was the flood, and that defendant's negligence was too remote to render it liable. The latter had ceased to operate as an active or efficient cause before the flood came.

Contributory Negligence. It is really on this ground (that defendant's negligence is not the proximate and efficient cause of one's injury) that the injured party is denied a recovery when he is shown to have been guilty of contributory negligence. A single example will suffice here: A workman is warned by his employer not to work upon a scaffold at a certain point because it has no railing there. He does work on that part, and, forgetting the absence of a rail, steps backward, falls, and is injured. Clearly, it is the workman's negligence, not the employer's, that is the decisive cause of his harm. But suppose, being there with knowledge of defendant's negligent omission of a railing, he had been knocked from the scaffold by the fall of an object from the roof, which fall was due to defendant's negligence. The servant's presence at the point in question would have furnished an opportunity for defendant's negligence to operate, but would not have been the cause of his injury, and he would recover.

It should be noted that contributory negligence on the part of a plaintiff is not an absolute bar to recovery in admiralty (q.v.) as it is at common law. It only diminishes his damages. Hence, whenever one has an option to sue at common law or in admiralty for the defendant's negligence, he should choose the latter jurisdiction.

Criminal Negligence. Negligence which is the proximate and efficient cause of the death of a human being may subject one to a criminal prosecution for manslaughter (q.v.), but at common law it does not render one liable in tort. The latter rule has been changed by statute both in England and in many of our States. While this legislation varies in different jurisdictions, its principal object is to grant a cause of action on behalf of those who were dependent upon or financially interested in the life of the deceased, against the one wrongfully causing his death. Consult: Beven, *Negligence in Law* (London, 1895); Shearman and Redfield, *Treatise on the Law of Negligence* (New York, 1898); Pollock, *The Law of Torts* (London and New York, 1901).

NEGOTIABLE INSTRUMENTS (ML. *negotiabilis*, from Lat. *negotiari*, to negotiate, from *negotium*, business, from *nec*, not + *otium*, leisure). Contracts in writing which are transferable by indorsement or delivery, and which are enforceable by the transferee in his own name, without previous notice to the promisor, as well as without the risk of being met by defenses that would have been good against the transferrer. Such contracts were unknown to the early common law of England. By that law a contract, whether written or oral, could not be transferred so as to enable the transferee to sue upon it in his own name. He was obliged to sue in the name of the transferrer. Equity modified this rule to the extent of allowing an assignee of a contract to sue in his own name. But even in equity, the assignment would not bind the promisor until he received notice of it, and after notice he could set up all defenses against the assignee which were available to him against the assignor at the time of notice. In other words, the assignee could get no better title than the assignor had. Modern statutes have made nearly all contracts and rights of action assignable; that is, they permit the assignee to sue upon them in his own name, but he takes them and sues upon them subject to the defenses available against his assignor.

The negotiability of certain contracts is a characteristic impressed upon them by the usages of merchants. This quality was first recognized and made effective by the law merchant (q.v.), whose rules upon this were later adopted and enforced by the common law. Thus it has come about that for more than three centuries certain contracts in writing have been treated by all English judicial tribunals as negotiable, and have been contrasted with others which are only assignable. The earliest form of negotiable instrument recognized by English law was the foreign bill of exchange (q.v.). Next in order came the domestic or inland bill of exchange, differing from the foreign bill only in the fact that it was drawn and payable within the same State or political jurisdiction. Following this came the promissory note (q.v.), but its negotiable character was not established without a struggle. It is true that the negotiability of this novel mercantile instrument passed unchallenged for a time in England, but after Lord Holt became Chief Justice he set his face against the recognition of new forms of negotiable instruments and decided that promissory notes were not negotiable. Immediately the merchants of London appealed to Parliament, and that august body enacted a statute without delay, upholding the mercantile view and declaring promissory notes negotiable like bills of exchange (3 and 4 Anne, c. 9, 1704). About this time another species of negotiable instruments was devised and came into general use—the goldsmiths' or bankers' notes. These were the promissory notes of bankers, payable to bearer on demand, and originally given for money actually deposited with the maker by the one to whom they were issued. Lord Mansfield had no hesitation in treating them as negotiable by delivery. A little later the use of checks (q.v.) became general. For some time the legal status of this instrument was doubtful, but it has long been recognized as a species of bill of exchange, and is now authoritatively defined as a bill drawn on a bank and payable on demand.

The foregoing are the most common forms of negotiable paper, but several other forms have been found useful in mercantile transactions, and have received judicial approval, such as the bonds of business and municipal corporations, exchequer bills, and scrip for Government bonds. In order that a written contract may possess negotiability, it must be payable to order or to bearer and must be treated in the money market as a security for and representative of money. Accordingly, bills of lading (q.v.), warehouse receipts (q.v.), and like documents of title are not negotiable instruments, even in jurisdictions where they are declared by statute to be negotiable. They are not representatives of money and cannot perform the functions of currency. They are symbols of goods, and their transferee gets no better title to the goods which they symbolize than he would secure by the actual delivery of the goods themselves. Hence the thief or the finder of a bill of lading cannot pass a perfect title to a bona fide purchaser thereof, as he can do in case of a bill of exchange or promissory note, which is payable to bearer or indorsed in blank.

The right to enforce negotiable paper free from defenses available against the transferrer or prior parties is confined to the bona fide holder, that is, to one who has become the owner of the paper before it is due, for value, and without notice of any defect in the transferrer's title. Such a holder, however, can pass his perfect title even after the paper is due, and to one who has notice of defects in the title of one back of such holder.

The law of negotiable instruments has been codified in Great Britain (Bills of Exchange Act, 1882, 45 and 46 Vict., c. 61) and in a number of our jurisdictions (Colorado, Connecticut, District of Columbia, Florida, Maryland, Massachusetts, North Carolina, North Dakota, Oregon, Pennsylvania, Rhode Island, Tennessee, Utah, Washington, Wisconsin). Consult: Chalmers, *Bills of Exchange Act* (London, 1902); Crawford, *The Negotiable Instruments Law, Annotated* (New York, 1902); Daniels, *Treatise on the Law of Negotiable Instruments* (New York, 1903); Bigelow, *The Laws of Bills, Notes, and Cheques* (Boston, 1900).

NEGOTIABLE PAPER. In its strict legal sense, this term is used interchangeably with the term 'negotiable instruments,' to denote any written securities for the payment of money, the legal and equitable title to which may be transferred by indorsement and delivery, or if payable to bearer, by delivery merely, and which if so transferred before maturity give the transferee complete title, and an absolute right to demand the amount named on the face thereof, free from any defenses which might have been available against the transferrer. However, the term is popularly employed to designate such instruments in writing, as promissory notes and bills of exchange, which alone had the above qualities by the 'law merchant,' or common law, and as distinguished from the term 'negotiable instruments,' which, in some jurisdictions, include municipal and corporate bonds, certificates of deposit, warehouse receipts, bills of lading, and other instruments. Therefore, the popular usage would exclude any instrument which was not negotiable by the common law, and which has only been given the peculiar qualities of negotiability by statute. Consult Story, *The Law of Bills of Exchange;* Parsons, *The Law of Promissory Notes and Bills of Exchange.* See NEGOTIABLE INSTRUMENTS.

NEGRI, nā'grē, ADA (1870—). An Italian poetess, born at Lodi of a family of artisans. As a teacher in a village school, she wrote her first verses, which passed almost unnoticed in the columns of a periodical, but they attracted attention to her when published as the volume of lyrics entitled *Fatalità* (1893). A second volume, the *Tempeste*, appeared in 1896. Soon after the publication of the *Fatalità* she was given a good post in the normal school at Milan. In Ada Negri's verse the note of protest against the abuses in the social order rings out loudly. She has noble ideals as to universal brotherhood, and depicts in vivid colors the abject misery of those engaged in a constant struggle to gain the means of a livelihood. Spontaneousness and sincerity are undeniable qualities of her verse, but she may be said to idealize too much the figure of the peasant and artisan. Consult: Jean Dornis, *La poesie italienne contemporaine* (Paris, 1898); Mazzoni, in the *Nuova Antologia* (Rome, June 17, 1893).

NEGRI, CRISTOFORO (1809-96). An Italian politician, historian, and geographer, born at Milan. He became professor at Padua in 1843, was the first member of the faculty to side with the Italian cause in 1848, and after Custozza and the success of Austria he was forced to resign his chair. He was almost immediately elected president of the University of Turin, and held a place in Gioberti's Ministry until the battle of Novara. He then became chief of the consular service and held this position under Azeglio, Rattazzi, and Cavour. Negri founded in 1867 the Italian Geographical Society, and was its president for five years. He wrote: *La grandezza italiana* (1864); *La storia politica dell antichita paragonata alla moderna* (1867); and *I passati viaggi antartici e l'ideata spedizione italiana* (1880).

NEGRI, PAOLO (1853—). An Italian gynecologist. He was born in Verona, studied medicine at Padua, and, after teaching at Milan and at Novara, where he became director of the Obstetrical School, in 1886, was appointed director of the School of Obstetrics of the University of Padua, situated at Venice. He wrote: *Studii e ricerche di ostetricia* (1885); *Sulla idrocefalia ripetuta del feto* (1890); and *Cinquanta laparotomie* (1892).

NEGRITOS, nā-grē'tōz (Sp., little negro). The term applied by most modern ethnologists to one of the great ethnic groups into which the population of the East Indies is divided. Some anthropologists recognize a 'Negritic stock' consisting of three groups, Negrito, Papuan, and Melanesian, while others regard the 'Indo-Oceanic Negritos' as a separate branch of the *Homo Æthiopicus,* distinct from the 'Indo-Oceanic Negros' from whom they believe that the Papuans and Melanesians have sprung. It seems best, however, to count the Malays, Indonesians, Negritos, and Papuans as the four ethnic stocks of Malaysia. The term should be used in the restricted sense implied in the principal recent classifications of mankind in this area. The physical characteristics of the Negritos are: Small stature (great majority under five feet), a brachycephalic or subbrachycephalic head-form, a dark brown or black skin sometimes somewhat yellowish, the hair woolly (scanty on face and body), a flat nose, thickish lips, and other features of physiognomy and body of a Negroid character. Many ethnologists assume that the earliest inhabitants of extreme Southeastern Asia, the Malay Archipelago, and neighboring regions were of this stock, but evidence for such a view is lacking. No real proof of their presence in Sumatra, Java, Borneo, Celebes, or Formosa has been produced. It is held by some, however, that the Negritos once inhabited Timor, Flores, and the islands near, while it has been reported that the Karons of the Arfak Hills in Northwestern New Guinea were Negritos, although this is not certain. The only centres of undoubted Negrito population existing at present are in the Andaman Islands, the Malay Peninsula, and certain of the Philippine Islands, the pure Negritos being certainly represented only by the Minkopis, Sakai, and Aëtas. The Minkopis of the Andaman Islands, who average four feet ten inches in height, are taller than the other Negritos, except some of the Malaccans, who are probably crossed with Malays. The Semangs and Mantras, in the peninsula of Malacca, may be regarded as Negritos, while the Mintra and the Jakhuns of Johore are Sakai-Malay half-breeds, with lighter skin and taller stature. Some authorities, however, regard them as Negritos. The Semangs (whose own name is Mendi or Menik) of Northern Perak, Kedah, Rahman, Ranga, and Kelantan are described by Martin, who visited the Malay Peninsula in 1897, as representing a dark-brown ulotrichous variety of man, while the Sakai (whose own name is Senoi) of Southeastern Perak and Northwestern Pahang are a brown cymotrichous variety. Both are distinct alike from the Malayan and the Mongoloid peoples. The Blandas, Ma-meri (or Besesi) of Southern Selangor, the Mantra of the territory of Malacca and Rembau, and the Jakhuns of Johore he styles mixed peoples. As to head-form the Semangs are mesocephalic (tending to dolichocephalic), the purest Sakai are dolichocephalic, and the Besesi brachycephalic. The hair of the Semangs is frizzy or thick woolly, while that of the Sakai and of the mixed tribes is for the most part wavy. The Sakai may perhaps be the descendants of the Neolithic population of this portion of Farther India. The Aëtas of the Philippines, who number altogether some 10,000, are found in certain parts of the interior of Luzon, Mindoro, Panay, and Negros, and Northeastern Mindanao. The culture-status of the Negritos is very primitive, though the arts and industries of the Andaman Islanders, the best studied members of the stock, give more evidence of talent and ingenious adaptation to environment than is commonly attributed to them. The strict monogamy of the Sakai and their rather high morality ought also to be noted. The bow and arrow (often poisoned) is a characteristic Negrito weapon.

Consult: Quatrefages, *Les pygmées* (Paris, 1887); Man, *The Aborigines of the Andaman Islands* (London, 1885); Clifford, *In Court and Campong* (London, 1897); Stevens, *Materialien zur Kenntniss der wilden Stämme auf der Halbinsel Malakka* (Berlin, 1892); Giglioli, *Nuove notizie sui popoli negroidi dell' Asia e specialmente sui Negriti* (Florence, 1879); Meyer, *Album von Philippinen-Typen* (Dresden, 1885); Blumentritt, *Ethnographie der Philippinen* (Gotha, 1892); Meyer, *Die Negritos* (Dresden, 1899).

NEGRO (Sp., Port., It. *negro*, black, from Lat. *niger*, black). The name properly applied to a subspecies of mankind of whom the chief characteristics are a dark skin, woolly or frizzly hair, and a dolichocephalic skull. The negroid type presents many modifications and has obtained a fairly wide dispersion, but is found in its purest state and in greatest numbers in Africa, and that continent must be considered its centre of distribution.

It is commonly held that the type is best represented by the Sudanese tribes of Africa, who are regarded as true negroes. They are distinguished by a very dark brown or chocolate-colored skin, black crisp hair which is flat on section, a relatively long head, with flat, broad nose and projecting jaws with thick, everted lips. In stature they are tall, with long arms and slender legs.

The most important modification of this type is found in the Bantu group of tribes, which stretches southward in Africa from the Sudan to the Cape of Good Hope. This division is one based largely on linguistic grounds, and, presenting as it does many variations of slight extent, it is impossible to name any single physical character which distinguishes the Bantu negro from the Sudanese. In general, however, the Bantu face is less coarse than the Sudanese, the jaws less projecting, and the lips not so thick. In color of skin the Bantu shows all shades of dark brown, and in stature corresponds to the Sudanese.

A marked variation, and one difficult to account for, is seen in the dwarf races who are found in scattered groups across Central Africa surrounded by Bantu neighbors and extending far to the south, where they are represented by the well-known tribe of Bushmen. The Bushmen, with their somewhat taller neighbors, the Hottentots, are usually regarded as forming an independent stock not to be classed with the pygmies of the equatorial region. This problem is at present impossible to settle.

The dwarfs offer striking physical traits which differentiate them from the other negroid peoples of Africa. In stature the northern pygmies do not average much over four feet, the Bushmen seldom range over five feet, while the Hottentots are somewhat taller. In color the skin is a light yellowish brown, and, in the true dwarf groups, said to be covered with a sort of down. The hair is crisp and in the central dwarfs of a rusty brown color, while in the Bushmen-Hottentot group it is black and tufted.

Of the true negroes of the Sudan the most important tribes are, in the west, the Wolof, Mandingan, Felup, Timni, Kru, Sierra Leonese, Liberian, Tshi, Ewe, Yoruba, Ibo, Efik, Borgu, and Mossi. In the Central Sudan, the Sonrhay, Hausa, Mosgu, Kanembu, Kanuri, Baghirmi, and Yedina; and in the east, the Maba, Fur, Nuba, Shilluk, Dinka, Bari, Abaka, Bongo, Mangbattu, Zandeh, Momfu, and Bari.

Of the Bantu tribes traced southward along the east coast and northward along the west, following their probable course of migration, the most important divisions are the Bonjo, Baya, Waganda, Wanyoro, Wapokomo, Wagiryama, Waswhahili, Zulu, Mashona, Bechuana, Ova-Herrero, Eshi-Kongo, Bashilange, Balolo, Manyuema, Bakalai, Fan, Mpongwe, Dwala, and Batanga.

The dwarf races of Central Africa are little known, but the most familiar are the Akka, Wochua, Obongo, and Batwa. In the south are the Bushmen and the Hottentots, the chief tribes of the latter being the Namaqua, Griqua, and Damaras.

These peoples include the bulk of the African negroids. The dark-skinned natives of the north, viz. in Abyssinia and in neighboring regions, and along the Mediterranean, exhibit such differences and are so allied in other respects with Semitic and Hamitic peoples that they are usually classed with them.

The extra-African distribution of negroid stocks immediately presents difficulties. We can disregard the negroes of the two Americas, who are almost invariably of West African descent and differ from their parent stocks only in the modifications due to mixture with Europeans and Indians.

The Australians, who are regarded as negroes by some authorities, must be considered an independent race presenting physical characteristics which differentiate them from the true negro, notwithstanding their dark skins.

There are, however, in the East Indian Archipelago, in New Guinea and Melanesia, and in Madagascar negroid tribes whose classification and relationships present difficulties at present insurmountable. Of these stocks the Papuans of New Guinea and the Melanesians are the most numerous and important. They are a dark-skinned, tall, dolichocephalic race, and differ physically from the African negro chiefly in the hair, which is longer and mop-like, and in facial features, which latter, however, are variable. There are no safe grounds for considering them as a branch of the true negro stock other than the striking resemblance in skin color.

At different points in the northern portion of this region are found scattered groups of an undersized negroid stock commonly called Negritos. They are usually compared with the dwarf races of Africa and undoubtedly do offer striking similarities in physical characters, but in other respects seem to correspond rather to the Australian and Papuan.

The parentage of the negroids of Madagascar is also in dispute. The proximity of Africa would indicate an origin from that continent, and there are both physical and cultural facts to support the view, but there are also unmistakable signs of Melanesian traits which suggest immigration from both regions.

Much has been written as to the mental capacity of the negro, but trustworthy information is scanty. Such few careful observations as have been made upon negro brains indicate a slightly lower type than that of Europeans; but the variability is so high as to forbid drawing any conclusions regarding the accompanying intellectual powers—a statement which holds true of the natives of Melanesia as well as of Africa.

In culture the negro presents almost as many degrees and varieties as there are stocks. A relatively low grade represented by certain of the Sudanese, Bantu, and dwarf tribes is found side by side with a relatively high civilization, as, for example, that of the Hausa; but it must be admitted that the sporadic examples of marked cultural progress in Africa can almost invariably be traced to Arabic or other foreign influence. Environment has, of course, produced specific types of culture in different parts of the continent, such as the cattle-breeding, pastoral life of the south and west, and the strictly hunting life of the dwarfs of the equatorial forests, and this diversity makes general statements dangerous or impossible.

With regard to religion, we find an extensive animism which has developed remarkably at different points. For example, the ancestor worship of the Zulus has been carried to a logical extreme, which is unique among savages, and the complex fetishism of West Africa is everywhere regarded as the type of that phase of belief.

Political organization is equally diverse, ranging from hereditary kingship to such loose tribal systems that no chieftainship is ascertainable.

In comparison with other great groups of mankind, the negro seems to possess certain temperamental qualities which are more or less characteristic, being lively, excitable, and fond of social life and discussion; and this trait has undoubtedly played an important rôle in the development of certain phases of African culture. Our knowledge of the majority of the negro tribes of Africa is still lamentably slight, but, with the extension of European interests in that continent, much valuable information is coming to light. See NEGRO EDUCATION.

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NEGRO, nā′grō, Rio. A tributary of the Amazon. See RIO NEGRO.

NEGRO BUG. A plant-bug of the family Corimelænidæ. These bugs are usually of very small size and are intensely black in color, sometimes having a bluish or greenish tinge. They are convex in form, the scutellum covering nearly the whole upper side of the body, and are often mistaken for small beetles. They are fond of laying their eggs on small fruits, like blackberry and raspberry, giving them a very disagreeable taste. A common species in the United States, the flea-like negro bug (*Corimelæna puticaria*), is frequently mistaken for the chinch bug.

NEGRO EDUCATION. Much of the negro advancement in the United States since the Civil War is to be credited to the regular habits of industry, and to the knowledge of the white man's religion, language, and ways of life gained in slavery days. To one connected with negro schools nothing is clearer than the value of the influence of good Southern white families upon their slaves. Some of the plantations were really large trade schools where habits of industry were formed. Carpenters, coopers, sawyers, blacksmiths, tanners, curriers, shoemakers, spinners, weavers, knitters, and distillers were all to be found among plantation slaves; and the negro mechanic was an important man in the community. Thus the race was being gradually trained in the ways of civilization, was contracting the habit of labor, acquiring a superior language and religion, and developing a character capable of further advancement.

Credit should also be given to the training which the colored man received during the Civil War. In the Northern armies there were thousands of colored troops who received discipline of the most valuable sort. In the South, the homes and farms of the white Confederate soldiers were largely in the hands of negro men and women. Most valuable to the slaves was the gain in power and executive ability that came out of that experience. While their masters were fighting to keep them in slavery, they were receiving in the absence of those masters the education which was to fit them to be freemen.

The sudden emancipation of the blacks brought about a condition bordering upon chaos. The Southern white man knew little of the treatment due a negro freeman, and the negro knew as little what his relation to his former master should be. The white man was unable to look upon the black in any other light than as his servant, and the black man looked upon all service as degrading, considering that freedom and education ought to exempt him from labor, especially from the labor of the hands.

Upon the heels of the Northern armies came an army of devoted women, eager to teach the freedmen. In September, 1861, the American Missionary Association opened its first school for contrabands at Hampton, Va., the outcome of which is the Hampton Normal and Agricultural Institute (q.v.). In the following January schools were started at Hilton Head and Beaufort, S. C., and in 1862 and 1863 teachers were sent to Tennessee. The Rev. John Eaton, an army chaplain from Ohio, afterwards United States Commissioner of Education, was placed by General Grant in charge of the instruction of the colored people, of whom it is estimated that more than a million learned to read and write; of the 80,000 colored troops in the Northern army, 20,000 learned to read and write. The churches of the North vied with one another in their endeavors to bring education to the black man. In 1865 the Freedman's Bureau (q.v.) was established, and, in addition to other work, it superintended the education given to the freedmen by the Government and the churches of the North. Between 1865 and 1870 more than five million dollars was expended by this organization for educational purposes. In some cases Government buildings and land were granted.

The proved capacity of the negroes for education suggested the wisdom and economy of providing their schools with teachers of their own race, and during the years from 1868 to 1878 there were founded twenty-five normal and collegiate institutions under the control of different religious denominations, the Congregationalists and Baptists leading in the number and size of their schools. They extended from Hampton in Virginia to Tillotson in Texas. At Atlanta, Nashville, Chattanooga, and other centres institutions were built costing from $200,000 to $500,000, and having a yearly attendance of from 300 to 500 students. They have trained many of the teachers of the negro race.

The work of these schools has often been criticised, and sometimes, perhaps, justly. But it is nevertheless true that they have had much to do with the uplifting of the negro race. From them have gone forth many of the best teachers of the negro public schools. Most of these institutions had as their model the New England high school or college. Latin and Greek had often a prominent place. The practical side of education, which was largely provided for in the New England home, was not supplied in the one-room cabin of the South. Too great emphasis was sometimes placed upon the literary and academic side of education, and too little upon the gaining of a knowledge of the common things of life and of the forming of habits of intelligent industry. It was natural that the colored man, after years of forced labor, should revolt against any education that gave prominence to the work of the hand. It was natural that his teacher, who heard it continually said that negroes were fit only to be hewers of wood and drawers of water, should wish to prove that they could become successful lawyers, physicians, and clergymen. The wisdom of raising up leaders of a people is unquestioned, but where ninety per cent. of a race live on the land, as is the case with the blacks of the South, and where a large majority live, as the masses of the negro race still do, in one-room cabins under the lien system of crops, it would seem that there ought to be a close relation between education and vocation, and that their teachers and clergymen should be taught how to build their own houses, and how to cultivate their land properly. Each year is giving to these higher institutions for negroes in the South, as to the colleges of the North, curricula which have a more vital connection with life.

What is called race prejudice has caused a separation between the white and black races which, though attended with evil, has been productive of much good. The unwillingness of the Southern whites to allow white and black children to be taught in the same schools has resulted in the founding of the schools just described, which are in some respects superior to most of those that are open to the white children of the South. It has also resulted in a system of public schools taught by colored teachers which, while it has its disadvantages, has resulted in good to the race.

Before the year 1870 there were practically no negro public schools, with the exception of those in Memphis, New Orleans, and Nashville. There were, however, in the District of Columbia 10,494 colored children in public and private schools. In 1870, while for the most part there was opposition, certain far-seeing Southerners declared in favor of the education of the blacks. In 1871 a little improvement was made. In 1872 Delaware and Kentucky were the only States that had not made provision for negro education. In 1873 and 1874 State normal schools began to be established for the training of negro teachers. In 1877 the total number of negro children reported of school age was 1,513,065, and the number enrolled in the schools 571,506. There were twenty-seven normal schools with 3785 pupils, and twenty-three institutions for secondary instruction, with 2087 pupils. In 1882-83 the colored school population in the District of Columbia and the former slave States was 1,944,572, and the enrollment 802,982. Thus, less than twenty years after the war there was built up in the South a public school system for both whites and blacks, with normal schools for the training of teachers, which, considering the extreme poverty of the Southern States, was admirable. In 1897-98 the United States Commissioner of Education stated that there was an enrollment in the schools of 1,506,742 colored children, or 52.97 per cent. of the colored school population, while his report for 1900-01 shows an enrollment of 57.22 per cent. of the negro children. The average daily attendance in the colored schools is 62.46 per cent. of their enrollment.

No account of negro education in America would be complete which did not include an account of the work of General S. C. Armstrong at Hampton Institute. Believing in the moral value of self-help, General Armstrong built up a school in which greater prominence was given to doing than to mere learning, where there was not only the schoolroom, but also the workshop; not only the church, but also the farm; not only the training of the mind, but also that of the heart and hand. An effort was made in this school to fit men and women for definite conditions, to develop a love for intelligent work, and to inspire in its pupils a strong desire to go out and help to uplift their people. The school at Tuskegee, founded by Booker T. Washington, Hampton's most distinguished graduate, was established with similar views. While receiving help from the North, both of these schools have put themselves in the closest touch with the South and its public school system. Their influence on this system has been marked. As a result of the kind of training given at Hampton and Tuskegee, hundreds of young people have been sent out who, by the establishment of homes, the cultivation of land, and the carrying on of business enterprises, have reconstructed whole communities. There is reason to believe that this type of school is meeting the pressing need, on the part of the negro people, of knowledge of the common duties of life, while, at the same time, it is providing a kind of training which results in the stability of character so lacking in the masses of this people.

In the establishment and conduct of negro schools, two wisely administered funds have had a large share. (See PEABODY EDUCATION FUND; SLATER FUND.) Mention should also be made of the Southern and General Education Boards, which are composed of prominent Northern and Southern men. Both these agencies represent a union of wealth, business sagacity, and educational statesmanship that augurs well for the cause of universal education. The Southern Education Board conducts a campaign of education for the purpose of stimulating public sentiment in favor of more liberal provision for the common schools for both races. Its work is supplemented by that of the General Education Board, which, in addition to collecting information in regard to existing educational conditions among both races, is empowered to disburse certain funds where they are most needed for the strengthening of the agencies tending to promote the education of all the people.

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NEGRO EXODUS. The name applied to a movement of freedmen from the Southern to the Western and Northern States in 1879 and 1880. The movement began in the early spring of 1879, and before the close of 1880 fully 40,000 negroes had removed to Kansas alone, while a large number had settled in Missouri and Indiana also. Many arrived at their destination poorly clad, generally destitute, and without promise of employment, and for a time there was much want and suffering among them. Large sums of money, however, were contributed for their relief throughout the North, especially in Kansas, where, soon after the arrival of the first band of immigrants, an efficient Freedmen's Relief Association was organized. The only Southern States from which the blacks emigrated in any considerable numbers seem to have been Mississippi, Louisiana, and Texas. The chief reasons given by the negroes for the abandonment of their homes were that they were forced to pay excessive rents, that the system of land tenure in the South was unjust, that exorbitant prices were charged by 'credit' merchants, and that the freedmen were wholly denied political recognition and were kept down in every way by 'bulldozing' methods. Opponents of the movement asserted that the negroes had been misled by the representations of land speculators, by misguided philanthropists, and by politicians who, in view of the approaching Presidential election, wished to import numbers of Republican voters into various parts of the North, where the Republican majority was doubtful. The movement seems to have been considerably furthered by the 'Nashville Colored Convention,' which met in Nashville, Tenn., May 7, 1879, adopted a report setting forth the grievances of the blacks and the many disadvantages, social, economic, and political, under which they labored in the South, and recommending that the negroes should emigrate to those States where their rights were not denied them. For an account of the causes of the movement, consult an article by Runnion, "The Negro Exodus," in the *Atlantic Monthly*, vol. xliv. (Boston, 1879); and for arguments justifying and condemning the movement, consult articles by R. T. Greener and Frederick Douglass, respectively, in the *Journal of Social Science*, vol. xi. (Boston, 1888).

NEGRO IN AMERICA. The first appearance of the negro in the English colonies in America was in 1619, when a cargo of negro slaves was landed at Jamestown. The scarcity of labor, especially in the Southern colonies, created an increasing demand for negro slaves; and by 1714 the number had increased to 58,850 (estimated). The greater part of these were brought direct from Africa, although considerable importations from the West Indies took place, and natural increase contributed an appreciable number. Importation was carried on more extensively in the following half century, the aggregate of negroes in the colonies reaching about 300,000 in 1754. In 1790 the first census found 757,208 in the United States. In the next hundred years this number was multiplied tenfold. This extraordinary growth in numbers has been due chiefly to natural increase; although importations were considerable up to 1808, when they were prohibited by the Constitution. The smuggling in of Africans continued, however, up to the Civil War. Since that time there has been some immigration of negroes from the West Indies, not sufficient, however, to affect the truth of the proposition that recent growth in negro population practically represents a natural increase.

It is a matter of great importance whether or not the negro population is increasing more rapidly than the white. Table I. from the *Twelfth Census* shows the number of negroes in the United States for each decade, from 1790 to 1900, together with the percentage of the total population which the negroes represent:

Table I.

	Negroes	Percentage of total population of United States
1790	757.208	19.3
1800	1,002,037	18.9
1810	1,377,808	19.0
1820	1,771,656	18.4
1830	2,328,642	18.1
1840	2,873,648	16.8
1850	3,638,808	15.7
1860	4,441,830	14.1
1870	4,880,009	12.7
1880	6,580,793	13.1
1890	7,488,788	11.9
1900	8,840,789	11.6

It will be seen that the proportion of negroes to the general population has declined for every decade since 1810 except 1870-80; and it is now generally understood that the apparent increase for that decade was the result of faulty enumeration. It is true that much of the relative increase in white population is to be ascribed to immigration (q.v.). Nevertheless, it appears that the native white population is increasing faster than the negro population. Thus, for the decade 1890-1900, the native whites of native parentage increased 18.9 per cent., while the negroes increased 18.1 per cent.

Distribution of Negro Population. In the colonial period negroes were found in every colony, but were most numerous in the South, where their services were in greater demand. The abolition of slavery in the North led to greater concentration in the South; and by 1860, out of 4,441,830 in the United States, only 226,216 lived in the Northern States. Since the war a considerable diffusion has taken place. At times it has been feared that a large proportion of the negroes would flock to the North; but adverse climatic conditions and the difficulty of competing with white labor have forced most of the negroes to remain in the South. See Table II. for the distribution of negroes.

Table II.

DISTRIBUTION OF NEGROES.

	1880	1890	1900
North Atlantic division	229,417	269,906	385,020
South Atlantic division	2,941,202	3,262,690	3,729,017
North Central division	385,621	431,112	495,751
South Central division	3,012,701	3,497,887	4,193,952
Western division	11,852	27,081	30,254

It will be seen that in absolute numbers the negroes have increased in each of the greater census divisions. Relatively to the general population, their numbers have increased in the last decade in the North Atlantic division only. See Table III.

Table III.

PERCENTAGE OF NEGROES IN GENERAL POPULATION.

	1890	1900
North Atlantic division	1.6	1.8
South Atlantic division	36.8	35.7
North Central division	1.9	1.9
South Central division	31.3	29.8
Western division	0.9	0.7

Georgia had a negro population in 1900 of 1,034,813, Mississippi 907,630, Alabama 827,307, South Carolina 782,321. Virginia. North Carolina, Louisiana, and Texas exceeded 600,000. In Alabama the negroes are 58.7 per cent. of the total population; South Carolina, 58.4; Louisiana, 47.2; Georgia, 46.7; Florida, 43.7. A more detailed statistical study would show a tendency of the negroes to concentrate in limited areas in some of the Southern States. Thus, in five counties of the Yazoo-Mississippi delta, in Mississippi, the negroes form 87.6 per cent. of the total population.

Economic Condition of the Negro. As a laborer, the negro is capable of the hardest physical toil, and works without difficulty where the humidity and heat render labor intolerable for the white. He is lacking in stability, and is inclined to roam from one district to another without any satisfactory reason; he is wasteful and careless, requiring constant supervision. These characteristics have largely determined his economic position. As an agricultural laborer the negro is indispensable in the South, more especially in the low, swampy districts, where the white laborer readily succumbs to disease. As a domestic servant the negro has proved his usefulness. In manufactures, on the other hand, negro labor is unsatisfactory, since the negro will not remain in a position long enough to develop a high degree of skill. The same deficiency is driving him out of the handicrafts. Under slavery a large number of negroes were trained in handicrafts, and proved to be valuable workmen after emancipation; but the generation which has risen since slavery has manifested an unwillingness to enter upon the long period of training necessary for the exercise of the trades. The tendency toward agricultural labor and personal service is illustrated by the statistics of occupations of the *Eleventh Census*. In 1890, of all negroes in gainful occupations, 57.2 per cent. were engaged in agriculture, 31.4 per cent. in personal service, 5.6 per cent. in manufactures, 4.7 per cent. in trade and transportation, and 1.1 per cent. in the professions. In the Southern States the proportion engaged in agriculture was greater—64 and 71 per cent. for the South Atlantic and South Central divisions respectively.

The wages of the negro agricultural laborer in the South usually range from six to ten dollars a month, with substantial additions in the shape of food, house room, etc. In the busy season of the year the day laborer usually receives a far higher wage. A good cotton-picker in the Yazoo-Mississippi delta often earns a dollar and a half a day. Whether wages are high or low, the negro laborer is likely at any time to leave his employment, with resulting embarrassment to the employer. Hence, it is a common practice to let small holdings to negroes, in order that interest in the crop may diminish their migratory tendencies. According to the census of 1890, 549,642 'farms' were occupied by negroes, of which only 22 per cent. were owned by their occupants. The tenant farmers sometimes pay a cash rental, but more frequently farm 'on shares.' The landowner furnishes machinery and draught animals, receiving one-half the crop. Frequently he advances food and other supplies to the tenant, recouping himself out of the tenant's share in the crop.

Whether as tenant or as independent landowner, the negro farmer has not as yet attained a high degree of prosperity. Negligence in the care of his stock and machinery and lack of foresight in the expenditure of his income prevent him from attaining economic independence. Recent educational movements (see NEGRO EDUCATION) aim to encourage the negro tenant to become a landowner, and to teach him how to utilize his land to the best advantage. The great mass of the negro farmers have not yet been affected by such influences.

In the North the negro manifests a tendency to concentrate in the cities, where his economic activities are chiefly confined to personal service and unskilled labor.

SOCIAL AND MORAL CONDITIONS. When account is taken of the fact that the ancestors of the American negro were taken from a state of barbarism in which moral standards were quite wanting, and were subjected only to comparatively weak moral restraint under slavery, it does not appear surprising that the social and moral condition of the negro is unsatisfactory. The great mass of the negro children receive an inadequate home training, and are therefore left to pursue their own inclinations, with the result that they readily lapse into their ancestral vices. The rules of monogamic marriage are but loosely obeyed—the exchanging of wives, for example, being not uncommon on Southern plantations. Illegitimacy is common. The percentage of illegitimate births among negroes in the city of Washington increased from 17.6 per cent. in 1879 to 26.5 per cent. in 1894. Sexual promiscuity is common wherever large negro colonies exist. Whether conditions are improving or deteriorating in this respect it is impossible to prove. It is, however, the testimony of a large number of observers that wherever the negro withdraws from the presence of the white population, moral conditions deteriorate; hence the tendency toward segregation noted above is generally viewed with anxiety by those who are most deeply interested in the improvement of the negro race. Wherever the economic conditions of the negro are improving, on the other hand, family life and morals also show a tendency toward improvement. The poverty of the masses of the negroes at present results in the overcrowding of cabins and tenements, which is destructive of family life and morality. For this reason students of the race problem look to the technical education of the negro as the best method of elevating him morally.

Statistics of crime present another serious problem connected with the presence of the negro in the United States. In 1890 there were in the Southern States six white prisoners to every ten thousand whites, and twenty-nine negro prisoners to every ten thousand negroes. In the Northern States there were twelve white prisoners to every ten thousand whites, sixty-nine negro prisoners to every ten thousand negroes. In the South negro prisoners increased 29 per ten thousand between 1880 and 1890, while white prisoners increased 8 per ten thousand. While it is no doubt true that a larger percentage of crimes against property committed by negroes is detected and punished, and hence the relative amount of negro criminality may be exaggerated, it is also true that a large number of negro crimes committed against members of their own race are not punished at all, and so do not appear in the statistics of criminality. Crimes of violence appear to be increasingly frequent where the negroes are least in contact with the whites.

The greatest improvement in the position of the negro appears in the statistics of education. At the close of the Civil War it is doubtful whether more than 5 per cent. could read and write. In 1900 the percentage of illiteracy had been reduced to 44.5 per cent. But it does not appear that such education as the mass of the negroes have received has perceptibly affected their material or moral conditions.

POLITICAL CONDITION. After the close of the Civil War, the negroes, under the leadership of a certain class of whites, practically controlled the government of many of the Southern States. (See RECONSTRUCTION.) Their ignorance and lack of political training rendered them incapable of exercising political power wisely, and they were gradually excluded from power by the whites, at first by wholly illegal means, later by State laws and constitutional amendments. In 1890 the Constitution of Mississippi was amended so as to exclude from the suffrage any person unable to read any section of the Constitution, or understand it when read to him and give a reasonable interpretation of it. Payment of a poll tax was also required. The effect of this amendment was the exclusion of the greater part of the negro vote. In 1895 South Carolina amended its Constitution so as to exclude the votes of those unable to read or write any section of the Constitution, or to show that he owned and paid taxes on property assessed at $300 or more. In 1898 Louisiana passed a similar amendment, with the addition of the so-called 'grandfather clause,' excusing from the limitations of the amendment all descendants of men who voted previous to the war, thus admitting to the suffrage illiterate, propertyless whites. North Carolina took similar action in 1900, though no property qualification was required. In 1901 constitutional amendments were adopted in Virginia and Alabama practically disfranchising the negro.

For the solution of the various 'negro problems,' social, economic, and political, several plans have been brought to public attention. Repatriation of the negro in Africa was widely advocated, especially in the first two decades after the Civil War; but the plan has been generally abandoned as impracticable, since the negro manifests no desire to return to Africa, and could not be forced to emigrate against his will. From a moral point of view, the plan has been condemned on the ground that it would mean a reversion to barbarism of the greater part of the race. Economically its effects would be grave, since the Southern States must for a long time rely upon the negro for unskilled labor.

The plan which finds greatest favor at present is the industrial education of the negro, the encouragement of land-ownership by those who are now tenants, and the general extension of education. (See Negro Education.) The plan has already produced valuable results. Graduates of institutions like Tuskegee (q.v.) and Hampton Institute have proved that under the leadership of members of their own race negro communities are capable of rapid improvement, economically and morally. See Negro; Negro Education; Slavery.

Bibliography. Bruce, *The Plantation Negro as a Freeman* (New York, 1889); Ingle, *The Negro in the District of Columbia* (Baltimore, 1893); Gannett, *Statistics of the Negroes in the United States* (Baltimore, 1894); Du Bois, *The Philadelphia Negro* (Philadelphia, 1899); id., *The Negroes of the Black Belt* (Washington, 1899); Washington, *The Future of the American Negro* (Boston, 1899); id., *Up From Slavery* (New York, 1901); *Montgomery Conference Proceedings* (Montgomery, 1900); Tillinghast, *The Negro in Africa and America* (New York, 1902). See also references under Negro; Negro Education.

NEGRO MELODIES. The music of the American negroes is essentially vocal. Their few musical instruments are of importance only for furnishing accompaniments to songs or for accenting the rhythm of the dance. During the last twenty years negro music has been steadily losing its distinctive features, owing to the tendency among the younger generation to discard everything which harks back to the days of slavery. The old plaintive melodies have been replaced largely by more modern comic and erotic songs which are cast in a nondescript Afric-European mode.

Negro songs may be divided into two general groups: those which show evidences of foreign origin, but which have been added to and changed until they are undeniably negro in character; and those which are the spontaneous expression of the negro's own feelings. The first group may be subdivided into (a) those derived from European songs and dances, and (b) those adapted from Baptist and Methodist hymns. The *original* negro songs, whose most typical element is a weird recitative, have undoubtedly an affinity with the musical forms used in Africa, but they have been greatly expanded both rhythmically and melodically. Though it is possible to make some such analysis of negro melodies, the most important feature, their interpretation, cannot be adequately described. Impromptu chords, notes, and accents are introduced, the whole blending into unusual forms with strikingly original melodies and motives. Strange to say, the time structure is excellent, and the *tempo* is universally exact. The tunes have as a rule a range of few notes, and, as in Africa, the major key predominates. In some songs both the major and minor keys are used. The weird effect produced by many of their cadences is not as a rule due to the use of the minor key so much as to the employment of the pentatonic scale, and the major scale with the flat seventh. A distinctive character of negro melodies is the 'rhythmical snap' which became such an overworked feature in ragtime. See Folk-Music; Ragtime. Consult: Ritter, *Music in America* (New ed., New York, 1900); Edwards, *Bahama Songs and Stories* (New York, 1895); Marsh, *The Story of the Jubilee Singers and Their Songs* (Boston, 1880); and Trotter, *Music, and Some Highly Musical People* (ib., 1878).

NEGRO MONKEY. (1) A sooty black langur (*Semnopithecus maurus*), about 24 inches long, plus a still longer tail. The animal is well known in Sumatra and the Malay Peninsula. Its young are reddish in color and grow black with advancing age. (2) A marmoset (*Midas ursulus*) of Brazil, also called 'negro tamarin,' and often tamed. It is black with a reddish dorsal stripe.

NEGROS, nā′grōs. One of the Philippine Islands, belonging to the Visayas group. It lies between the islands of Panay and Cebú. It is separated from Panay and the small island of Guimarás on the northwest by the Strait of Guimarás, eight miles wide at the narrowest, and from Cebú on the east by the Strait of Tañón, from 6 to 22 miles wide (Map: Philippine Islands, G 10). On the north the island borders on the Visayan Sea, and on the southwest and south it is washed by the Sulu Sea, which to the southeast separates Negros by a distance of 30 miles from Mindanao. The island is roughly rectangular, but very elongated in shape. Its length is 134 miles, and its average breadth 26 miles, increased near the southern end to 34 miles by a broad, rounded peninsula, extending from the western coast. Its area is given as 4839 square miles. Including a number of small dependent islets, the area is 4854 square miles. It ranks fourth in size among the Philippine Islands.

The coasts are clear and steep, but very little indented, and afford no harbors except a few anchorages sheltered by the small adjacent islands. The whole interior consists of a mountainous plateau with a central ridge running the entire length of the island and dividing it into two distinct halves, forming its two political divisions. The active volcano of Canlaón or Malaspina, situated in the north central part of the island, is 8192 feet high. The range terminates at the north in the remarkable isolated peak Solitario. The two slopes are eroded into numerous lateral valleys watered by short and generally simple streams, the largest being on the western slope. In the southern part are two remarkable mountain lakes, the larger six miles long. The mountains of the interior are covered with vast forests of valuable timber, among which the teak is prominent. The soil is everywhere fertile and well watered, and agriculture is the principal occupation. The chief products are cacao of an excellent quality, hemp, sugar-cane, coffee, rice, tobacco, cotton, and cereals. The fisheries are next in importance to agriculture, and cattle-raising also receives considerable attention, large numbers of horses, carabaos, and hogs being raised.

The chief manufactures are abaca, cabo negro, sugar sacks, and sugar, the last-named manufacture employing hydraulic and steam machinery. Means of communication are very poor. Coasting vessels are almost the only means of communication between the towns. These are nearly all situated on the coast, the interior being a wilderness. The population of the island in 1901 was estimated at 372,000. The prevailing race is the Visayan, and the Visayan is the language most spoken. The forests of the interior are inhabited by roaming savages. Politically the island is divided into the two provinces of Negros Occidental and Negros Oriental, whose areas, respectively, are 3112 and 1742 square miles, and whose populations are 231,000 and 141,000. The capital of the former is Bacólod, and of the latter Dumaguete. The two old provinces were continued under civil government by the Philippine Commission Act of February 6, 1901. Some resistance was offered to the authority of the United States by bands of natives, who kept American troops actively engaged on the island during the campaigns of 1899 and 1900. Consult *Apuntes de la Isla de Negros* (Manila, 1894).

NEGRUZZI, nȧ-grōōt'sē, Konstantin (1808-68). A Rumanian poet. born at Jassy, the disciple and translator of the poet Pushkin. He also translated some of Hugo's works, and wrote an epic poem, *Aprodul Purice*, and a volume of verse and prose, *The Sins of Youth*. His complete works were published in 1873. His son, Jacob (1843—), was born at Jassy, and became professor of commercial law at the university there, and afterwards at Bucharest (1885). In 1867 he founded and became the editor of the literary journal, *Convorbiri literare*. His writings include: *Poesiĭ* (1872); *Mirónasi Florica*, an idyl; *Mihiau Vereanu*, a novel; and the short stories in *Copiĭ după natura*.

NEGUN'DO (Neo-Lat., from the North American Indian name). A group of trees sometimes separated from Acer as a genus of the natural order Aceraceæ (see Maple), differing from the maples chiefly in the apetalous diœcious flowers, and in the pinnated ash-like leaves. The common negundo. ash-leaved maple. or box-elder (q.v.), is a native of North America often planted for ornament and extensively cultivated in the Western United States.

NEHAN'TIC. See Niantic.

NE'HEMI'AH (Heb. *Nĕḥemyah*, Yahweh is consolation). A Hebrew leader of the fifth century B.C., whose memoirs are embodied in the Book of Nehemiah of the Old Testament. It is there stated that he was a son of Hachaliah, and cup-bearer to Artaxerxes (i.e. Artaxerxes I., Longimanus, B.C. 465-425) in the palace of Shushan. Having learned the sad condition of the returned colonists in Jerusalem, he prevailed upon the King to send him to his brethren there with full powers 'to seek their welfare.' He received an appointment as 'governor,' and worked for the safety of the city and its inhabitants. He rebuilt the city walls, notwithstanding many hindrances and dangers; he induced people from the country—priests and laymen—to take up their abode in the city, thus promoting its prosperity; above all he rekindled the flame of ancient piety and enthusiasm for the observance of the law in the hearts of the rough immigrants. He then returned to Persia, trusting to the new vitality which his reforms had, as he thought, infused into the Jewish commonwealth. But not long afterwards he had again to obtain leave from the King to return for the purpose of abolishing many abuses that had crept in during his brief absence. He enforced the rigorous observance of feast and Sabbath, and rearranged the temple service, procuring at the same time the means for its proper support by inducing the people to offer the tithes as of old.

Owing to the changes in the memoirs of Nehemiah which have been made in the course of the different editings to which they have been subjected (see Nehemiah, Book of), it is difficult to separate the actual course of events from the traditional view concerning Nehemiah's activity. This much, however, seems certain: that Nehemiah paid two visits to Jerusalem, the one in B.C. 445, the other probably in 433. He came the first time on a special mission to protect Jerusalem from attack by rebuilding the walls, and for this work he was intrusted with full powers by the Persian King. He completed the restoration of the walls in the short space of fifty-two days, and provided for the proper guarding of the gates; afterwards he returned to the Persians. In this visit he appears as the 'governor.' In the second, however, he holds no such office; his purpose is to insure the enforcement of the provisions of the 'Priestly Code,' particularly those forbidding marriages between Jews and non-Jews. By his influence he succeeded in aiding the pious Ezra in his efforts. See Ezra.

NEHEMIAH, Book of. One of the historical books of the Old Testament. In some Greek and Latin versions it is called the Second Book of Ezra, and in the Jewish canon the books of Ezra and Nehemiah originally constituted one book. It is the opinion of modern scholars that both books were put into their present form by one and the same editor. (See Ezra, Book of.) The period covered by the Book of Nehemiah is the years B.C. 445-432. It is based upon the genuine memoirs of Nehemiah, but also, according to the critical view, contains much extraneous material, the memoirs having been freely used by compilers whose aim it was to prove that the work of restoration of the temple, the cult, and the general reorganization was performed by Babylonian Jews who returned from the Exile; whereas, as a matter of fact, much of the work was due to the section of the Jewish community of Jerusalem which had remained in the country. The contents of the book may be summarized as follows: Nehemiah's sorrow over the desolation of Jerusalem is depicted, and he prays to God for opportunity to rebuild the city (ch. i.). Permission is granted him by the King to undertake the work; he arrives at Jerusalem, surveys the ruins, and begins to rebuild the walls (chs. ii.-iii.). The opposition of enemies is related and the plans by which their schemes were defeated (ch. iv.). The people complain against the oppression of the nobles and the evil is redressed (ch. v.). Enemies form a plot to interrupt the work, which is frustrated by Nehemiah's boldness (ch. vi.). A record of the families that returned first from Babylon is given, followed by an account of the offerings made by rich and poor for the work (ch. vii.). The law is read by Ezra the Scribe, accompanied with a joyful celebration of the feast of tabernacles (ch. viii.). The people mourn, fast, and repent, a full confession of sin is made and a solemn covenant sealed by princes, priests, and Levites, and confirmed with an oath by the whole multitude to observe the law, sanctify the Sabbath, sustain the services of the temple, and bring in all the tithes (chs. ix.-x.). A tenth of the people are selected by lot to dwell in Jerusalem and the rest are distributed through the other cities of the land (ch. xi.). A list of priests and Levites is given, and the joyous dedication of the wall, accompanied with sacrifices, is described (ch. xii.). During Nehemiah's absence in Persia heathen strangers were admitted into the temple; they are expelled after his return, and the broken covenant to pay the tithes, to sanctify the Sabbath, and to refrain from mixed marriages is enforced (ch. xiii.).

The chronological questions involved in the Book of Nehemiah will be found discussed in the articles Ezra, Book of, and Nehemiah. As to how much of the book represents Nehemiah's memoirs, scholars are not agreed. The genuine historical basis of the work is probably the account of Nehemiah's first visit, his activity in the rebuilding of the walls, his return to Persia, and his subsequent second visit to Jerusalem to enforce the regulations of the 'Priestly Code,' which had been adopted by the people in B.C. 444 on the occasion of the first visit. For literature, consult the works mentioned under Ezra, Book of.

NEHER, nā′ẽr, Bernhard von (1806-86). A German historical painter, born at Biberach, Württemberg. He studied in Stuttgart under Hetsch and Dannecker, and in 1823 proceeded to Munich, where he studied at the Academy under Cornelius. During his sojourn in Rome, from 1828 to 1832, he produced "The Raising of the Youth at Nain" (1831, Stuttgart Gallery), and "Abraham Visited by the Angels" (1832, Basel Museum), and on his return to Munich was commissioned to execute the fresco painting "Entry of Emperor Louis the Bavarian" (1832-35), on the recently restored Isar gate. Appointed director of the Leipzig Academy in 1841, he thence went to Stuttgart in 1846, as professor at the School of Art, and became its director in 1854. His most important works there were a dozen great cartoons for stained-glass windows to be placed in churches in Stuttgart. Among several larger and smaller canvases, dating from that period, should be mentioned: "Descent from the Cross" (1855, Stuttgart Gallery), and "Spring" (1858, Royal Palace, Stuttgart).

NEHER, Michael (1798-1876). A German architectural painter, brother of the preceding, born in Munich. On his way to Italy, in 1819, he spent some time at Trent painting portraits, but in Rome he took up genre subjects, and gradually gave more and more prominence to architectural surroundings. His "Roman Poultry Vender" (1825, New Pinakothek, Munich) is an exquisite specimen of that phase of his work. He returned to Munich in 1825, and painted many landscapes and architectural and costume pieces. After 1837 he confined his brush to those subjects with which his name was thenceforth associated, namely, views of city squares, enlivened with scenes from German life of the past. The New Pinakothek at Munich has "Interior of Chapel at Castle Traussnitz" (1838); "Views in Old Munich" (1842-43); "Magdeburg Cathedral" (1855); "Saint Vitus's Church in Prague."

NEHLIG, nȧ′lêg′, Victor (1830—). A French historical painter, born in Paris. He was a pupil of Cogniet and Abel de Pujol, and came to the United States in 1856. He opened a studio in New York, and in 1870 was made a member of the National Academy of Design. In 1872 he returned to Paris, where he still resides. Among his best works are: the "Bravo" (1870); "Armorer of the Olden Time," "Gertrude of Wyoming," the "Artist's Dream," the "Cavalry Charge of Lieutenant Hidden," New York Historical Society; "Battle at Antietam," in possession of William Astor, New York; the "Captive Huguenot," "Pocahontas," "Hiawatha," the "Serenade," and "Waiting for My Enemy." Neblig is successful in depicting historical scenes.

NEHRING, nā′rĭng, Wladislaw (1830—). A German Slavic scholar, born at Kletzko, near Gnesen. He was educated at the University of Breslau, where he was appointed professor of Slavic languages and literature in 1868. Among his publications are: *Kurs literatury polskiéj* (1866); *Study a literacki* (1884); and *Altpolnische Sprachdenkmäler* (1887).

NEIDE, nī′d*e*, Emil (1843—). A German painter, born at Königsberg. First a pupil of the Academy there, he continued his studies at Düsseldorf and Munich, especially under Dietz, and subsequently traveled in Belgium, Holland, France, and Italy. Previous to this journey he had executed the fresco painting "Ptolemy Observing the Constellations," in the Aula of the Gymnasium at Königsberg, where, after his return, he painted numerous portraits and several mythological subjects, of which "Psyche Conveyed Across the Styx by Charon" (1873, Königsberg Museum), "Orpheus and Eurydice" (1876, Halsey Collection, New York City), and the "Scenes from the Odyssey," in fresco for the Gymnasium at Insterburg, are the most prominent. In 1880 he was appointed instructor, and in 1884 professor at the Königsberg Academy. Two years afterwards he created a startling impression by his revolutionary change in the choice of subjects and their coloristic treatment, as exemplified by such sensational genre scenes as "On the Scene of the Deed" (the discovery of a murdered man's body), "Tired of Life," and similar incidents.

NEIDHART VON REUENTHAL, nīt′härt fōn roi′*e*n-tȧl (c.1180-c.1250). A German poet, born in Bavaria. He participated in the crusade against Damietta, Egypt (1218-19), and later resided at the Court of Frederick the Quarrelsome in Vienna. From Frederick he received a fief near Melk and other valuable gifts. He was the originator of a new form of the mediæval lyric—the peasant lyric written under the influence of the Court. In this he satirizes the wealthy but vulgar peasantry of Bavaria and Austria, with its display of finery, its brawls, and its insolence to betters. For this ridicule he was bitterly disliked by the rustic versifiers, and, by the name Neidhart Fuchs, was known as the enemy of the peasants as late as the sixteenth century. Neidhart's work was an important one in the development of the Volkslied, upon which it continued for two centuries to leave a distinct impression. A manuscript collection of his poems, dating from the thirteenth century, was edited by Benecke, in vol. ii. of the *Beiträge zur Kenntnis der altdeutschen Sprache* (Göttingen, 1832). The critical edition by Haupt (Leipzig, 1858) is excellent. Neidhart is co-hero with the Pfaff Amis of Anastasius Grün's (Count Auersperg's) *Pfaff vom Kahlenberg* (Leipzig, 1850; 3d ed. 1877). Consult also, Bielschowsky, *Leben und Dichten Neidharts von Reuenthal* (Berlin, 1891).

NEILGHERRY (nêl-gē'rĭ) **HILLS.** Mountains in India. See NILGIRI HILLS.

NEILGHERRY (or **NILGIRI**) **NETTLE** (*Girardinia palmata*). A plant of the natural order Urticaceæ, nearly allied to the true nettles, and possessing the stinging power common in them. It is frequent on all the higher ranges of the Nilgiri hills. The natives obtain the fibre by first boiling the plant, to destroy its stinging properties, and then peeling the stalks. There are said to be two or three distinct forms or varieties of Neilgherry nettle fibre, and different specific names have been given the plants producing them. Its bark yields a long, soft, and silky fibre, which is said to be one of the best fibres produced in India.

NEILL, nēl, EDWARD DUFFIELD (1823-93). An American author and educator, born at Philadelphia. He attended the University of Pennsylvania for a time, but was graduated at Amherst in 1842, and afterwards studied theology at Andover. After ordination as a Presbyterian minister he removed to Saint Paul, Minn., in 1848, and became pastor of the first Protestant church. In 1851-53 he was superintendent of public instruction for the Territory, and from 1858 to 1861 chancellor of the State University. In 1861-64 he was an army and hospital chaplain. From that time until 1869 he was one of the secretaries of Presidents Lincoln and Johnson. President Grant appointed him consul to Dublin in 1869, but he returned the next year. In 1873-84 he was president of Manchester College in Saint Paul, and from that time until his death professor of history and literature. He published many historical works, chiefly concerning the colonial period. They are drawn entirely from original documents, and contain much valuable material, arranged, however, with little sense of proportion. The most important are: *History of Minnesota* (1858, 5th ed. 1883); *Minnesota Explorers and Pioneers* (1881); *Terra Mariæ*, a history of early Maryland (1867); *History of the Virginia Company of London* (1869); *English Colonization of America During the Seventeenth Century* (1871); *Virginia Vetusta* (1885); *Virginia Carolorum* (1886).

NEILLS'VILLE. A city and the county-seat of Clark County, Wis., 66 miles northeast of La Crosse, at the junction of the O'Neil and Black rivers, and on the Chicago, Saint Paul, Minneapolis and Omaha Railroad (Map: Wisconsin, C 4). The city has a public library of 2000 volumes. It is the centre of a prosperous farming and cattle-raising community; there are manufactures of flour, furniture, and lumber in various products. Population, in 1890, 1936; in 1900, 2104.

NEILSON, nēl'son, JAMES BEAUMONT (1792-1865). A Scotch inventor, born at Shettleston, near Glasgow. He had little education in school, and at fourteen was set to work. He was employed by his brother, then as engineer of a colliery near Irvine, and in 1817 as foreman of the Glasgow gas works, where he made many improvements in the method of gas manufacture, and founded an institute for the education of employees. His great invention, that of the hot blast in manufacturing iron, was directly opposed to the belief of contemporary foundrymen that the colder the blast the better the quality and the greater the quantity; and his experiments were long blocked by the impossibility of a fair test. Neilson's patent, taken out in 1828, was very successful. With equal fuel his method produced three times the iron of the cold blast. But the validity of the patent was attacked with some success, and many firms refused to pay the license for the blast. Neilson won the great suit against the Bairds of Gartsherrie in 1843, and four years afterwards retired to the Isle of Bute. His last years were spent at Queenshill, Kirkcudbright, where he established a workingman's institute.

NEILSON, LILIAN ADELAIDE (1848-80). The assumed name of an English actress named Elizabeth Ann Brown. She was born March 3, 1848, in Leeds, and her childhood at Guiseley was of the humblest. When fourteen years old she ran away from home, and going to London, was educated for the stage through the kindness of a chance acquaintance, making her début in 1865 in the part of Juliet. She played for a few years in various theatres of London and the provinces, till 1870-71, when she met great success as Amy Robsart in an adaptation of *Kenilworth*, and as Rebecca in *Ivanhoe*. At once she became one of the favorites of the English stage, and was equally popular in America, where she appeared neary every year from 1872 to her death. Her great characters, besides those mentioned, were the Shakespearean Rosalind, Beatrice, and Imogen, and also Julia in *The Hunchback*. Early in her career she was married to Philip Lee, from whom she was divorced in 1877. She died suddenly in the prime of her beauty, in Paris, August 15, 1880. Consult: Scott, *The Drama of Yesterday and To-Day* (London, 1899); Marston, *Our Recent Actors* (ib., 1890).

NEILSON, SAMUEL (1761-1803). An Irish politician, founder of the United Irish Society. He was born at Ballyroney, County Down, the son of a Presbyterian clergyman, and established himself in Belfast as a woolen merchant, but his interest in politics soon forced him out of business. In 1792 he founded the *Northern Star*, an organ of the United Irishmen. The formation of this society had been suggested by Neilson in the previous year and was carried out by Wolf Tone. The *Star* was suppressed in 1797 after the editor, who aimed at complete separation from England, had several times suffered arrest and imprisonment. Rearrested in 1798, Neilson either bargained with the Government in behalf of all political prisoners that they were to be exiled to some country friendly to Great Britain, and in return would disclose the secrets of the United Irish Society, or in some other way managed to escape trial. In 1802 he was set free at Cuxhaven, soon afterwards came to the United States, and died at Poughkeepsie, N. Y.

NEIRA (nā'ê-rȧ) **BANDA.** One of the Banda Islands (q.v.).

NEISSE, nī'se. The capital of a circle, and a fortified town in the Province of Silesia, Prussia, on the Glatzer Neisse, 46 miles south-southeast of Breslau (Map: Prussia, G 3). The town proper on the left bank of the river is well built, and has a number of interesting features, of which the most prominent are the Gothic Church of Saint Jacob, dating from the twelfth century, the Jesuit Church, completed in 1688, the Rathaus with its high tower, the bishop's residence, now used as municipal offices, and the Catholic Gymnasium, formerly a Jesuit college. The town has manufactures of furniture, machinery, blankets, lace, and wire screens, and carries on a trade in sugar, wood, marble, and vegetables. Population, in 1890, 22,444; in 1900, 24,271. Neisse was formerly the capital of the Principality of Neisse, which belonged to the Bishopric of Breslau.

NEITH, nē′ĭth. An Egyptian goddess worshiped especially at Sais in the Delta. She is mentioned in some of the most ancient inscriptions, but did not attain any special prominence until the time of Dynasty 26, which originated in Sais. Neith is represented as a woman wearing the crown of Lower Egypt, and holding in her hand a bow and arrows together with the sceptre of a goddess. It is probable that she was originally a Libyan divinity. Consult: Wiedemann, *Religion of the Ancient Egyptians* (New York, 1897); Mallet, *Le culte de Neit à Sais* (Paris, 1889); Petrie, *Nagada and Ballas* (London, 1896).

NEIVA, nā′ė-vȧ. A town of the Department of Tolima, Colombia, on the right bank of the River Magdalena, at the head of navigation for light craft, and 112 miles southwest of Begotá (Map: Colombia, C 3). It is the chief centre for commerce for Southern Colombia, is celebrated for its cacao, and has an export trade in cattle. There are minor industries in silk-weaving and in the manufacture of hats. Its former trade in cinchona has largely disappeared through the destruction of the trees. Neiva was founded in 1550, and nineteen years later destroyed by the Indians. It was rebuilt in 1612 on its present site. It remained the capital of the department until 1888. Its population, in 1892, was about 5000; of the municipal district, 16,000.

NEJD, nĕj″d. A region of Arabia. See Nedjed.

NEKHBET, nĕk′bĕt. An Egyptian deity, the local divinity of the city of Eileithyia (q.v.).

NEKRASOFF, nyĕ-krä′sôf, Nikolai Alexeyevitch (1821-78). A Russian poet, born in the Government of Podolia. At sixteen he left the Yaroslav Gymnasium, and was sent to Saint Petersburg to enter the Regiment of Nobles. He matriculated at the university in 1839, whereupon his father cast him off. For three years he suffered fearful privations, and amid his bitter surroundings his poetic genius turned into a 'muse of vengeance and dolor.' A tutorship in a preparatory school and some hack-work for periodicals improved his material circumstances. While writing for the *Annals of the Fatherland* he chanced to show Byelinski (q.v.) a poem, "On the Road." The warm praise of that great critic turned Nekrasoff to his true vocation. He bought the *Contemporary* (1847), which soon became the most popular monthly in Russia. The years between 1856 and 1866 were the most brilliant period in his literary activity. Until then despondent and doubting, he now shared the roseate hopes aroused by the great reform movement. Though mainly the singer of the people's sufferings, he did not confine himself within that narrow circle. His works depict the 'downtrodden and oppressed' of all classes of Russian society. His *Fatherland*, *Peasants' Children*, and *Last Songs* are among the most touching of his poems. The peasant groaning under the heavy hands of the master, the workman hauling the barges on the Volga, the heroic devotion of the wives of the Decembrists as they follow their husbands to the Siberian dungeons straight from the glamor of the Court (*Russian Women*), bear witness to the range of his sympathies. The meeting of husbands and wives in the dark mines of Siberia (*Russian Women*) is probably the most moving and powerful episode in all Russian literature, and his *Hero for an Hour* would alone give him an international reputation. The long poem (5000 verses) *Who Lives Happily in Russia?* written in an unusual metre, is sometimes diffuse in the treatment of the whole life of the whole nation, but the greater part of it is admirable. He died January 8, 1878. The *Last Songs*, written with a dying hand, are overpowering in their intensity of feeling.

NÉLATON, nå′lȧ-tôɴ′, Auguste (1807-73). A French surgeon, born in Paris. He received his doctor's degree in 1836, from 1839 until 1851 was adjunct professor in the Faculty of Paris, and from the latter year until 1867 was professor of clinical surgery. He became a Senator in 1868, and a member of the Institute in 1869. He was one of the most skillful operators of his time, and made several important improvements in surgery, one of which, a probe, having an unpolished porcelain knob at its end, much used in military surgery in searching for bullets, is called Nélaton's probe. His principal work is *Eléments de pathologie chirurgicale* (2d ed. 1868-85).

NE′LEUS (Lat., from Gk. Νηλεύς). A son of Poseidon and brother of Pelias. Having been exposed by their mother, the brothers were found and brought up by a herdsman, and when grown up were recognized by their mother, Tyro, who had married Cretheus of Iolcus. After his death they quarreled over the possession of Iolcus, and Neleus withdrew to Pylos in Messenia. Because he refused to purify Hercules after the murder of Iphitus, Hercules killed all his sons except Nestor. According to one account Neleus perished with his sons. He is also said to have reestablished the Olympic Games and to have died at Corinth.

NELIGH, nē′lĭg. A city and the county-seat of Antelope County, Neb., 152 miles northwest of Omaha; on the Elkhorn River, and on the Fremont, Elkhorn and Missouri Valley Railroad (Map: Nebraska, G 1). Gates Academy (Congregational), with a library of 5000 volumes, is located here. The city is the commercial centre of a large agricultural and stock-raising region. Alfalfa is extensively cultivated in this vicinity. Population, in 1890, 1209; in 1900, 1135.

NELLORE, nĕl-lōr′, or **NELLUR**, nĕl-lo͞or′. The capital of a district, Madras, British India, situated on an elevation on the right bank of the Pennair River, eight miles from its mouth, and 96 miles northwest of Madras by rail (Map: India, D 6). It is irregularly built and has densely populated sections; but there are also some good streets. It is the seat of several European missions. One of the features of the vicinity is the anicut, 677 yards long, the chief irrigation work on the Pennair. The town has a good water supply. The ancient Sinhapur, "lion city," was formerly an important fortress. The discovery in the ruins of a Hindu temple, at the end of the eighteenth century, of a pot filled with second century Roman gold coins and medals, chiefly of Trajan, Adrian, and Faustina, would point to a remote origin. Population, in 1891, 29,336; in 1901, 32.040.

NEL'SON. A municipal borough and manufacturing town in Lancashire, England, 3½ miles northeast of Burnley (Map: England, D 3). Besides coal-mining, it has considerable manufactures of cotton, worsted, and silk. It contains a handsome market-hall, and a technical school. In 1850 it was a small village named after a roadside inn; its manufactures inaugurated its prosperity, and it was incorporated in 1890. It owns its water, gas, and electric lighting plants, market, free library, cemetery, and provides technical instruction. Population, in 1871, 5600; in 1891, 22,754; in 1901, 32,816.

NELSON. The capital of a province of the same name, in New Zealand, situated at the north end of South Island (Map: New Zealand, D 4). The harbor has a depth on bar of from 15 to 19 feet. The railway wharf can be reached only by vessels drawing 18 feet and under. Steamers periodically ply to Sydney and Melbourne. The manufactures of the town comprise cloth and leather goods. The centre of the town is a hill rising 40 feet above the surrounding streets, and laid out as a square with an Episcopal cathedral in its centre. The city was founded in 1841. Population, in 1901, 7000; of electoral district, 11,100.

NEL'SON. A town in the southeastern part of British Columbia, situated on the Kootenay River, 20 miles west of Kootenay Lake (Map: British Columbia, F 5). It is the chief mining centre of the Kootenay silver-mining region, and has a large smelting plant, saw mill, foundry, and machine shops. Population, in 1901, 5273.

NELSON, Horatio, Viscount (1758-1805). The most famous of English admirals. He was born at Burnham-Thorpe, Norfolk, England, on September 29, 1758. His father was the rector of his native place, while his mother was a grand-niece of Sir Robert Walpole. Nelson received only a slender education, and at the age of twelve he entered the navy under the care of his maternal uncle, Captain Maurice Suckling. To this uncle he owed his early rapid promotion, and the advice which led to his careful training in seamanship. During his first period of service he made voyages to the Arctic regions and the East Indies, and suffered considerably from ill health, for throughout life Nelson was very weak physically, and often was maintained only by sheer force of will. In 1777 Nelson was made second lieutenant, and again went to the West Indies. In 1779 he became captain, and henceforth promotion came to him only in due order, since the regulations did not allow any promotion other than according to seniority after the rank of captain.

In 1783, after the war with France and the American colonies had closed, Nelson was for a short time put on half pay, but after a few months, part of which time was spent in France, he was appointed to the *Boreas*, on which he served in the West Indies until 1787. Here he performed his first notable service, which, however, brought him into conflict with his commander, Sir Richard Hughes, a well-meaning, but timid man. Contrary to the latter's orders and in opposition to powerful interests in the West Indies, Nelson insisted upon enforcing the Navigation Acts against the United States and other foreign nations. He was ultimately upheld by the British Government, but for the time it involved him in vexatious law-suits and caused him much anxiety. While on this station Nelson first met at Nevis the widow of Dr. Josiah Nisbet, by birth a Miss Frances Woolward, whom he ultimately married on March 11, 1787, Prince William Henry giving the bride away.

Soon after his marriage Nelson started for home, and on November 30, 1787, he was relieved from active service. For some obscure reasons a coolness had sprung up between Nelson and the Admiralty, with the result that he remained in retirement until the threatened outbreak of the war with France in 1792 caused all officers to be recalled into active service. On January 30, 1793, Nelson was given command of the sixty-four-gun ship *Agamemnon*, which, together with his last ship, the *Victory*, is most closely associated with his career. He served on it for over three years. He was assigned to the Mediterranean fleet, serving first under Admiral Hood, then under Hotham, and finally under Sir John Jervis (later the Earl of Saint Vincent). Several times he was sent on diplomatic missions, and on the occasion of one to Naples in September, 1793, Nelson for the first time met Sir William Hamilton and his wife, Lady Emma Hamilton, who was to have later so great an influence over him. Nelson took an active part in Hood's conquest of Corsica, commanding the marines at Bastia and Calvi, where he lost the sight of his right eye. This period of his life Nelson always considered the happiest part of his career, and it prepared him for the great events to come. In 1796 he was made a commodore, and given a new ship.

At this time Napoleon was winning his great victories over the Austrians in Italy. The position of the British fleet in the Mediterranean was becoming precarious, as Spain was about to join France, in which case the English fleet would be greatly outnumbered. The hold of the British on Corsica was loosening, since, under the influence of the great French victories, the Republicans were becoming very active on the island. Taking all these things into consideration, the British Government ordered Sir John Jervis to abandon Corsica, to withdraw from the Mediterranean, and return to England. These orders were received on September 25, 1796, and Nelson had to superintend the work, though he considered it best for Great Britain to retain everything, since he believed the British fleet sufficiently powerful to cope with the enemy.

In December, 1796, Jervis sent Nelson back to the Mediterranean to aid in the removal of the naval stores from the island of Elba, which the British had retained at the time they had abandoned the other posts in that sea. As he was returning he had to pass through the whole Spanish fleet, and on February 13, 1797, he had rejoined Jervis. The following day took place the great battle off Cape Saint Vincent (q.v.). Here by his rapid and independent manœuvres Nelson did much to carry the day, and Jervis was magnanimous enough to give him due credit. The Spanish fleet of twenty-seven ships was totally defeated by fifteen vessels, and one of the chief naval resources of France had disappeared. As a reward for his share in this great event Nelson received a knighthood of the Bath, and before this he had become in due order of promotion a rear-admiral of the blue. His next duty was to bring the troops away from Elba, a task which he promptly accomplished. It is interesting to note that though at this time the serious mutinies in the fleet at Spithead and the Nore took place, Nelson had no difficulty with his men, who assured him of their loyalty. For a few weeks Nelson served off Cadiz, and then, at his own suggestion, he was detached to make an attack on the town of Santa Cruz, on the island of Teneriffe, believing that large Mexican treasure ships had taken refuge there, whose capture would deal a severe blow to Spain. The expedition arrived at its destination on July 20, 1797, and the following day an attack was made. This assault and some later ones were all repulsed. The plan had never anything to recommend it but its boldness and a belief that the place was not strongly defended. Nelson himself fought with great heroism and lost his right arm, and, as the wound did not heal well, he was compelled to return to England, where he arrived on September 3, 1797. On September 27 he was invested with the Order of the Bath by George III. in person, and at the same time a pension of £1000 a year was awarded him. At this time, on account of his ill health and a fear that he would never again be able to enter active service, his spirits were greatly depressed, but he revived at once when on March 29, 1798, his flag was again hoisted over a ship. On April 30th he rejoined the Earl of Saint Vincent off Cadiz.

From this time a new period in Nelson's life begins. He soon becomes the great man of his service, instead of merely one of many distinguished naval officers. It is the period which opens with Abukir Bay and closes with Trafalgar. It is necessary to consider now the state of Europe at the time when Nelson rejoined the fleet. Austria had been compelled by Napoleon's victories in Italy to sign the Preliminaries of Leoben on April 18, 1797, which were ratified soon after by the Treaty of Campo-Formio (q.v.). This left England with only one weak ally, Portugal, while it set Napoleon free to attack England itself. He thought the best place to injure England would be in the East, and for this purpose prepared his great Egyptian expedition. (See NAPOLEON I.) The news of Napoleon's intentions soon reached Saint Vincent, and in spite of the jealousy of some older officers, he detached Nelson to watch the French fleet and to check it. Nelson was unable to prevent it from getting to Egypt, and for months there was a weary hunt to find the French ships and compel them to fight. Finally, on August 1, 1798, Nelson discovered them in the Bay of Abukir (q.v.), and in the battle that ensued the French fleet was completely defeated, and only two vessels escaped. Nelson received a wound on the head from which he suffered forever after. The brilliant victory at Abukir practically insured the failure of Napoleon's expedition, since it cut him off from his base of supplies. Nelson was created Baron Nelson of the Nile, and given a pension of £2000 a year, and besides received other numerous gifts and compliments both from England and abroad. On August 19th he sailed from Alexandria and on September 22d he finally arrived at Naples.

The Neapolitan period of Nelson's life, which covered the ensuing two years, was the one blemish on his otherwise glorious career. Here began his criminal relations with the wife of the English Minister at Naples, Lady Emma Hamilton (q.v.), which led to a complete separation of Nelson and his wife early in 1801. Moreover, Lady Hamilton influenced Nelson's public acts, so that for a time he behaved rather as commander-in-chief of the Neapolitan navy than as an English admiral. He induced Naples, however, to make war upon France, but the Neapolitan army was soon decisively defeated, and the royal family was compelled in December, 1798, to leave Naples, where the French proclaimed the Parthenopean Republic. After residing for a while with the Hamiltons at Palermo, and vexed for a time on account of the appointment of a junior officer, Sir Sidney Smith, to an important command in the Levant, Nelson was finally roused again to action on May 12, 1799, by the news that Admiral Bruix with the French Brest fleet had escaped from that harbor and was about to enter the Mediterranean. The danger was imminent that the French would recover the naval supremacy in the Mediterranean, which had been destroyed by the victory at Abukir Bay. Nelson prepared for the emergency with his usual ability, when, to his disgust, Jervis resigned his command and was succeeded by Keith, an honest but by no means brilliant officer. Friction between him and Nelson existed from the start. On June 24, 1799, Nelson appeared before Naples intent upon securing that city before the French fleet should appear. He found that the Republicans had complete control and were aided by a Neapolitan squadron under Commodore Caraccioli. The Neapolitan admiral was captured on June 29th, and Nelson, as commander-in-chief of the Neapolitan navy, immediately ordered a court-martial, which sentenced the Commodore to death, and he was executed at once. Nelson has often been blamed unjustly for this action, the only fault which can possibly be imputed to him being that possibly he might have proceeded with more deliberation. The forts of the city had surrendered on June 26th. At this time Nelson was created Duke of Bronte by the despicable Ferdinand IV. of Naples. To the influence of Lady Hamilton, who was the intimate of the Queen of Naples, must be charged the serious disobedience of orders by Nelson shortly after. He had been ordered to join Lord Keith and to assist him to meet a large French fleet, but he preferred to remain at Naples. The danger, it is true, was averted; for on August 13, 1799, the French fleet reëntered Brest, but had Nelson come up in time it is just possible that another great victory might have been won. For a short time Nelson was commander in the Mediterranean, but he displayed no enthusiasm for his work. On January 20, 1800, he united his command with that of Keith, and after several quarrels Nelson was finally recalled by orders which reached him in June. He traveled overland with the Hamiltons, and though received everywhere with great enthusiasm, his conduct gave great cause of scandal to all his friends. On November 6, 1800, the party arrived in England, and soon after Nelson's final breach with his wife took place.

On January 1, 1801, Nelson was promoted to be vice-admiral, and he was assigned to the command of Sir Hyde Parker, who was to coerce the Northern Confederation. This league, composed of the States on the Baltic, had been maintaining an armed neutrality, which in truth was only a veiled attempt to aid Napoleon. Nelson advised an attack on the strongest member of the confederacy, Russia; but his daring plan was not followed, and instead the whole fleet sailed for Denmark. In a bold assault on the Danish fleet at Copenhagen, Nelson was victorious (April 2, 1801), and the Danes were compelled on April 9th to sign an armistice, which tied their hands, but left the English free. It was during the engagement of April 2d that Nelson, having received an order early in the day to cease action, placed his telescope to his blind eye and said, "I really do not see the signal." On May 5, 1801, Nelson was appointed commander-in-chief in place of Parker. He immediately proceeded to carry out his plan of attacking Russia, but found, when he arrived at Revel, that the Czar Paul had been murdered on March 24th, and his son and successor, Alexander I., was preparing to follow another policy. For his services in this campaign Nelson was created a viscount. He returned to England and lived with the Hamiltons. After some slight service in the Channel, the Peace of Amiens closed the war, and on October 22, 1801, Nelson left his ship.

Peace, however, proved of short duration, and on May 18, 1803, Nelson raised his flag on the *Victory* as commander-in-chief of the Mediterranean fleet. For two years he blockaded Toulon and kept a watchful eye on affairs, but Villeneuve escaped from Toulon with the French fleet on March 30, 1805. Napoleon was preparing at Boulogne to invade England, and for this purpose the different French fleets were to unite and cover the expedition. A most exciting chase followed, in which Nelson pursued Villeneuve to the West Indies and back to the coast of Spain, but the French admiral was unable to elude Nelson and the other English admirals long enough to give Napoleon any opportunity of crossing the Channel. Villeneuve finally put in at Cadiz and Napoleon marched against Austria, which had declared war against him. Thus England was saved.

Nelson now blockaded Villeneuve at Cadiz, but Napoleon was threatening to disgrace his admiral for not fighting, and consequently, when Nelson had to send six vessels to Gibraltar for water, Villeneuve seized the opportunity and started to leave his shelter on October 19, 1805, and on October 21st took place the famous battle off Cape Trafalgar (q.v.). Before beginning battle Nelson gave his now famous signal, "England expects that every man will do his duty." The victory was complete, but Nelson was mortally wounded, and died on the afternoon of October 21, 1805, with the words "Thank God, I have done my duty." By his final great victory he had destroyed the combined French and Spanish fleets, and Napoleon's hope of creating a naval power vanished forever. Nelson thus contributed immensely to the final destruction of the Napoleonic ambitions, for without the control of the sea England would have been unable to wage her long contest. Nelson was buried at Saint Paul's Cathedral, London, on January 9, 1806, amid extraordinary public demonstrations.

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NELSON, SAMUEL (1792-1873). An American jurist, born at Hebron, Washington County, N. Y. He graduated at Middlebury College, Vermont, in 1813. He then read law, removed to New York State, where in 1817 he was admitted to the bar, and began practice at Cortland. In 1820 he was a Presidential elector on the Democratic ticket. His long judicial career of half a century began in 1823, when he was appointed by Governor Yates a judge of the State circuit court. In 1831 he was promoted to be an associate justice of the New York State Supreme Court, and in 1837, by appointment of Governor Marcy, he became Chief Justice of the court in succession to Judge Savage. In 1845 he was nominated by President Tyler as an associate justice of the Supreme Court of the United States. Although he concurred with Chief Justice Taney in the "Dred Scott" decision in 1857, and disapproved of the President's exercise of "war powers" during the Civil War, his loyalty was never questioned, and he was frequently consulted by Lincoln in judicial matters. He ranks as one of the greatest American authorities on admiralty and maritime law, and his prize-court decisions during the Civil War are of the utmost importance. In 1871 he was appointed by President Grant as one of the Joint High Commission for the settlement of the Alabama claims (q.v.).

NELSON, THOMAS (1738-89). An American patriot, one of the signers of the Declaration of Independence. He was born at Yorktown, Va., and was the son of William Nelson, Governor of Virginia in 1770-71. He went to England in 1753, was educated at Eton and at Trinity College, Cambridge, and returned to his home at Yorktown in 1761. He was a delegate for several terms to the House of Burgesses, and served in the Provincial Conventions of 1774, 1775, and 1776, introducing in the last the resolution by which Virginia's delegates to Congress were instructed (May 15th) to propose a declaration of independence. From August, 1775, until May, 1777, when he was forced by ill health to resign, he was a delegate to the Continental Congress, and signed the Declaration of Independence. In 1775 he was for a time colonel of the Second Virginia Regiment, and from August, 1777, until late in 1782, he commanded the Virginia State forces, rendering valuable service at the siege of Yorktown (1781), where he showed his patriotism by ordering the gunners to fire upon his own mansion, supposed to be the headquarters of Cornwallis. In 1779 he again sat for a time in Congress, and was again forced by ill health to resign; in 1780 he raised a large sum of money, on his own security, for the State, and paid out of his own pocket the arrearages of two Virginia regiments ordered South; and in the spring of

1781 he succeeded Jefferson as Governor of Virginia, though he resigned in November. Impoverished by his liberal advances to the State during the war, he passed his last years in very straitened circumstances, and much of his property was sold to pay public debts, for which he was security.

NELSON, William (1825-62). An American naval officer and soldier, born in Maysville, Ky. He entered the United States Navy in 1840, and in 1847 commanded a battery at the siege of Vera Cruz. He subsequently served in the Mediterranean and South Pacific, was promoted to the rank of master in 1854 and to that of lieutenant in 1855, and in 1858, as commander of the *Niagara,* transported to Africa the negroes who had been rescued from the slave-ship *Echo.* In 1861 he was on ordnance duty at Washington, and at the outbreak of the Civil War he was placed in command of the gunboats on the Ohio, with the rank of lieutenant-commander. He left the navy soon afterwards, entered the military service, was ordered to Kentucky, and there established recruiting stations, and organized camp 'Dick Robinson,' near Danville, and a similar rendezvous at Washington, in Mason County. In September, 1861, he became a brigadier-general of volunteers, and at the battle of Shiloh (April 6-7, 1862) he commanded the second division under General Buell. (See Shiloh, Battle of.) He was wounded in the engagement at Richmond, Ky.; was in command at Louisville, Ky., in 1862, when the Confederate General Bragg threatened that city, and in July of this year was commissioned major-general of volunteers. On September 29th he was fatally shot at the Galt House, Louisville, by the Federal general Jefferson C. Davis, in a personal quarrel.

NELSON, Wolfred (1792-1863). A Canadian physician and revolutionist. The son of an English officer, he was born at Montreal. In 1811 he began the practice of medicine in Saint Denis. In the war with the United States, 1812, he served as surgeon. He was chosen representative of Sorel in the Canadian Parliament of 1827. He took a leading part in the revolution of 1837, and was in command at the victory obtained by the insurgents at Saint Denis, on the Richelieu River, but was captured and sent to Bermuda as an exile. The following year he settled at Plattsburg, N. Y., and in 1842, after the declaration of a general amnesty, returned to Montreal. He was again elected to Parliament from his former district in 1844 and 1845, and in 1851 was made inspector of prisons, a position which he held for several years. He served as Mayor of Montreal two terms and was at the head of the Lower Canada College of Physicians and Surgeons. He died in Montreal.

NELSON MONUMENT. A granite column in the centre of Trafalgar Square, London, copied from a Corinthian column of the Temple of Mars Ultor, in Rome, and crowned with a statue of Nelson, 17 feet in height. The shaft, 145 feet high, was erected in 1843 by voluntary subscriptions. The pedestal bears bronze reliefs, cast from French cannon, depicting scenes from Nelson's life. At the foot of the column are four colossal bronze lions, by Sir Edwin Landseer.

NELSON RIVER. The principal river in the Canadian Territory of Keewatin, forming the lower course of the Saskatchewan (q.v.) (Map: Northwest Territories, K 3). It flows from the north end of Lake Winnipeg, first northward, through a series of lakes, then northeastward, into Hudson Bay at York Factory, after a course emptying through the estuary of Port Nelson of about 400 miles. It is deep, wide, and swift, discharging an enormous volume of water; rapids and falls in its upper reaches limit its navigation by steamers to from 80 to 90 miles, though boats can ascend 127 miles from its mouth.

NELSON'S FARM, Battle of. See Frazier's Farm, Battle of.

NEL'SONVILLE. A city in Athens County, Ohio, 62 miles southeast of the State capital, Columbus; on the Hocking River, and on the Hocking Valley Railroad (Map: Ohio, F 7). There is an important trade in coal, which is mined extensively in the vicinity, this being one of the most productive coal fields of the State. Nelsonville has a large establishment which manufactures mining implements, car wheels, etc., and conducts a large repair business. The water-works are owned by the municipality. Population, in 1890, 4558; in 1900, 5421.

NELUM'BO (Ceylonese name), *Nelumbium.* A genus of aquatic plants similar to water-lilies, and often included under that name in the natural order Nymphæaceæ. The few species which are found in the warm parts of Asia, North America, and the north of Africa, are all distinguished by the beauty of their flowers. *Nelumbium speciosum,* with rose-colored flowers, is the Egyptian bean of Pythagoras, the lotus (q.v.) held sacred by the Hindus and by the people of Tibet, has been used as a food by the Egyptians from remote antiquity, and is much esteemed where it is cultivated, especially in China, for its edible seeds, roots, leaf-stalks, and flower-stalks. The seeds resemble acorns in size and shape, and have a more delicate flavor than almonds. The root contains much starch, and Chinese arrowroot is said to be obtained from it. Great quantities are pickled with salt and vinegar, and eaten with rice. When powdered it makes excellent soup with water or milk. The ancient Egyptian mode of sowing this plant, by inclosing each seed in a ball of clay, and throwing it into the water, is practiced at the present day in India. *Nelumbium luteum* is a North American species, with yellow flowers, which extends almost as far north as Ontario. The edible seeds, called water chinquapins, are sought for by children and others, and the farinaceous roots are agreeable when boiled.

NEMATHELMINTHES (Neo-Lat. nom. pl., from Gk. νῆμα, *nēma,* thread + ἕλμινς, *helmins,* worm). A large and important phylum of the unsegmented worms, of a more or less elongated cylindrical form and known as 'round-worms.' Their skin is thick and strong, and is usually wrinkled, giving the body a slightly annulated appearance, which, however, disappears if the animal is placed in water. The nervous system in the higher forms consists of two lateral ganglia at the anterior extremity, which are united by a nervous ring, and from which two nervous trunks, one dorsal and one ventral, proceed to the posterior part of the body. In the lower forms the dorsal cord is wanting, or else the ventral cord is wanting and there are two lateral cords. Special organs of sense are rarely met with; but a general sense of touch exists, and a few of the free-living species have two simple eye-spots. The digestive organs are extremely simple. No blood system nor distinct respiratory or excretory organs can be detected. These worms are unisexual; but the males are comparatively rarely found, and are always smaller than the females. With the exception of the two families—the Enoplidæ, which are mostly marine forms, and the Anguillulidæ, or paste and vinegar eels—all the animals of this class are parasitic.

This phylum is divisible into three very distinct classes, namely, *Acanthocephala*, which have a protrusible proboscis armed with continuous hooks, and are destitute of an intestinal canal; the *Gordiacea*, which possess an intestinal canal, but no anus; and the *Nematoda*, which usually possess a perfect intestinal canal, provided with two orifices. See Ascaris; Entozoa; Filaria; Guineaworm; Pinworm; Roundworm; Threadworm; Trichina.

NEMATOCYST (from Gk. *νῆμα*, *nēma*, thread + *κύστις*, *kystis*, bladder). One of the lasso-cells, thread-cells, or nettling organs (*cnidæ*) of jellyfishes and other Cœlenterata, acting as organs of offense and defense. These bodies are imbedded in the outer cellular layer or ectoderm of cœlenterates. A nematocyst is an oval, tough capsule, filled with a clear fluid, and invaginated at one end in the form of a hollow process which is prolonged into a long coiled hollow thread. The entire structure is developed in an interstitial cell called a cnidoblast, which, as it approaches maturity, migrates toward the surface and becomes imbedded in one of the large ectoderm cells. At one point on its surface the cnidoblast is produced into a delicate protoplasmic process, the cnidocil or 'trigger-hair.' Any small animal on coming in contact with the lasso-cells of a jellyfish is stung, benumbed, or poisoned by them. Upon contact with one or many of these lasso-cells in the tentacles of a jellyfish or hydra, or a physalia, the cnidoblast suddenly contracts, and the pressure upon the stinging capsule causes an instantaneous eversion of the thread, at the base of which are minute sharp barbs. The threads also convey a poisonous fluid, which benumbs the victim. In this way sea-anemones and coral polyps obtain their food, paralyzing and thus capturing quite large animals, even young fishes. These poison lasso-cells also occur in certain Protozoa, mollusks, and in sponges, and in a modified form exist in the skin of certain worms, both terrestrial and aquatic. They are in these worms minute stiff rods, either coiled up in an irregularly spiral manner, or short and straight, contained in oval cells. They are shot out in great numbers when the animal is irritated, but are not retractile, being projected clear from the skin. That they are true nettling organs is proved by the fact that on touching the worms with the tongue they cause a tingling sensation. See illustration under Cœlenterata.

NEMATODA. A class of the phylum Nemathelminthes (q.v.), mostly parasites, but many others are extremely abundant in both fresh and salt water. They are the roundworms (q.v.) and a familiar example is found in Ascaris (q.v.). They are ranked in two orders: *Nematoidea*, in which the cœlom is not lined by epithelium, and *Gordioidea*, in which it is so lined. See Hairworm; Nemathelminthes.

NEM′ATOG′NATHI (Neo-Lat. nom. pl., from Gk. *νῆμα*, *nēma*, thread + *γνάθος*, *gnathos*, jaw). An order of fishes. See Catfish; compare Plectospondyli.

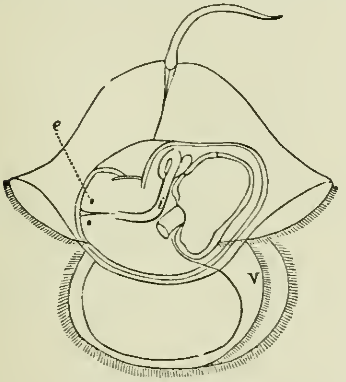
NEMATOPHYTON (Neo-Lat., from Gk. *νῆμα*, *nēma*, thread + *φυτόν*, *phyton*, plant). A gigantic fossil alga found in rocks of Devonian age in the Eastern United States and Canada. The stem is of great size, often 40 feet long by 2 to 3 feet in diameter, and resembles the trunk of a tree to such extent that it was originally supposed to be the trunk of a conifer. This resemblance led Dawson to name it Prototaxites or ancestral yewtree. The cellular structure is that of an alga. Several large trunks were uncovered near Monroe, Orange County, N. Y., during 1897 to 1899. The type species is Nematophyton Logani.

NEMAU′SUS. An ancient town of Gallia Narbonensis, now Nîmes (q.v.).

NĚMCOVÁ, nyĕm′tsô-vä, Bozena (1820-62). A Czech novelist, born in Vienna. She lived in Bohemia for several years, making a study of the life in its villages. One of her novels on this subject, *Babička* ("Little Grandmother," 1855), is especially well known. It has frequently been translated into foreign languages, and into English by Gregor in 1891. Her other works include *Karla* ("Charlotte," 1856) and *Pohorská vesnice* ("The Village in the Mountains," 1856). Her contributions to the study of Bohemian and Hungarian folk-lore in the volumes *Národní báchorky a pověsti* (1845-46) and *Slovenské pohádky a pověsti* ("Slovak Folk Tales," 1858) are valuable. Her complete works, *Sebranē spisy*, were published in 1862-63.

NE′MEA (Lat., from Gk. Νεμέα). The ancient name of a well-wooded valley of Argolis, in the Peloponnesus, between Cleonæ and Phlius. It lies north and south, and is from two to three miles long, and more than half a mile broad. In it there was no town but a sacred inclosure and temple of Zeus, of which three columns are still standing, while the others lie where they have been thrown by earthquakes. The valley was the seat of one of the four great national festivals of the Greeks—the *Nemean Games*, which were celebrated in mid-summer every two years, at the beginning of the second and fourth year of each Olympiad. The first of the historical period seems to have been held in B.C. 573, though legend ascribed the foundation of the games to the seven heroes on their march against Thebes, or to Hercules. The games consisted of the usual athletic contests, horse-racing, and a competition for players on the cithara. The prize was a palm branch and crown of parsley.

NEM′ERTIN′EA (Neo-Lat., from Gk. *Νημέρτης*, *nēmertēs*, name of a Nereid, from *νημερτής*, *nēmertēs*, unerring, from *νη-*, *nē-*, not + *ἁμαρτάνειν*, *hamartanein*, to miss). A class of flatworms easily distinguished from the Platodes by the proboscis and the presence of an anus. They are also remarkable for the prodigious length attained by some of the species, which, in the most extended state, is 10 or 12 feet, and one (*Linus longissimus*) reaches 90 feet. But the animal which so stretches itself out is capable of suddenly contracting itself to a quarter of that length. The nemertineans are unsegmented worms, with a ciliated body epithelium, and are more or less dorso-ventrally flattened. There is no distinct body-cavity; the intestine is straight, with lateral diverticula; the anus is at the posterior end of the body. The blood, nervous, and excretory systems are all present, and are usually very well developed. The only sense-organs are little ciliated pits possibly olfactory, and pigment eyes. The sexes are separate and the larva goes through a complicated metamorphosis in most cases. One of the characteristic features of the nemertineans is the proboscis, lying above the œsophagus and opening from its cavity, just over the mouth. This proboscis may be used in the capture of food, which consists, to a large extent, of other sorts of worms. These worms twine themselves into knots and rolls, apparently inextricable, but without any real entanglement. A large number of species are known from all parts of the world. The great majority are marine, but a few are fresh-water, and land forms are known. The latter are all small and dull-colored, but the marine forms, besides being oftentimes very large, are frequently very gaudy, red and green being common colors. These worms usually pass through a metamorphosis; the pre-larva is called a 'pilidium,' which is helmet-shaped with side lobes or lappets. A reduced form of the pilidium is called Desor's larva. The body of the pilidium is not entirely absorbed by the growing worm, but the worm develops within the larva, and finally frees itself, when the remnant of the pilidium dies. Certain forms have a direct development. Multiplication by transverse fission is frequent. Consult Shedson, *Cambridge Natural History*, vol. ii. (London, 1896).



PILIDIUM OF NEMERTES.

The worm is shown growing within the larva; *v*, velum; *e*, eyes; *i*, intestine of the nemertinean worm.

NE'MESIA'NUS, MARCUS AURELIUS OLYMPIUS. A Carthaginian Latinist of the latter half of the third Christian century. He wrote *Cynegetica*, 'On Hunting,' of which the 325 lines preserved constitute what is apparently an introduction to the main work (edited by Baehrens in his *Poetæ Latini Minores*, 1879, and by Stern, together with Grattius, 1832); and four *Eclogæ*, reminiscent of Vergil, of Manilius, and most of all of Calpurnius Siculus, with whose poems they are so constantly found in manuscript that they long passed as his work (edited by Baehrens, as above, and by Schenkl, 1885; translated into English verse by Scott, 1891). The fondness of the author for the refrain and other points of similarity in style have suggested the attribution to Nemesianus of the *Pervigilium Veneris;* but this is entirely problematical.

NEM'ESIS (Lat., from Gk. Νέμεσις, from νέμειν, *nemein*, to distribute). A goddess of fate, who apportions to men their deserts. In Homer Nemesis does not appear as a person, though the word is used as a common noun in the sense of 'righteous anger.' In another early epic, the *Cypria*, Nemesis was a goddess beloved by Zeus, whom she sought to escape by transforming herself into various animals. Finally, the god approached her as a swan, and she brought forth an egg, which was found and kept by Leda, till in fullness of time Helen, the cause of the Trojan War, was born. Nemesis was worshiped at Smyrna, in Ionia, where there seem to have been two goddesses of the same name, and especially at Rhamnus in Attica, where were two temples, an old one, and a large new one erected in the period following the Persian wars. It contained a famous statue of the goddess by Agoracritos, the pupil of Phidias, of which the head is in the British Museum. According to Hesiod, Nemesis was the daughter of destructive night. She is the avenger of wrong, punishing especially vaunting pride, and in general any overstepping of the bounds of due moderation. Those who forget to humble themselves before the gods or who offend against the eternal laws are likely to fall under her power. In Alexandrian poetry Nemesis is frequently invoked to punish a cold or fickle loved one. In art Nemesis appears as a dignified youthful figure, bearing frequently a measuring-rod or an apple-branch in one hand, and commonly drawing forward the upper seam of her tunic. In later art she is frequently winged, with a wheel at her feet, or a griffin at her side, or holding a bridle.

NEME'SIUS (Lat., from Gk. Νεμέσιος). A Greek philosopher, who lived about the middle of the fourth century A.D. He was Bishop of Emesa, and wrote in Greek a treatise on *The Nature of Man*, in which he expressed his belief in the preëminence of the soul, the freedom of the will, and the indestructibility of matter. There is a passage in the book which has been interpreted as showing some understanding of the circulation of the blood. In Latin translation the work was much read during the Middle Ages, and since then it has been translated into several of the languages of modern Europe. There is an edition by Matthaei (Halle, 1802).

NEMI, nā'mē. A lake in Italy about 17 miles southeast of Rome, having on its margin a famous grove of Diana. It was anciently called *Lacus Nemorensis* and also *Speculum Dianæ*, mirror of Diana. The grove of Diana was celebrated on account of its priest, who won his place by slaying his predecessor, and held it only till he was himself slain. The grove seems to have been situated on the northeast shore, near the modern village of Nemi. The lake fills the crater of an extinct volcano, is about 1100 feet above the sea, four miles in circumference, and has no outlet except a passage of unknown antiquity which still serves its original purpose. It had long been known that there were remains of vessels sunk near the shore, but it was not till 1895 that these were satisfactorily examined. One seems to have been about 200 feet in length, and 60 feet beam; the other was perhaps 250 feet long. The decks were paved with thin slabs of porphyry and serpentine, and the railings were of gilded bronze. Lead water-pipes with the name of Caligula furnished a clew to the date, and seemed to imply fountains on board. Though commonly called ships, it is far more probable that they were great rafts used in some spectacle connected with the worship of Diana. On the ritual of the grove, consult Frazer, *The Golden Bough* (2d. ed., London and New York, 1900).

NEMOURS, ne-mōōr', Duke of. A French general who gained fame in the Italian wars of Louis XII. See *Gaston de Foix*, Duke of Nemours, under Foix.

NEMOURS, Louis Charles Philippe Raphael d'Orléans, Duke de (1814-96). Second son of Louis Philippe. He was born in Paris and educated at the College of Henry IV. In 1831 he was elected King of the Belgians, but declined the offer. He served in the two Belgian campaigns, and in Algeria, and was in 1837 made lieutenant-general. After the death of his elder brother, the Duke of Orléans (July 13, 1842), it was proposed to confer the regency upon the Duke de Nemours; but this was not sanctioned by public opinion, and he left France on the outbreak of the Revolution in 1848, and did not return till 1871. After the adoption of the anti-royalist bill of 1886 his name was struck off the army list.

NENA SAHIB, nä'nȧ sä'hēb. Leader in the Sepoy Mutiny in India. See Nana Sahib.

NENCIONI, nān-chō'nē, Enrico (1840-96). An Italian poet and critic, born at Florence. He was one of that literary company called the 'Amici pedanti,' of which Carducci was the leader. He wrote for the *Italia Nuova*, and translated much French and English poetry into his language. Especially remarkable are his papers on English literature. Toward the end of his life he held a professorship at the Woman's Normal School in Florence. His works include: *Versi* (1880); *Medaglioni* (1883 and 1897); and *Studi di letterature straniere* (1897-98).

NEN'NIUS. An historian who lived in Wales at the end of the eighth and beginning of the ninth century, and who is believed by some to be the author of the *Historia Britonum*. Little is definitely known about him. The *Historia Britonum* contains a description of Britain, and deals briefly with the period of the Roman occupation, and the subsequent events, as the incursions of the Picts and Scots and the Saxon conquest. As an historical source it has little value, but it is of some importance for the study of early British mythology, especially for the study of the legend of Arthur, and because it contains the genealogies of English kings to 796. The best edition is by Mommsen, in *Monumenta Germaniæ Historica: Auctores Antiquissimi*, vol. xiii. (Berlin, 1898). For secondary works, consult: Zimmer, *Nennius Vindicatus* (Berlin, 1893); Thurneysen, "Nennius Vindicatus," in *Zeitschrift für deutsche Philologie*, vol. xxviii. (Halle, 1895): id., in *Zeitschrift für celtische Philologie*, vol. i. (Halle, 1897); Gross, *Sources and Literature of English History* (New York, 1900).

NE'OCENE (from Gk. *νέος*, *neos*, new + *καινός*, *kainos*, recent). A geologic term employed by the United States Geological Survey to designate the middle portion of American Cenozoic time, and corresponding to the combined Miocene and Pliocene periods of the Lyellian classification. See Tertiary System.

NEO-DARWINISM. Although Darwin, in his *Animals and Plants Under Domestication*, gave more weight to changes in the conditions of life, conceding that natural selection was not an exclusive factor in organic evolution, Wallace and others, notably Weismann, have insisted on the 'all-sufficiency' of natural selection, pushing, as many think, Darwinism far beyond its legitimate bounds. See Weismannism.

NE'OGÆ'A (Neo-Lat., from Gk. *νέος*, *neos*, new + *γαῖα*, *gaia*, earth). An alternative name in zoögeography for the continent of South America, or Neotropical Region, in conformity with 'Arctogæa,' 'Notogæa,' and so on.

NEO-HEGELIANISM, nē'ō-hā-gā'lĭ-*a*n-ĭz'm. A term often applied by opponents to the doctrine of those English, Scotch, and American thinkers who, more or less under the influence of Hegel, hold that consciousness and object are mutually implicated, and who, believing in the historical priority of the physical universe to the finite consciousnesses which are in some way correlated with physiological organisms, feel themselves forced to the conclusion that there is an eternal consciousness, of which the universe is the object. T. H. Green, J. and E. Caird, J. Watson, H. Jones, D. G. Ritchie, and Josiah Royce may be mentioned as prominent among those to whom the epithet is often applied. See especially Green, Thomas Hill.

NEO-KANTIANISM, nē'ō-kăn'tĭ-*a*n-ĭz'm. A term applied to the doctrine of those followers of Kant who accept the general result of Kant's philosophy so far as the theory of knowledge goes, but do not follow Kant in his endeavor by practical reason to work out a metaphysics. F. A. Lange, H. Cohen, P. Natorp, J. Volkelt, and O. Liebmann may be mentioned as representatives of this tendency.

NE'OLAMARCK'ISM. The modified doctrine held by those naturalists who accept in the main the teachings of Lamarck (q.v.). Lamarck was the first truly scientific thinker to state in a detailed way the causes not only of the origin of species, but of certain types of animal life, such as some orders of birds, of the groups represented by the ai, lemur, the kangaroo, and so on. The chief Lamarckian factors of organic evolution (see Lamarckism) are changes in the environment, direct in plants and the lowest animals, indirect in the higher animals; also, the use and disuse of organs, and the transmission of characters acquired during the lifetime of the individual, or what is called 'use-inheritance.' The first writer after Lamarck, on the lines laid out by the great French zoölogist, was Herbert Spencer. In 1866-71, in his *Principles of Biology*, Haeckel claimed (1868) that we should have to adopt Lamarck's theory of descent for the explanation of biological phenomena, "even if we did not possess Darwin's theory of selection," adding: "The one is so completely and *directly proved* by the other, and established by mechanical causes, that there remains nothing to be desired."

In America, Cope (1866-71) and Hyatt (1866-74) independently advocated Lamarckian views.

Cope first (1871) furnished what he considered as "an actual demonstration of the reality of the Lamarckian factor of use, or motion, as friction, impact, and strain, as an efficient cause of evolution." A. S. Packard (1871), by his studies of the embryology of Limulus, and of cave animals, was led to adopt Lamarckian views in preference to the theory of natural selection, which never seemed to him adequate or sufficiently comprehensive to explain the origin of variations and the rise of new types; and it was he who originated the term *Neolamarckism.* "Neolamarckism," he explained, "gathers up and makes use of the factors both of the Saint-Hilaire and Lamarckian schools, as containing the more fundamental causes of variation, and adds those of geographical isolation or segregation (Wagner and Gulick), the effects of gravity, the effects of currents of air and of water, of fixed or sedentary as opposed to active modes of life, the results of strains and impacts (Ryder, Cope, and Osborn), the principle of change of function as inducing the formation of new structures (Dohrn), the effects of parasitism, commensalism, and of symbiosis—in short, the biological environment; together with geological extinction, natural and sexual selection, and hybridity."

Among American zoölogists who have advocated Lamarckian views are W. H. Dall, J. A. Allen, R. T. Jackson, C. H. Eigenmann, and others; in England, Spencer, Henslow, Cunningham, Gadow, and others; in France, Giard, Perrier; and in Germany and Holland, Haeckel, Wagner, Eimer, Standfuss, Fischer, Plate, Pfeffer, O. Hertwig, Emery, Roux, and others.

NE′OLITH′IC MAN (from Gk. νέος, *neos*, new + λίθος, *lithos*, stone). The term applied by European archæologists to the races in a supposed geological period when the polishing of stone, agriculture, pottery, weaving, domestication of animals, and the construction of pile dwellings on lakesides in Switzerland, France, Italy, and Ireland, the burying of the dead in dolmens, and the rearing of megalithic monuments, were practiced.

NE′ON (Gk. νεόν, neu. sg. of νέος, *neos*, new). A gaseous element obtained from the atmosphere by William Ramsay and Morris W. Travers in 1898. It resembles helium, and, like other members of its group, has among its characteristic features a disinclination to unite with other elements. Neon is separated from the atmosphere in the same way as krypton (q.v.). Its atomic weight is given by Ramsay and Travers as 19.94.

NE′OPHYTE (Fr. *néophyte*, from Lat. *neophytus*, from Gk. νεόφυτος, from νέος, *neos*, new + φυτός, *phytos*, from φύειν, *phyein*, to grow). The name given in early ecclesiastical language to persons recently converted to Christianity. The word is used in this sense by Saint Paul, and is explained by Saint Gregory the Great as an allusion to 'their being newly planted in the faith.' It differed from catechumen (q.v.), inasmuch as it supposed the person to have not only embraced the doctrines of the Church, but also to have received baptism. Saint Paul, in the passage referred to, directs Timothy not to promote a neophyte to the episcopate; and this prohibition was generally maintained, although occasionally disregarded in extraordinary circumstances, such as those of Saint Ambrose (q.v.). The duration of this exclusion was left for a time to the discretion of bishops; but several of the ancient synods legislated regarding it. In the modern Roman Catholic Church the same discipline is observed, and extends to persons converted not alone from heathenism, but from any sect of Christians separated from the communion of Rome. The time, however, is left to be determined by circumstances.

NEO-PLA′TONISM. The name applied to the teachings, primarily of the Græco-Alexandrian school of philosophy, and later of a number of Italian humanists, as well as some Englishmen. The extension of the Roman Empire and the growing intercourse between different parts of the world gave rise to an eclectic tendency which combined features of various systems. The process of amalgamation showed itself most prominently at Alexandria, whose central position made it a meeting-place for the chief religions and philosophies of the ancient world. Such a philosophy, therefore, as that promulgated by the Neo-Platonists, combining the peculiar mental characteristics of the East and the West, naturally originated there, though it soon ceased to have any local connection. The term Neo-Platonism is sometimes loosely used to signify the whole new intellectual movement proceeding from Alexandria, and attempts have been made to include among its exponents some of the Christian Fathers, such as Clement of Alexandria and Origen; but the name is more properly applied to the school of Ammonius Saccas (q.v.) and his followers. Plotinus (q.v.), a pupil of Ammonius, was its most important champion. Porphyry, Iamblichus, and Proclus (qq.v.) represent a continuous decline in philosophic interest, and a greater and greater tendency to wild and fantastic religious syncretism. In common with Neo-Pythagoreanism and the Judæo-Alexandrian philosophy represented by Philo, the teaching of this school is characterized by a dualistic opposition of the divine and the earthly, an abstract conception of God which excludes all knowledge of the divine essence, a contempt for the world of sense which rests on the Platonic doctrines of matter and of the descent of souls into bodies, the supposition of mediating forms which carry over the divine operations into the world of phenomena, the demand for an ascetic liberation from a life of sense, and a faith in a higher revelation obtained in ecstasy. Notwithstanding the assumption that these doctrines were deductions from the teachings of Plato, the school brought the whole of philosophical science under a new systematic form. In their view, the basis of the divine nature is unity, the One; from this as the primordial source of all things emanates 'pure intelligence'; and from this, in turn, emanates the 'soul of the world,' whose creative activity produces other lesser souls, of men and animals. The doctrine of the divine immanence in this *anima mundi* was one of the most marked points in later Neo-Platonism, and led very close to pantheism. One of the last Neo-Platonists of antiquity was Boëthius (q.v.), who by his continued popularity became the most influential medium for the transmission, during the early Middle Ages, of Greek philosophy to Western Europe.

The fifteenth century witnessed a strong revival of interest in these speculations. Nicholas of Cusa (q.v.) and other mystics seek to overcome the doubt arising from the inadequacy of human conceptions by the theory of man's immediate knowledge or intuition of God—a theory distinctly akin to the Neo-Platonic doctrine that the soul in a state of ecstasy has the power to transcend all finite limitations. The Italian humanists, in their reaction against the previously dominant Aristotelianism, paid great devotion to anything that seemed to derive from Plato. Marsilio Ficino, especially, by his translations of Plotinus, Porphyry, and Iamblichus, contributed to the spread of these doctrines. The Cambridge Platonists (q.v.) were not without their affinities to the Alexandrian teaching; and Wordsworth's prevalent idea of the existence of a soul in nature which holds converse with the soul of man might be traced to the same source. Consult: Whittaker, *The Neo-Platonists* (Cambridge, 1901); Bigg, *The Christian Platonists of Alexandria* (Oxford, 1886); id., *Neo-Platonism* (ib., 1895); Hipler, *Neuplatonische Studien* (Vienna, 1868); Jules Simon, *L'école d'Alexandrie* (Paris, 1843-45): Kellner, *Hellenismus und Christenthum* (Cologne, 1865); and see NEO-PYTHAGOREANISM.

NE′OPTOL′EMUS (Lat., from Gk. *Νεοπτόλεμος*). The son of Achilles and Deidamia, also called Pyrrhus. After the death of his father he was taken by Odysseus to Troy, where he was distinguished by his courage, and was one of the band who entered Troy inclosed in the wooden horse. He was the slayer of the aged Priam. He returned with rich spoils to Phthia and married Hermione, the daughter of Menelaus. According to later legend he brought back with him as part of his booty Andromache, the wife of Hector, and settled in Epirus, and later married Hermione when he had gone to Phthia to restore Peleus to his throne. He was killed at the altar at Delphi by Orestes, the former lover of Hermione, or by the Delphians. He was buried within the precincts of the temple, where he was afterwards worshiped as a hero.

NE′O-PYTH′AGO′REANISM. The name of one of the two Græco-Alexandrian schools of philosophy, the other school being the Neo-Platonic. (See NEO-PLATONISM.) Pythagoreanism was revived in the first century B.C., by P. Nigidius Figulus, a Roman prætor, but Apollonius of Tyana (q.v.) was the most prominent representative of this attempt to blend Pythagorean philosophy with Oriental theosophy. The Neo-Pythagoreans regarded it as the greatest task of the philosopher to purify himself from connection with matter by the suppression of desire and by the observance of certain ceremonial rules which were adopted from the earlier Pythagorean brotherhood. In their theoretical system, numbers had symbolic significance. Consult: Zeller, *Der Philosophie der Griechen*, part iii.; *Die nacharistotelische Philosophie* (3d ed., Leipzig, 1880-81); Vacherot, *Histoire critique de l'école d'Alexandrie* (Paris, 1846-51); also the histories of philosophy by Ueberweg-Heinze, Windelband, Erdmann, and Bergmann.

NEORNITHES, nē̇-ôr′nĭ-thēz (Neo-Lat. nom. pl., from Gk. νέος, *neos*, new + ὄρνις, *ornis*, bird). Modern birds, as distinguished from those of Jurassic times, which are called *Archornithes*. They are characterized by fused metacarpals, the second finger longest, and the caudal vertebræ not more than thirteen in number. The group comprises not only existing groups, but all fossil birds except Archæopteryx.

NEOSHO, nē̇-ō′shō̇. A city and the county-seat of Newton County, Mo., 21 miles southeast of Joplin, on the Saint Louis and San Francisco and the Kansas City, Pittsburg and Gulf railroads (Map: Missouri, B 5). It has a public school, library, and the Scarritt Collegiate Institute (Methodist Episcopal South), opened in 1888. The United States Government fish hatchery here includes thirteen ponds, well stocked with various species of fish. The city is on the edge of the zinc and lead mining district of southwestern Missouri, and manufactures foundry and machine-shop products, agricultural implements, flour, etc. Settled in 1839, Neosho was incorporated as a town in 1868, and in 1878 was chartered as a city. Population, in 1890, 2198; in 1900, 2725.

NEOSHO. A river rising in Morris County, east central Kansas (Map: Kansas, G 3). It flows southeast through eastern Kansas, then southwest and south through Indian Territory, joining the Arkansas River near Fort Gibson, after a course of about 350 miles. The chief towns on its banks are Oswego, Burlington, and Emporia.

NEOT′ENY. See PARTHENOGENESIS.

NEOTROPICAL REGION. In zoögeography, a primary division embracing South America and its islands, Central America, and the hot lowlands of Mexico and the West Indies. Other names proposed for it have been Austro-Columbian, Dendrogæa, and Notogæa. Its characteristics are more distinctly marked than in some of the other regions, and indicate a remote antiquity for the mainland areas, and also a long period of isolation from North America. It also has some curious resemblances to the Australian Region, especially in the presence of marsupials and ratite birds. It is naturally divided into four subregions by physiographic features. The first, or Brazilian Subregion, comprises the great forested equatorial area from the Caribbean coast to the pampas of Southern Brazil. The second, or Chilean Subregion, stretches along the Andean plateaus and the dry coast strip between the Andes and the Pacific, from Peru to about latitude 4° N. The third, or Mexican Subregion (q.v.), consists of Central America and tropical Mexico. The fourth, or Antillean Subregion, embraces all the West Indies except Trinidad and Tobago, which are continental in their characteristics. The region as a whole is characterized by great richness of life, as well as by marks of isolation. Wallace found that it had eight families of mammals absolutely confined to it, including the distinct group (Cebidæ and Hapalidæ) of 'New World' monkeys; the blood-sucking bats (Phyllostomidæ); the chinchillas, cavies, and three other families of rodents. Nearly all the edentates of the world are collected here—sloths, armadillos, ant-eaters, and the like. It has also many important lesser groups, as the llamas, the opossums (save one species), the hutias, the solenodons, and many peculiar carnivores. The absence of certain groups is notable; it has no civets, no insectivores (save a shrew or two from the North), no wild cattle or sheep, no ruminants, except the llamas and a few deer, and no other hoofed mammals except the tapir (elsewhere known only in Malaya) and the peccary. In birds the case is even more extraordinary. About twenty-five of its families are not known elsewhere, including such large or peculiar groups as the plant-cutters, manakins, cotinga, ant-thrushes, tree-creepers (Dendrocolaptidæ), toucans, todies, mot-mots, curassows, tinamous, sun-bitterns, and many others; while it possesses the great majority of several groups, such as the humming-birds, only scantily present in North America, and not known at all in the Old World. A similar account might be given of regional peculiarities in the departments of reptiles, amphibians, fishes, and the many branches of invertebrate life. The West Indies, as a part of this region, present some extraordinary peculiarities. Though so near to the shores of North America, their zoölogical affinities are distinctly Neotropical, and they present curious resemblances to the island fauna of Madagascar. See AMERICA, paragraph *Fauna;* Zoögeographical Map under DISTRIBUTION OF ANIMALS; and consult the authorities there cited.

NE′OZO′IC (from Gk. νέος, *neos*, new + ζωή, *zōē*, life). A term introduced by Edward Forbes to include all the strata from the Trias to the most recent deposits. It has been occasionally used as a substitute for Cenozoic (q.v.), and for the Tertiary system (q.v.).

NEPAL, nē-pal′, or **NIPAL**. An independent State on the southern slope of the Himalayas, bordering on Northern India (Map: India, D 3). It is bounded by Tibet on the north, by the native State of Sikhim and Bengal on the east, and by Bengal and the United Provinces of British India on the south and west. Its area is estimated at 54,000 square miles.

The southern portion, known as the *terai*, is a level strip of land, partly covered with forests and well cultivated. The rest of the country belongs to the region of the Himalayas (q.v.), and contains some of the highest mountains in the world, such as Mount Everest (29,000 feet) and Dhawalagiri, which are covered with perpetual snow. There are a number of minor ranges intersecting each other and inclosing numerous valleys. The country belongs to the basin of the Ganges, its chief rivers being the Karnali and the Sarju in the west, the Gandak in the centre, and the Kusi in the east. The climate varies considerably in accordance with the configuration of the surface. In the mountainous part it is naturally cold, while in the flat region along the southern boundary and in some of the valleys of the interior it is hot and humid. The average temperature at Khatmandu (over 4300 feet) is about 62°. Deposits of iron, lignite, copper, lead, and zinc are found and exploited to some extent by the natives. There are also many mineral springs and some deposits of gold and silver. The chief occupation of the inhabitants is agriculture; although carried on in a primitive way, it is highly intensive, owing to the scarcity of agricultural land. The slopes of the hills and ledges even, difficult of access, are utilized for agricultural purposes, and the methods employed for diverting mountain torrents for irrigational needs exhibit noticeable and varying degrees of ingenuity.

The chief crops in the central valleys are several varieties of rice, wheat, pulse, corn, sugarcane, potatoes, and various vegetables. In the *terai* region are cultivated tea, cotton, tobacco, etc. Many European fruits are successfully cultivated. The chief manufactures are coarse cloth, paper, brass bells, utensils, and ornaments. Excellent pottery is produced in some parts of the country and the wonderful wood-carving found in the temples testifies to the skill of the natives. The commerce of Nepal is chiefly with British India and Tibet. From British India are imported cotton goods, silver, spices, salt, brass, copper, sugar, iron, leather goods, etc. These are partly reëxported to Tibet, which sends in return drugs, tea, woolen cloth, salt, paper plant, domestic animals, honey, wax, silver, gold, etc. The chief exports to British India are rice, oil seeds, cattle, tobacco, hides, timber, and glue. The exports to and imports from British India amounted in 1900-01 to $5,987,049 and $5,257,372 respectively. Goods are usually transported by human carriers or pack animals.

Theoretically Nepal is an absolute monarchy, but the actual rulers of the State are the Prime Minister and his party. There are a State Council and a number of courts. The savage native code has been humanized by British influence. The revenue of the Government is derived chiefly from land tax, customs, mines, forests, and monopolies. There is an efficient army of about 50,000, which can be greatly enlarged in case of necessity in view of the fact that the Gurkhas (q.v.) are all efficient fighters.

No reliable figures as to the population of Nepal are available. Native statistics place it at 5,000,000, but these figures are probably exaggerated. The great mass of the population of Nepal are by some considered to be Mongolic, with large infusions of Dravidian and Aryan blood, while others regard them as a mixed race of Indo-Afghan and Mongolic descent. The chief divisions are the Kulu-lahuli and Paharias in the west, and the Mangars and Gurkhas in the east. Some of the hill-tribes have, perhaps, more of Mongolian than other blood, but the effects of the Hindu invasions from the twelfth century down are seen everywhere. The typical representatives of the Nepalese are the Gurkhas (q.v.), whose Aryan ancestors from Rajputana mixed with the aborigines. In religion the majority of the Nepalese are Hindus, but there are also several hundred thousand Buddhists. The Kulu-lahulis are dolichocephalic and below the average in stature. Education is entirely in the hands of the priests and the bulk of the population are illiterate. The children of the wealthy classes are sent to the educational establishments of British India. Capital, Khatmandu (q.v.).

HISTORY. Various ruling dynasties from a remote period are given in the native literature, but the first authentic mention of a ruler—Ançuvarma of the Thakuri dynasty—is made by Hiuen Tsang, the Chinese Buddhist pilgrim, who visited Nepal in the seventh century. In 1324 the country was invaded and occupied by Harisinha-deva, Raja of Simraungarh. Modern history begins in 1768 with its conquest by the Gurkhas, who originally were driven from Rajputana by the Mohammedan invasion. Gurkha aggressions on Tibetan territory in 1790 led to their defeat by China, and the limitation of their northern boundary. In 1814, by way of reprisals, the British invaded the country, but were defeated; the following year, however, advancing on

Khatmandu, they obtained favorable conditions of peace and the establishment of a British Residency at the capital. By the assassination of his uncle in 1845, and by the Kot massacre of his opponents in the following year, Jung Bahadur, a colonel in the army, became Prime Minister and nominal ruler. Having firmly established himself in power, he visited England in 1850, and after his return the fruits of his journey were exhibited in the wise reforms that he introduced. During the Indian Mutiny of 1857 he rendered valuable assistance to the British and was handsomely rewarded. He died in 1877 and was succeeded by his brother, who also resorted to wholesale executions to maintain his ascendency, and ruled until 1885, when he was murdered at the instigation of Bir Shamsher Jang, now Prime Minister and father-in-law, by two daughters, of the reigning Maharaja, Pirthivi Bir Bikram, who was born in 1875 and ascended the throne in 1881.

Bibliography. Hodgson. *Colonization of Nepaul* (Calcutta, 1857); id., *Essays on the Language, Literature, and Religion of Nepaul and Tibet* (London, 1874); Wright (ed.), *History of Nepaul* (Cambridge, 1877); Oldfield, *Sketches from Nepaul, Historical and Descriptive* (ib., 1880); Hunter, *Imperial Gazetteer of India*, vol. x. (ib., 1886); Bendall, *Journal of Literary and Archæological Research in Nepal* (ib., 1886); Vansittart, *Notes on Nepal* (Calcutta, 1895); Ballantine, *On India's Frontier, or Nepal* (New York, 1896); Waddell, *Among the Himalayas* (London, 1898); Boeck, *Durch Indien ins verschlossene Land Nepal* (Leipzig, 1903).

NEPENTHE, nē-pĕn′thē (Gk. νηπενθής, *nēpenthēs*, from νη-, *ne-*, negative prefix + πένθος, *penthos*, grief). In the *Odyssey*, an epithet of a drug given to Helen in Egypt, possessing the power to bring forgetfulness of every pain or grief. Later writers identified the drug with opium, or some preparation of hemp.

NEPENTHES, nē-pĕn′thēz. A genus of herbs or half-shrubby plants of the natural order Nepenthaceæ. The species are natives of swampy ground in India, China, Malaysia, Madagascar, etc., and are chiefly remarkable for the leaves of some species which consist of a dilated foliaceous petiole, prolonged beyond its foliaceous part, as if it were the prolongation of the midrib of a leaf, and terminating in a pitcher (ascidium), from which the name pitcher-plant has been derived. The pitcher is terminated by a lid, which is regarded as the true blade of the leaf. The fluid found in these pitchers is a secretion of the plant itself. Insects often enter the pitcher, and according to investigations of Vines, are dissolved by a ferment secreted by the leaves and absorbed; so that the nepenthes rank among insectivorous plants. Many of the species are epiphytes, being attached to trees and other plants, and are rather commonly grown in hothouses for their strange leaves. The name pitcher-plant is applied to many other plants, as Sarracenia spp., Arisæma triphyllum, etc.

A CULTIVATED VARIETY OF NEPENTHES.

NEPHELENE SYENITE (*nephelene*, from Gk. νεφέλη, *nephelē*, cloud + *syenite*). *Laurvigite.* An igneous rock of granitic texture, of which the essential mineral constituents are nephelene and alkali feldspar. Nephelene syenites usually contain also an alkaline variety of pyroxene (acmite or ægerine), and frequently also nosean or haüyne, sodalite, sphene, and peculiar varieties of mica (lepidomelane) and garnet (melanite). These minerals are so generally found together, and so rarely occur except when in association with nephelene or the allied mineral leucite, that the nephelene syenites and a few rare families of rocks (leucite syenites, theralites) are quite marked in their peculiarities. Nephelene syenites are very rich in the alkalies and alumina. They are quite subject to alteration by weathering processes.

NEPH′ELITE (from Gk. νεφέλη, *nephelē*, cloud). A mineral sodium-aluminum silicate that crystallizes in the hexagonal system, has a vitreous or greasy lustre, and is generally colorless or light yellow, though sometimes when found massive it is green or red. It occurs in both ancient and modern volcanic rocks, and in such as syenite. It is found in the lavas of the volcanoes of Italy; also in Bohemia, in France, in Brazil, and in Canada; in the United States the massive and crystallized varieties are found in Maine, New Jersey, in the Ozark Mountains (Arkansas), and in Montana.

NEPHE′LIUM. A genus of plants. See Litchi.

NEPHI, nē′fī. A city and the county-seat of Juab County, Utah, 87 miles south of Salt Lake City; at the junction of the Oregon Short Line and the Sanpete Valley railroads (Map: Utah, B 2). It is the distributing point for a district interested chiefly in farming, lumbering, and cattle-raising, and in the mining of salt and gypsum. Population, in 1890, 2034; in 1900, 2208.

NEPHOSCOPE (from Gk. νέφος, *nephos*, cloud + σκοπεῖν, *skopein*, to view). An instrument used by meteorologists for observing the clouds, and especially for determining the amount and direction of the horizontal component of the apparent motion of a cloud. The modern nephoscope is the development of an idea embodied by Aimé in 1846, in his so-called 'reflecting anemometer,' and in its best form it has a wide range of usefulness. The simplest form is merely a horizontal mirror, having a circular graduated edge. The observer brings one eye to such a position that the reflected image of the cloud is seen to pass from the centre of the mirror to the circumference, and he merely records the direction in which the image appears to pass off. The Marvin nephoscope, an instrument of high precision, is used by the United States Weather Bureau observers, and has been extensively employed in cloud observations. A form of nephoscope for use on vessels at sea was devised by Professor Finemann and used by him about 1888. About the same time Professor Abbe devised his marine nephoscope and a method of using it for determining absolute altitudes and movements of clouds at sea. It consists essentially of a light bronze circle fitting rather loosely on top of the ordinary ship's compass; it therefore replaces the nearly horizontal circle of the apparatus ordinarily used by the navigator to sight upon the sun when measuring azimuths. The bronze circle is graduated, and at its zero point carries a hinge and an adjustable arm, having at its end a knob which serves to define the line of sight. The circle also carries a glass mirror from which the quicksilver backing has been removed, leaving a transparent circle, through which the graduation of the compass needle can be read. As this marine nephoscope enables one to locate a storm centre by the motions of the lower clouds better than can be done by the wind, and as it gives the direction of the pennant at masthead much more accurately than it can be observed by the unaided eye, it is strongly recommended for use by navigators at sea. To ordinary meteorological observers it has the special advantage of being the only instrument by means of which observers at sea can easily determine the absolute altitude and movements of clouds.

Bibliography. A full account of various forms of nephoscopes is given in Abbe, *Treatise on Meteorological Apparatus and Methods* (Washingington, 1888), published as part 2 of the *Annual Report, Chief Signal Officer* for 1887. The Marvin nephoscope is described in the *Monthly Weather Review*, vol. xxiv. (Washington, 1896), and also in separate pamphlets. The description of Abbe's marine nephoscope was first published in 1893 in the *Report of the International Meteorological Congress* held in Chicago (*Weather Bureau Bulletin ii.*). A general description of work done with it is contained in the *American Meteorological Journal* for October, 1891.

NEPHREC'TOMY (from Gk. νεφρός, *nephros*, kidney + ἐκτομή, *ektomē*, excision, from ἐκ, *ek* + τομή, *tomē*, a cutting, from τεμνειν, *temnein*, to cut). The total removal of a kidney in rare cases of acute or chronic infection, either because the kidney is useless or because it is a source of infection owing to abscesses in its substance. The oblique extraperitoneal lumbar incision is the operative procedure of choice. Cutting through the lumbar muscles obliquely from the outer border of the sacro-lumbalis muscles, an inch below and parallel to the twelfth rib, making his incision downward and forward, the surgeon reaches the kidney. Blunt dissection frees it from its site and divests it of its capsule. Its pedicle is then tied and it is separated and removed. There is considerable danger from hemorrhage of the vessels of the pedicle. Tuffier states the mortality as follows: Primary nephrectomy, 371 cases, 36.8 per cent.; lumbar nephrectomy, 200 cases, 28.4 per cent.; secondary nephrectomy following nephrotomy (q.v.), 36 cases, 13.9 per cent. Garceau gives the mortality of nephrectomy for tuberculosis as 17.4 per cent., of secondary nephrectomy following nephrotomy, 11.9 per cent. Consult Warren-Gould, *International Text-Book of Surgery* (Philadelphia and London, 1902).

NEPH'RITE (from Gk. νεφρός, *nephros*, kidney). A variety of amphibole that varies from white to dark green in color, according to the amount of ferrous oxide that it contains. It is known chiefly through the carved ornaments and utensils that are found among the remains of primitive man in various parts of the world, especially in China and Mexico, and known under the collective name of *jade* (q.v.). Many imaginary virtues were ascribed to it, and it was especially sought after as a cure for epilepsy and diseases of the kidneys.

NEPHRI'TIS. See Bright's Disease; Cirrhosis.

NEPHROT'OMY (from Gk. νεφρός, *nephros*, kidney + τομή, *tomē*, a cutting). The operation of cutting open a kidney for the purpose of removing a stone or evacuating pus. An incision is made in the lumbar region, obliquely, from the outer border of the sacro-lumbalis muscle, an inch below the twelfth rib, parallel to the rib and forward and downward. The kidney is reached by the finger, and then the incision is modified as the nature of the case demands. The organ being grasped and drawn into reach, after blunt dissection, the surgeon bisects it through its convex edge, removes the calculi, and evacuates the pus. The viscus is then sutured together and replaced. Tuffier gives the results of the operation in these figures: In 43 cases there were 3 deaths, 2 fistulæ, and 38 recoveries. Consult Warren-Gould, *International Text-Book of Surgery* (Philadelphia and London, 1902).

NEPH'THYS (Lat., from Gk. Νέφθυς, Egyptian *Nebt-hat*). An Egyptian goddess, the daughter of Seb and Nût, and the sister and wife of Set (q.v.). By her brother Osiris, she was the mother of Anubis (q.v.). In the legend she joins with her sister Isis in mourning over and guarding the body of Osiris, and therefore in funerary scenes the two goddesses are often depicted protecting the mummy of the deceased. The lamentations of Isis and Nephthys over the body of Osiris form the subject of a poem of which several copies have been preserved. Nephthys is usually represented as a woman wearing upon her head the ideogram of her name. As a protector of the dead from evil influences she was worshiped throughout Egypt. Consult: Wiedemann, *Religion of the Ancient Egyptians* (New York, 1897); Horrack, *Lamentations d'Isis et de Nephthys* (Paris, 1866).

NEPI, nā'pē. An episcopal city in the Province of Rome, Italy, 17 miles southeast of Viterbo (Map: Italy, G 5). It is the Etruscan Nepete and the Roman Colonia Nepensis. The town is encircled by its ancient walls and towers, and has an eleventh-century cathedral, a ruined castle, the residence of Lucretia Borgia in 1500, and a handsome Renaissance municipal palace. Population, in 1901, 3036.

NEP'IGON, Lake. A lake of Canada. See Nipigon, Lake.

NEP'ISSING, Lake. A lake of Canada. See Nipissing, Lake.

NEPOMUK, nā'pô-mụk, John of. See John of Nepomuk.

NE'POS, Cornelius. A Roman historian, who flourished about the middle of the first century B.C. The place and precise time of his birth are unknown. He was the friend of Cicero and Catullus. The only work of his which has survived (if indeed it be his) is a series of twenty-five generally brief biographies of warriors and statesmen, mostly Greeks. These biographies are distinguished by the purity of their Latinity, the conciseness of their style, and their admirable delineation of character, but sufficient care has not been exercised in the examination of authorities, nor is the relative importance of things duly regarded. Until the middle of the sixteenth century, these biographies, on the strength of the titles given in the various manuscripts, were generally ascribed to Æmilius Probus, a writer who lived in the latter part of the fourth century; but in 1569 an edition was put out by the famous Dionysius Lambinus, who pronounced the so-called *Lives* of Æmilius Probus to be in reality the lost work of Cornelius Nepos, *De Viris Illustribus.* There are many editions, among which may be mentioned those of Van Staveren (Leyden, 1773), of Tzschucke (Göttingen, 1804), of Fleckeisen (Leipzig, 1884), of Nipperdey (10th ed., Leipzig, 1896), of Lindsay (New York, 1895), and of Flagg (New York, 1895).

NEP'TUNE (Lat. *Neptunus;* connected with Av. *napta*, moist), or POSEIDON (Gk. Ποσειδῶν, *Poseidōn, Doric* Ποτειδάϝων, *Poteidavōn,* Ποτειδᾶν, *Poteidan;* of uncertain etymology). In classical mythology, a brother of Zeus and lord of the sea. In legend he is the son of Cronus and Rhea. His home is a splendid palace in the depths of the sea near Ægæ, though which town of this name was meant caused much dispute. His wife in Hesiod is Amphitrite, and she shared his cult on the Isthmus. As a lover he rivals his brother Zeus, and many legends traced local heroes to Poseidon and some nymph or daughter of an early king. So Neleus and Pelias were sons of Poseidon and Tyro. In his nature Poseidon is always wild and implacable, never becoming a guardian of higher virtues. He is the 'shaker of the earth,' a natural conclusion from the frequency with which disturbances of the sea accompany the shocks on land, but he is, above all, the master of the sea, who sends the dreaded storms, and at his will controls the waves, which are called his swift horses. His attribute is the trident, or three-pronged harpoon of the Ægean fisherman, with which he controls the waves, or brings springs from rocks. Closely associated with him is the horse. He was the horse-tamer, was honored with horse-races at many points, horses were frequently sacrified to him, and there are traces of a belief that he was in the form of a horse. His worship was chiefly confined to the coast, though he had temples even in the inland country of Arcadia, and it is not at all improbable that he was originally a god of water and moisture in general. There is some evidence for a decline in Poseidon worship, which seems reflected in the legends of his contest with Athena for Attica and with Hera for Argos. At Athens he was worshiped in the Erechtheum, and it seems clear that both Erechtheus and Ægeus are in essence the same deity. From him was also named the Attic month Poseideon (about December). He was a great Ionian divinity, and the Panionia were celebrated by the twelve Ionic cities at his sanctuary at Mycale. His temple on the island of Calauria, where Demosthenes died, was in very early times the centre of an amphictyony or league of maritime States. His most famous cult, however, was on the Isthmus of Corinth, where the *Isthmian Games* were celebrated in his honor. In art Poseidon has much the same type as Zeus, but without the dignity and benignity of the latter. Statues of him are by no means common. Two of the best are the Poseidon of Melos, now in Athens, and the fine statue in the Lateran, which many regard as derived from the famous bronze by Lysippus on the Isthmus.

At Rome the old Italian or Roman water-god, who appears dimly in religious tradition, seems to have been early identified with Poseidon, and during the historical period Neptune is scarcely distinguishable from the Greek god of the sea.

NEPTUNE. The outermost member of the solar system. Its mean distance from the sun is 2,792,000,000 miles; its diameter 34,800 miles; period of revolution about 165 solar years; mass seventeen times that of the earth; density one-fifth of the earth's. Thus, it is about eighty-five times larger than the earth, but from its extreme remoteness is of almost inappreciable magnitude when seen through an ordinary telescope.

DISCOVERY. The discovery of Neptune was an event unique in scientific history. It was the disturbance in the motion of Uranus, caused by the attractive force of Neptune, which led to its discovery. From 1690 to its discovery as a planet by Herschel, Uranus (q.v.) had been repeatedly recorded as a fixed star. Earlier observations were found not to agree with later observations, and hence it became evident that either the earlier observations were erroneous or that Uranus was wandering from its ancient track. On October 21, 1845, John Couch Adams (q.v.) communicated to the Royal Astronomer estimates of the elements and position in the heavens of a planet, whose mass would account for the orbital irregularities of Uranus. This did not, however, lead to any search for the planet in the heavens, and the matter remained buried in obscurity. In the same year the attention of Jean Joseph Leverrier (q.v.), a teacher of astronomy in the Ecole Polytechnique, was brought to the Uranian difficulty. In two papers communicated to the French Academy, Leverrier proved that only an exterior body could produce the irregularities in the Uranian orbit. In a third paper, submitted August 31, 1846, he had computed the orbit of the supposed planet, the visibility of which he described as that of a star of the eighth magnitude. These results were communicated to Galle of the Berlin Observatory, with a request to look for the planet in the place assigned to it. This Galle did in the evening of September 23d, and perceived a small body with a disk nearly 3″ in diameter. The place where it was found was within less than 1° of the spot indicated. Before the news of the discovery reached England, it had already been duplicated. Under the direction of Airy, director of the Greenwich Observatory, Challis of the Cambridge Observatory had commenced a search for the planet July 29th, and recorded 3150 stars, three of which were different positions of the planet, recorded on August 4th, August 12th, and September 29th. Challis proceeded to map them, but as he had no good star map this required considerable time, and before this was accomplished, news of the discovery arrived from Berlin on October 1, 1846. Neptune had already been seen by Lalande on the 8th and again on the 10th of May, 1795, but was taken to be a fixed star and repeatedly entered in the catalogues as such till its discovery as a planet.

Neptune is attended by one satellite, which was discovered October 10, 1846, by Lassell. This satellite, like those of Uranus, differs from the satellites of other planets in the direction of its motion, which is from east to west in a plane inclined at an angle of 35° to that of the ecliptic. Its period of revolution is 5 days 21 hours, and its distance from the planet somewhat less than that of our moon from the earth. For a complete account of the discovery of Neptune, consult Clerke, *History of Astronomy During the Nineteenth Century* (London, 1890). See PLANETS; SOLAR SYSTEM.

NEPTUNE, TEMPLE OF. (1) A remarkably preserved and majestic Doric temple at Pæstum, originally called Posidonia, in Lucania. The temple is a peripteral hexastyle, and measures 120 by 85 feet. The cella is surrounded by a passageway, and has two columns *in antis* at front and rear. The temple stands on a platform of three steps. (2) A temple forming part of a group of buildings erected on the Campus Martius at Rome, in B.C. 26, by Agrippa in commemoration of the victories at Mysæ, Naulochus, and Actium. It stood in the midst of a great square surrounded by a colonnade, the Portico of the Argonauts, which was decorated with naval paintings. The whole group was called the Neptunium, and was the seat of the Admiralty. It was destroyed in the great fire of A.D. 80, and was restored by Hadrian. Eleven columns of the temple, with a part of the cella and decorated ceiling, are still preserved. The substructure, now buried, bore under each column the figure of a Roman province, with trophies between the columns, of which there were thirty-six, corresponding to the number of Roman provinces at the time of Hadrian. A number of the figures have been recovered, but are dispersed in various collections. The cornice is mistakenly restored with a copy of the cornice of the Temple of Concord.

NEPTU′NIAN (from Lat. *Neptunius*, relating to Neptune, marine, from Lat. *Neptunus*, name of the Roman sea-god). A term formerly applied to the geologists who maintained the aqueous as against the igneous theory of the origin of rocks. The discussions between the two schools were long and bitter. See GEOLOGY.

NÉRAC, nā′răk′. The capital of an arrondissement in the Department of Lot-et-Garonne, France, on the Baise, 16 miles southwest of Agen (Map: France, G 7). The old town on the right bank of the river is united by bridges to the modern industrial quarter on the left bank. The ruins of its former imposing royal castle, now numbered among French historical monuments, and its park of La Garenne, are the chief objects of interest, and there is a small but interesting museum containing numerous remains, indicating the presence of an unknown city of Roman days on the site of Nérac. Corks, machines, coaches, and cloth are manufactured, and there is a general trade in wine, grain, and hemp. Here Henry IV., to whom there is a monument, spent his youth. Population, in 1900, 6435.

NERBUDDA, nẽr-bŭd′dȧ, more correctly **NARBADA** (Skt. *Narmada*). A river of India. It rises in the Maikal Range in the northern part of the Central Provinces, and flows southwestward for 800 miles, emptying into the Gulf of Cambay through an estuary beginning at Broach, 200 miles north of Bombay (Map: India, C 4). In the upper half of its course, below Jabalpur, it flows through a great depression between the Vindhya Mountains on the north and the Satpura range on the south, and is broken by numerous falls and rapids. In this valley, near Hoshangabad, are important deposits of coal and iron ore. In its lower course the river is broad, and becomes a tidal stream 50 miles from its mouth. Sea-going vessels ascend the estuary to Broach, and the river is navigable 82 miles for large boats, while smaller ones can ascend 28 miles farther. The Nerbudda is to the Hindus one of the most sacred streams of India.

NEREID (nē′rē-ĭd) **MONUMENT.** The name given to a sculptured heroön at Xanthus in Lycia, dating from the fourth century B.C., and discovered in 1838 by Sir Charles Fellows. The sculptures from the monument, preserved in the British Museum, show ten female figures with dripping garments, which, with the shells and seaweed represented, gave the monument its name.

NEREIDS (Gk. *Νηρηΐδες*, *Νηρεΐδες*, *Nēreïdes*). Sea-nymphs, daughters of Nereus and Doris, daughter of Oceanus. Their number is variously given, though fifty seems to have been the popular belief. We have, however, in the various lists some seventy-seven different names. Few of them appear as individuals, and of these Thetis, mother of Achilles, Amphitrite, the wife of Poseidon, and Galatea, beloved by the Cyclops Polyphemus, are alone conspicuous. In art they appear frequently as spectators in scenes involving sea-deities, as at the contest between Nereus and Hercules, or the capture of Thetis by Peleus, while a favorite scene represents them as bringing to Achilles the armor made by Hephæstus. In the later art they appear riding on various sea-monsters, sporting with Tritons, or attending on Poseidon and Amphitrite. The name has continued in the popular belief of the Greeks of to-day, but the Nereids are no longer sea-maidens, but have become nymphs of the land. The stories are in part such as correspond with the ancient ideas, but in many tales they appear as dangerous and vindictive spirits, carrying away children, or, vampire-like, sucking human blood. In summer they are supposed to be especially dangerous at mid-day, seizing their victims by a sudden stroke or destroying their senses. The old belief that whoso saw a nymph might be smitten with madness reappears in the modern popular superstition, and it is thought dangerous to haunt their caves, and still more to be caught in the whirlwinds of dust raised in their dances.

NEREIS. A genus of annelids (family *Nereidæ*) having a long slender body, a distinct head, with tentacles and eyes, the whole body covered with tubercles, and the gills lobed and tufted. They are all marine, and generally hide under rocks or in the sand. They swim actively by rapid and undulating inflections of the body, and by the aid of numerous 'oars' (setæ) arranged along the sides. The proboscis is thick, strong, and armed with two jaws.

NEREITES, nē′rē-ī′tēz (Neo-Lat., from Lat. *Nereis*, Nereid). A peculiar fossil trail found in the Cambrian rocks of America and Europe, and supposed to have been made by a crawling worm. See FOSSIL; WORM.

NEREUS, nē′rē-ŭs *or* nē′ro͞os (Gk. *Νηρεύς*), In Greek legend, an ancient sea-divinity, son of Pontus (sea) and Gæa (earth), and father, by Doris, of the Nereids. He seems to have been worshiped at Gythium, and probably elsewhere; but his cult was never prominent, and in legend he plays scarcely any other part than father of the Nereids, among whom was included Thetis, mother of Achilles. In the myths he is usually friendly and helpful, and his only contest is with Hercules, who, in order to learn the way to the Garden of the Hesperides, was obliged to wrestle with and hold Nereus, in spite of his manifold changes of shape.

NER′GAL. A prominent deity in the Babylonian and Assyrian pantheons. The name (probably better, Nerigal) is assured by the Old Testament; its meaning is obscure ('the rager,' or 'the great ruler'), the Babylonian etymologists explaining it as 'the mighty one of the great dwelling-place,' with reference to Nergal's lordship over Hades. His original aspect seems to have been that of a solar deity, representing especially the blazing heat of the sun at noon or the summer solstice: thus he is referred to as 'the hero of the gods, the lofty meridian sun.' As a destructive deity he became the god of war and the god of pestilence. He shares the former characteristic with Ninib, along with whom he also appears as the god of the chase. But he appears more uniquely as the god of pestilence, and so he became by an easy transition of thought the god of those whom he destroyed, and thus the deity of the lower world. Accordingly in the later mythology he stood for the declining sun, and the month of Chislev (December) is dedicated to him. This development in the character of Nergal is presented in a story preserved in an Amarna tablet, to the effect that the gods of the upper world became engaged in war with Allatu (Eresh-kigal), the goddess of Hades; Nergal as their leader makes his way into her presence, but is induced by her supplications to save her life and to marry her, so becoming the god of the lower world. With this may be compared the classic myth of Pluto and Proserpine. Nergal had also as wife Laz, probably an upper-world goddess. As god of war and destruction, Nergal was identified with the planet Mars, while the lion was his symbol. Nergal's ancient sanctuary, with which he was always associated from earliest to latest times, was Cutha, the name of which even became a synonym of Hades. Accordingly, the Cuthæan colony which was settled in Samaria after the deportation of Israel brought thither the cult of Nergal (II. Kings xvii. 30). His cult, however, was widespread and seems to have been especially patronized in the later Assyrian Empire. Consult Jastrow, *Religion of Babylonia and Assyria* (Boston, 1898).

NERI, nā′rē, Philip. See Philip Neri, Saint.

NERIN′EA (Neo-Lat., from Lat. *Nerine*, variant of *Nereis*, Nereid). A genus of siphonostomate gastropods allied to the Cerithiidæ and exclusively restricted to the Mesozoic formations, where it is especially abundant in and characteristic of the Jurassic coral beds of Europe. The shell is long and turreted, with many whorls, and the columella always, and usually also the inner lip of the aperture, are ornamented with strong ridges. Longitudinal sections of the shell show that these ridges increase in size and complexity from the apex to the aperture of the shell, in other words, as the shell increases in growth from its young to its adult stage.

NERIS′SA. In Shakespeare's *Merchant of Venice*, the companion of Portia. She marries Gratiano.

NE′RIUM. A subtropical plant. See Oleander.

NERLY, nĕr′lē (properly Nehrlich), Friedrich (1807-78). A German architectural and landscape painter, born at Erfurt, and educated at Hamburg. After studying in Rome for several years, Nerly visited Southern Italy, and in 1837 settled in Venice. Thenceforth he painted, almost exclusively, views in Venice, one of the first being the "Piazetta by Moonlight," a subject which met with universal favor. A fine view of "San Giovanni e Paolo" is in the National Gallery, Berlin, and mention may be made of a "Team of Buffaloes Drawing a Huge Marble Block Through the Campagna," in the Schwerin Gallery. His son and pupil, Friedrich (1842—), attained distinction as an able landscape and marine painter.

NERNST, nĕrnst, Walther (1864—). A German physicist, born at Briesen (West Prussia). He studied at the universities of Zurich, Berlin, Gratz, and Würzburg; in 1887 was appointed assistant to Ostwald at Leipzig, and in 1889 lecturer in physical chemistry in the university. In 1891 he became professor at Göttingen, where in 1895 he also organized and became director of the institute for physical chemistry. He is known as the inventor of the Nernst incandescent electric lamp, in which the carbon filament of the ordinary incandescent lamp is replaced by a bar of magnesia, which, unlike the carbon, is efficient at nearly its melting-point, and therefore much superior in illuminating power. The cost of operation is also said to be considerably less. See Electric Lighting.

NERNST LAMP. See Electric Lighting.

NE′RO. A Roman Emperor (A.D. 54-68). He was born at Antium, on the coast of Latium, December 15, A.D. 37, and was the son of Cn. Domitius Ahenobarbus and of Agrippina, the daughter of Germanicus Cæsar, and sister of Caligula. His mother afterwards became the wife of the Emperor Claudius, who adopted him (A.D. 50), and his name, originally L. Domitius Ahenobarbus, was changed to Nero Claudius Cæsar Drusus Germanicus. After the death of Claudius (A.D. 54), the Prætorian Guards, at the instigation of Afranius Burrus, their prefect, declared him Emperor, instead of Claudius's son Britannicus, and their choice was acknowledged both by the Senate and the provinces. His reign began under the guidance of Burrus and his tutor, Seneca, the philosopher; but the influence of his mother, together with his own moral weakness and sensuality, frustrated their efforts, and he soon plunged into debauchery, extravagance, and tyranny. He caused Britannicus, the son of Claudius, to be poisoned at the age of fourteen, because he dreaded him as a rival, and afterwards (A.D. 59) procured the death of his own mother, Agrippina, to please his mistress, Poppæa Sabina. She was the wife of his principal boon-companion, Otho, afterwards Emperor, and in order to marry her he divorced and afterwards put to death his wife Octavia, the sister of Britannicus (A.D. 62). The affairs of the Empire were at this time far from tranquil. In A.D. 61 an insurrection broke out in Britain among the Iceni under their Queen, Boadicea, which was, however, suppressed by Suetonius Paulinus. The following year saw an unsuccessful war against the Parthians in Armenia. At home matters were not much better. The Emperor was lampooned in verse; the Senate and priesthood, alike venal, were also satirized by audacious malcontents; Burrus died, and even Seneca removed from Court. In July, 64, occurred a great conflagration in Rome, by which two-thirds of the city was reduced to ashes. Nero himself is usually believed to have been the incendiary. It is said that he admired the spectacle from a distance, reciting verses about the burning of Troy, but many scholars are doubtful whether he really had any hand in it. At all events, he laid the blame on the Christians, and persecuted them with great fury. He rebuilt the city with great magnificence, and reared for himself a splendid palace extending from the Palatine Hill over the intervening valley to the slopes of the Esquiline, called, from the immense profusion of its golden ornaments, the *Domus Aurea*, or Golden House; and in order to provide for this expenditure, and for the gratification of the Roman populace by spectacles and distributions of corn, Italy and the provinces were unsparingly plundered. A conspiracy against him failed in the year 65, and Seneca and the poet Lucan fell victims to his vengeance. In a fit of passion he killed his wife Poppæa. He then proposed marriage to Antonia, the daughter of Claudius, but was refused, whereupon he caused her to be put to death, and married Statilia Messalina, after killing her husband. His vanity led him to seek distinction as a poet, a philosopher, an actor, a musician, and a charioteer, and he received applause, not only in Italy, but also in Greece, which, upon invitation of the Greek cities, he visited in 67. In 68 the Gallic and Spanish legions, and after them the Prætorian Guards, rose against him, proclaimed Galba Emperor, and Nero fled from Rome to the house of a freedman, Phaon, about four miles distant. The Senate, which had hitherto been most subservient, declared him an enemy of his country, and the tyrant ended his life by suicide, June 9, 68.

NERTCHINSK, nyĕr′chĭnsk. A district town in the Territory of Transbaikalia, Siberia, situated on the Nertcha and the Trans-Siberian Railway, 184 miles east of Tchita, the capital of the Territory (Map: Asia, L 3). It is poorly built. It has a museum and a library. The inhabitants are engaged chiefly in the cultivation of tobacco and vegetables, and in the fur trade, of which Nertchinsk is still an important centre. The town was founded in 1656 over a mile from its present site. It soon rose to great importance as the centre of the trade with China. With the rise of Kiakhta (q.v.) Nertchinsk lost in commercial importance, but it soon became the centre of an extensive mining region and received many immigrants, a considerable proportion being convicts. By the Treaty of Nertchinsk, concluded in 1689, the two rivers of Argun and Gorbitsa and the Stanovoi mountain chain were fixed upon as the boundary lines between Siberia and Manchuria. The mining industry in the vicinity of Nertchinsk is now of secondary importance. Population, in 1897, 6713, including about 1200 exiles.

NER′THUS. In Northern mythology, a goddess worshiped by the tribes of Northern Germany, among whom she journeyed at intervals, bringing peace and fertility. Her shrine was an island, sometimes identified with Rügen. She is also called Hertha, from a former reading of the passage in Tacitus in which she is mentioned.

NÉRUDA, nyĕ′rụ-dȧ, JAN (1834-91). A Bohemian poet and novelist, born at Prague. He was educated at the university in his native city, and began to write under the pseudonym of Janko Hovora. His poetical works belong to the Romantic School, new in Bohemia in his time, and he was influenced by the contemporary movement in the same direction in Germany. His volumes of verse include: *Hřbitovní kv̌ití* ("Flowers from the Cemetery," 1858); *Knihy vešů* ("Books of Verse," 1868); and *Písně kosmické* ("Cosmic Songs," 1878). He also wrote several plays of lesser importance. Néruda was connected with various newspapers as editor and contributor; he founded the review *Krěty* in 1866, and much of his best work appeared in the *Národní Listy*, for which he was feuilletonist from 1865 to 1891. His prose masterpiece, the studies of life in Prague called *Malostranské povídky*, was published in 1878. Others of his sketches and novels are: *Arabesky* (1864); *Různí lidé* (1871); *Obrazy z ciziny* (1872); and *Feuilletony* (1876 et seq.), all remarkable for humor, observation, and a style full of charm. His complete works were edited by Herrmann in 1891-99 (Prague).

NERUDA (NORMANN-NERUDA), WILMA MARIA FRANCISCA (1839—). A European violinist, born at Brünn, in Moravia, where her father was organist of the cathedral. She became a pupil of Jansa, and made her first appearance at Vienna, in 1846. In 1849 she went to London to play at the Philharmonic in one of Bériot's concerts. She then returned to the Continent and passed several years traveling as a soloist, chiefly in Russia. In 1864 she visited Paris and played with great success at the Pasdeloup concerts, the Conservatory, and elsewhere. In the same year she was married to Ludwig Normann, a Swedish musician. She returned to London in 1869, again taking part in the Philharmonic; in the winter following she played the first violin at the Monday Popular Concerts; and in 1888 married Sir Charles Hallé, with whom she toured Australia in 1890-91. She visited the United States in February, 1899.

NER′VA, FORUM OF, or FORUM TRANSITORIUM. The fourth of the Imperial fora at Rome, formed from the highway which separated the Forum of Peace from the Forum of Augustus. It was also called Forum Palladium, from the Temple of Minerva (Pallas), of which two Corinthian columns remain, the temple having been destroyed in 1606 to build the Chapel of Saint Paul in the Church of Santa Maria Maggiore.

NERVA, MARCUS COCCEIUS. A Roman Emperor (A.D. 96-98). He was born A.D. 32, of a family belonging to Narnia, in Umbria, and twice held the honor of consulship before his election by the Senate to the dignity of Emperor, after the murder of Domitian. He displayed great wisdom and moderation, rectified the administration of justice, and diminished the taxes; but finding himself, on account of his advanced age, not vigorous enough to repress the Prætorian Guards, he adopted M. Ulpius Trajanus, then at the head of the Army of Germany, who succeeded him on his death, January 25, 98. After his decease, he obtained an apotheosis.

NERVAL, nâr′vȧl′, Gérard de. A French writer. See Gérard de Nerval.

NERVE. See Nervous System and Brain.

NERVE-STRETCHING. A variety of treatment of sciatica, which is accomplished by putting the patient on his back and flexing the thigh strongly upon the abdomen. It has been successful in alleviating the pain in a few cases. See Sciatica.

NERVI, nĕr′vē. A town in the Province of Genoa, Italy, situated on the seacoast, six miles east of Genoa. It is a favorite winter health resort of the eastern Riviera. Population (commune), in 1901, 6766.

NERVII, nĕr′vĭ-ī. An ancient tribe in Gallia Belgica, north of the Ambiani. In the time of Cæsar, who first mentions them, they were a warlike people, who prohibited trade with their neighbors, forbade the introduction of luxuries, and attempted to make an alliance of the surrounding tribes against the Romans. Cæsar subdued them in B.C. 57.

NERVOUS DISEASE. An affection of any part of the nervous system, either of the brain, spinal cord, sympathetic nerves, or peripheral nerves. Diseases of the nervous system are divided into functional and organic. In the latter local anatomical alteration of nerve structure is apparent. There are in reality no such things as functional diseases. While not seen or described, undoubtedly anatomical changes are present in many cases; and in others there are lesions at a distance which constitute the real disease, while the symptoms which occupy the attention are the result of reflex action. It cannot be affirmed that there are no structural changes in nerve-fibres in so-called functional diseases of the nervous system, which constitute the bulk of nervous diseases. There are 176 special nervous diseases, classed as follows: peripheral, 87; spinal cord, 40; brain, 28; and functional, 21. Of these there are about 65 which are either very common or extremely important (Dana). In their proper place are found articles on the following nervous diseases or conditions: Acromegaly; Apoplexy; Caisson Disease; Catalepsy; Chorea; Embolism; Epilepsy; Goitre; Hysteria; Insomnia; Locomotor Ataxia; Meningitis; Myelitis; Neurasthenia; Neuralgia; Neuritis; Neurosis (including *occupation neuroses*); Neurotics; Paraplegia; Paralysis; Sclerosis; Sleeping Sickness; Thrombosis; Tic, etc. There is also an article on Neurology. In addition there are articles in the domain of psychiatry, on Insanity; Mania; Melancholia; Monomania; Paranoia; Paresis; Kleptomania; Dipsomania; Pyromania; Puerperal Mania, etc., as well as on Idiocy and Imbecility.

Consult: Starr, *Familiar Forms of Nervous Disease* (New York, 1895); Charcot, *Clinical Lectures on Certain Diseases of the Nervous System*, translated by Hurd (Detroit, 1888); Hirt, *The Diseases of the Nervous System*, translated by Hoch (New York, 1893); Gowers, *Manual of Diseases of the Nervous System* (London, 1899); Beevor, *Diseases of the Nervous System* (Philadelphia, 1898); Church and Peterson, *Nervous and Mental Diseases* (ib., 1901); Dana, *Textbook of Nervous Diseases* (New York, 1901); Oppenheim, *Lehrbuch der Nervenkrankheiten* (Berlin, 1902).

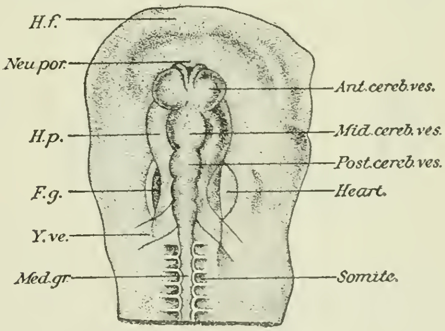
NERVOUSNESS. A condition of unstable nervous equilibrium, which is largely temperamental. A person afflicted with nervousness startles easily at sudden sounds, is unduly emotional, lacks poise and self-possession. If the condition go beyond these limits, actual disease is present, and the person is a neurasthenic, i.e. a sufferer from nerve fag. This state is characterized by unfounded feelings of apprehension, tremor, headache, disordered digestion, insomnia, loss of power of application, and irritability. Overwork, excesses, and disease may cause nervousness in normally stable people, which disappears when the cause is removed.

NERVOUS SYSTEM AND BRAIN. Historical. It is impossible in an article such as the present to do more than touch upon some of the more important investigations which have brought us to our present conception of nervous system structure. To the philosopher Descartes, in the latter part of the sixteenth century, belongs the honor of the first recorded description which gives any intelligent conception of the structure of the nervous system. His drawings of the brain possess a very fair degree of accuracy as regards general shape, though the lobes and convolutions appear much distorted. He pictured the nerves as originating in the brain and described their function as the carrying of the 'animal spirits' from the brain to the periphery. For the next two hundred and fifty years little progress was made in the study of the structure of the nervous system, though some work was done upon the gross anatomy of the brain by men whose names remain to us in our anatomical nomenclature. Thus, Vesalius, Fallopius, and Eustachius were among the earliest. In the seventeenth century we have Willis, whose name we recognize in the circle of Willis, and who described the basal ganglia, the pyramids and the olives; Vieussens, whose name is familiar in the valve of Vieussens; and Duboise, whose medical cognomen of 'Sylvius' marks that prominent sulcus of the cerebrum. The results of the labors of these investigators, as well as of those of Van Leeuwenhoek, of Malacarne, of Rolando, of Vico d'Azyr, of Arnold, of Monro, and others were collected and summed up in an extensive volume published by Burdach in 1819. Descartes had discovered the nerve fibre, and the next step forward in the histology of the nervous system was not taken until Ehrenberg in 1833 discovered the nerve cell in the spinal ganglia. This discovery was emphasized when four years later Purkinje observed the presence of cells not only in the ganglia, but in the cerebrum and cerebellum. The important fact that the dorsal roots of the spinal nerves are concerned with sensation and the ventral roots with motion was discovered by Sir Charles Bell, an eminent British surgeon and anatomist, and communicated by him to the Royal Society of London about 1820. In 1834 Remak discovered that the cells of the sympathetic ganglia had processes, and that these processes were connected with nerve fibres. The importance of this discovery, confirmed in 1842 by Helmholtz, was not at the time appreciated. One of the most careful studies of nerve cells and their processes was made by Otto Deiters of Bonn and published after the investigator's death by Max Schultze in 1865. Deiters divided the processes given off from nerve cells into two kinds, protoplasmic processes, which branched rapidly and the structure of which resembled that of the cell body, and axis cylinder processes or nervous processes which were often continuous with the axis cylinders of medullated nerves. Gerlach's publication in 1872 was far-reaching in its influence. By the use of the chloride of gold method, he was able to demonstrate many more and finer processes of nerve cells than had been recognized by the older methods of staining. These delicate processes were believed by Gerlach to form a diffuse nervous network within the gray matter. Besides describing this nervous network, Gerlach built up upon this as a basis a theory of nervous system structure which was accepted by most neurologists until the advent of the so-called 'newer investigations.' Gerlach believed that from the anterior horn cells of the spinal cord, processes passed directly off to form the motor roots of the spinal nerves. According to his theory the protoplasmic processes of these cells ramified in the gray matter of the cord, where they anastomosed with protoplasmic processes from other cells, forming a reticulum from which arose the fibres which passed out of the cord as the posterior or sensory roots. Gerlach believed that this same relation of afferent and efferent fibres to the nerve cells and to the reticulum obtained throughout the entire nervous system, which thus consisted of a remarkably complex continuum of nervous protoplasm.

The so-called 'newer investigations' upon which is based our present conception of the structure of the nervous system must be considered as begining with the discovery by Golgi of the staining method which bears his name. This was announced by Golgi in 1873, although it was not until ten years later, when Golgi published a considerable volume of his investigations, that the neurological world began to realize the importance of his discovery. To the investigations since that time of Golgi, His, Kölliker, Van Gehuchten, Forel, Retzius, Ramón y Cajal, Von Lenhossêk, and others must be ascribed the overthrow of Gerlach's theory of a diffuse nervous network and the establishment upon a firm basis of the at present accepted neurone theory of nervous-system structure.

Methods of Neurological Investigation. The history of the development of our knowledge of the structure of the nervous system is necessarily intimately associated with the history of advances in methods of investigation. Among the general methods which have proved of greatest value in working out the structure of the nervous system the following may be mentioned: (1) Method of Anatomical Dissection.—Only the coarser fibre tracts can be determined by this method, its main use being in studying the gross anatomy of the nervous system. (2) Method of Embryology.—The extreme value of this method is shown by the important investigations of His. By means of this method it is possible to study the development of the neurone from its first appearance to its adult condition and to observe how groups of neurones become separated off by themselves to form the different parts of the nervous system. Of especial importance is the fact that the fibres of different systems of neurones acquire their medullary sheaths at different embryonic ages. In this way it is possible, by studying the nervous systems of embryos of different ages, to differentiate many of the fibre systems. (3) Method of Pathology.—This is based upon the fact that any disease or injury which destroys the cell bodies of neurones, or which interrupts the continuity of their axones, causes degeneration in the axones whose cells are destroyed or whose continuity is interrupted. Thus, e.g. in an injury crushing the spinal cord at a certain level, there will be found degenerated above the point of injury all fibres whose cells lie below the injury, while below the injury there will be found degenerated all fibres whose cells lie above the injury. More recently it has been determined that not only does the distal portion of a cut nerve or cut fibre tract die, but that in disease of peripheral nerves changes take place in the central stump and in the cells from which the diseased axones originate. It has thus been possible in some cases to determine the cells from which diseased nerves originate. (4) Method of Arrested Development.—This method depends upon the fact that there sometimes occur abnormalities in the nervous system such as absence or malformation of a part, thus causing an absence of development in other parts dependent upon them. (5) Method of Animal Experimentation.—This method consists essentially in subjecting animals to certain conditions which cause changes in the nervous system and then studying those changes.

Most of our knowledge of the nervous system has been acquired by the application to the above general methods of certain special staining methods. Of these the four most important are the method of Weigert, the method of Golgi, the method of Nissl, and the method of Ehrlich. For the details of these methods the reader is referred to text-books on histology and histological technique.



ANTERIOR PORTION OF THE BODY OF A CHICK.

The head distinctly differentiated, seen from the surface. *H. f.*, head fold; *Neu. por.*, neuro-porus; *H. p.*, head plate; *F. g.*, foregut; *Y. ve.*, yolkvein; *Med. gr.*, medullary groove; *Ant. cereb. ves.*, anterior cerebral vesicle; *Mid. cereb. ves.*, middle cerebral vesicle; *Post. cereb. ves.*, posterior cerebral vesicle.

Development. The differentiation of the nervous system begins very early in embryonic life. There is first the formation of a groove or furrow in the outer layer of the blastoderm. This is known as the medullary or neural groove. By an increase of the cells at the sides of the groove and their union dorsally, this groove is converted into a closed canal, the neural or medullary canal. This canal corresponds to the central canal of the spinal cord and to the ventricles of the brain in the adult nervous system, and it is from the epiblastic cells surrounding the medullary canal that the entire nervous system is developed. At that end of the canal which corresponds to the head of the embryo, three dilatations appear. These are known respectively as the fore-brain (anterior cerebral vesicle—telencephalon), the mid-brain (middle cerebral vesicle—mesencephalon), and the hind-brain (posterior cerebral vesicle—metencephalon). These three vesicles soon become five from the development from the fore-brain of the interbrain or diencephalon, and from the hind-brain of the afterbrain or myelencephalon. From the anterior cerebral vesicles are developed the cerebral hemispheres, the corpus striatum, the optic thalami, and posteriorly, as far as the anterior corpora quadrigemina. From the middle cerebral vesicle are developed the corpora quadrigemina and the cerebral peduncles. From the posterior cerebral vesicles are developed the cerebellum, pons, and medulla oblongata. From the remaining undilated portion of the medullary canal is formed the spinal cord. During the closure of the canal there become separated off at varying intervals groups of cells which form the cerebro-spinal ganglia. Histologically, two kinds of cells may be observed in the walls of the medullary canal, spongioblasts and neuroblasts. From the former is developed the neuroglia or connective tissue of the nervous system, from the latter are developed the nervous elements or neurones. The neuroblast is at first a small round cell. It soon becomes pear-shaped, and from the small end of the pear a process grows out—the axis cylinder process or axone. Other processes of a different nature appear later. They are known as protoplasmic processes or dendrites. This nerve cell with all its processes is what is known as the 'neurone.'

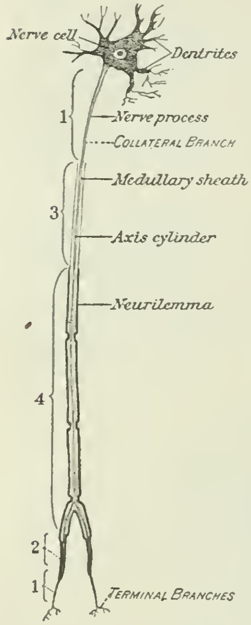
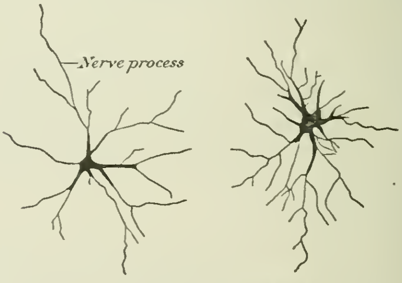


DIAGRAM OF A NEURONE.

1. Nerve process naked; 2. Enveloped only by neurilemma; 3. Enveloped only by medullary sheath; 4. Enveloped by both medullary sheath and neurilemma.

Nervous Tissue. The structural element of nervous tissue is the neurone. This has already been defined as the nerve cell with all its branches. These neurones in their association with one another to form the organs of the nervous system are supported by a peculiar type of connective tissue called neuroglia. As noted above in describing its development, each adult neurone consists of a cell body, and passing off from this two kinds of processes, the axis cylinder process and the dendritic processes. The cell body, as in most other cells, consists of a mass of protoplasm containing a nucleus.

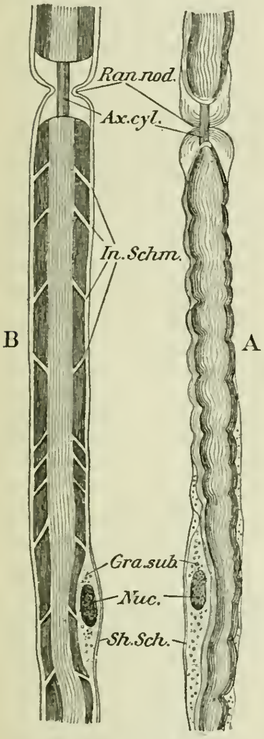
Our knowledge of the internal structure of the nerve cell has been greatly enhanced within the last few years by the application of a new method known as the method of Nissl. This method consists essentially in placing fresh tissue in some quick fixative such as absolute alcohol, and staining sections with such a dye as methylene blue. This method demonstrates two very different types of cell in the nervous tissues. In one of these the nucleus alone stains, the cell body remaining unstained; in the other, both nucleus and cell body are stained. The former are known as caryochrome cells, the latter as somatochrome cells. The structure of a somatochrome cell as shown by the method of Nissl is as follows: The rather large nucleus situated in the centre of the cell differs in no essential from the nuclei of other cells. It is surrounded by a nuclear membrane and traversed by an intranuclear network, both of which stain blue. The nucleoplasm or basement substance of the nucleus remains unstained. Within each nucleus is a darkly staining nucleolus. The body of the cell shows three distinct elements in its structure, a basement substance, a cytoreticulum or fibrillar element, and chromophilic bodies. The basement substance is unstained by Nissl's method and appears homogeneous. Traversing this basement substance may be seen very delicate fibrils. These are described by some investigators as fibrillæ passing through the cell body, by others as a definite reticulum. This reticulum or fibrillar structure extends not only throughout the body of the cell, but also into the dendrites and into the axis cylinder, possibly as far as these processes themselves extend. The chromophilic bodies are blue, staining granular masses scattered throughout the cell body. The size and arrangement of these bodies differ greatly for different cells, and are quite characteristic for certain types of cells. In addition to the elements already described, there is present in many nerve cells more or less yellow or brown pigment. This pigment is absent in the nerve cells of the newborn child. The internal structure of the dendrites is similar to that of the cell body. They usually branch rapidly and end in the gray matter near their cell of origin. The method of Gogli shows them to be covered with little knob-like projections known as 'gemmules.' The axone differs from both cell body and dendrites in that it contains no chromophilic bodies. It arises from a portion of the cell called the axone hill, which is also free from chromophilic bodies. In Golgi preparations the axone is distinguished by



TWO FORMS OF MULTIPOLAR NERVE CELLS.

From the ventral horn of the spinal cord of a new-born rabbit, showing the richly branched protoplasmic processes. (Schaper.)

its fineness, its straight course, approximately uniform diameter, and its few branches. These few branches pass off at right angles and are known as collaterals. In some cells the axone branches rapidly and ends in the gray matter near its cell of origin. Other axones pass into the white matter and become axis cylinders of nerve fibres. At its origin from the cell body and at its termination, the axone is uncovered by any sheath. Some axones—confined to the gray matter—are entirely devoid of any covering. Other axones—fibres of Remak, found mainly in the sympathetic system—are covered by a delicate sheath known as the neurilemma or sheath of Schwann. The axones of the white matter of the brain and cord are protected by a thick sheath called the medullary sheath. The axones of the peripheral cranial and spinal nerves are covered by a medullary sheath and outside of this a neurilemma. Such axones, with their sheaths, are known as medullated nerve fibres. A medullated nerve fibre thus consists of a central core or axis cylinder which is continuous throughout the fibre and is the axone of a nerve cell. This axis cylinder is covered by a rather thick sheath of a fatty nature known as the medullary or myelin sheath, outside of which is the delicate neurilemma. From the neurilemma fine septa extend into the myelin called the incisures of Schmidt. At intervals the medullary sheath is interrupted and the axis cylinder is uncovered or covered only by the neurilemma. These points are known as the nodes of Ranvier, and the portion of the nerve fibre between two nodes as an internodal segment.



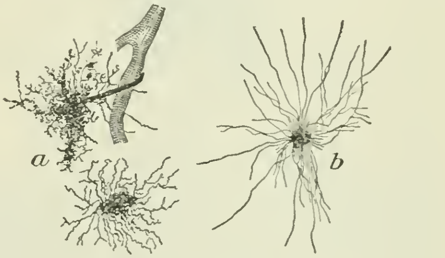
MEDULLATED NERVE FIBRES (OSMIC ACID).

A. View. B. Section. *Ran. nod.*, Ranvier's nodes, where the medullary sheath is interrupted and the axis cylinder appears; *Ax. cyl.*, Axis cylinder; *In. Schm.*, Incisures of Schmidt; *Gra. sub.*, Granular substance at the poles of the nucleus; *Nuc.*, Nucleus; *Sh. Sch.*, Sheath of Schwann.

As to the physiological significance of these different parts of the neurone, our ideas are still based largely upon theoretical grounds. The cell body has been shown to be the birth or genetic centre of the neurone. From the fact that any portion of the neurone which is cut off from the cell body dies, the cell would seem to be the nutritive or trophic centre of the neurone. From the absence of nervous activity in portions of the neurone which have been cut off from their cell of origin, the cell body would also appear to be the functional centre of the neurone. The most generally accepted theories of the significance of the component parts of the cell itself may be summed up as follows. The function of the nucleus is the same as in other cells. It seems to preside over the constructive activities of the neurone, by which food products brought to the cell by the lymph are transformed into food elements of the cell, and finally into its nervous elements proper. The basement substance and the chromophilic bodies represent the food elements of the cell. The cytoreticulum represents the working nervous mechanism of the cell, it alone being concerned in the reception, transformation, and emission of the nervous impulse. Of the processes the axone is centrifugal in function, carrying impulses away from the cell body, the dendrites are centripetal in function, bringing impulses to the cell body. Axones thus act as organs of distribution as regards the nervous impulse, dendrites as organs of reception. Neurones are associated with one another by approximation or by contact, and not by continuity of their protoplasm; that is, no two neurones are believed to be directly connected with each other. The axonal terminations of one neurone simply lie in contiguity, or at most in touch with the dendrites or cell bodies of other neurones, the impulse passing over from one to the other.

Neuroglia, or the connective tissue of the nervous system, differs both in structure and in origin from the form of connective tissue found in other organs. As already stated, it is epiblastic in origin, developing like the neurone from the cells which line the embryonic neural canal. These cells, at first morphologically identical, soon differentiate into neuroblasts, or future neurones, and spongioblasts, or future neuroglia cells.

In adult neuroglia two main types of cells are found, spider cells and mossy cells. The spider cell has a rather small body, from which are given off on all sides straight, unbranching, spine-like processes. They occur mainly in the white matter. The mossy cell has also a rather small body, its processes are fewer, are coarse, rough, and branching; they occur mainly in connection with blood-vessels. As in the case of the nerve cell, the processes of these cells do not anastomose, but interlace, forming a dense feltwork.



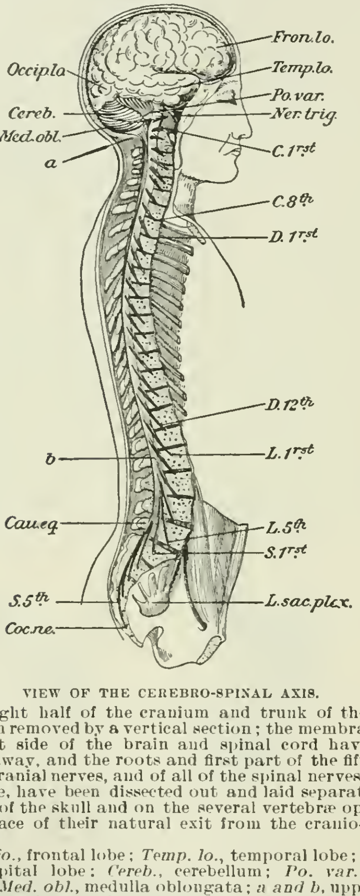
CELLS FROM SECTIONS OF THE BRAIN OF ADULT MAN.
a, Mossy cell; *b*, spider cell.

The nervous system is composed in all vertebrated animals of two distinct portions or systems—viz. the *cerebro-spinal* and *sympathetic* or *ganglionic*.

The *cerebro-spinal system* includes the brain and spinal cord (which form the *cerebro-spinal axis*, or central nervous system) and the cranial and spinal nerves. It was termed by Bichat the nervous system of animal life, and comprises all the nervous organs concerned in sensation, volition, and mental action.

The *sympathetic system* consists essentially of a chain of ganglia connected by nervous cords, extending from the cranium to the pelvis, along each side of the vertebral column, and from which nerves with large ganglionic masses proceed to the viscera and blood-vessels in the cavities of the chest, abdomen, and pelvis. It was termed by Bichat the nervous system of organic life, since it seems to regulate—almost or quite independently of the will—the due performance of the functions of the organs of respiration, circulation, and digestion.

The Central Nervous System. The brain and spinal cord are covered and protected by three membranes or *meninges,* as they are frequently termed—viz. the *dura mater*, the *arachnoid*, and the *pia mater*. The *dura mater* is a strong fibrous membrane, which supplies the cranial bones with blood in early life, and adheres firmly to their inner surface. The *arachnoid* (so called from its being supposed to be as thin as a spider's web) is a serous membrane, and, like all serous membranes, is a closed sac, consisting of a parietal and a visceral layer. The parietal layer adheres to the inner surface of the *dura mater,* while the visceral layer somewhat loosely invests the brain and spinal cord, from direct contact with which, however, it is separated by the intervention of the *pia mater* and some loose areolar tissue. The *pia mater* is an extremely vascular membrane consisting of minute blood-vessels, held together by an extremely fine areolar tissue. It dips down between the convolutions and fissures of the brain, and is prolonged into the interior, forming the *velum interpositum* and the choroid plexuses of the fourth ventricle. It is by means of this membrane that the blood-vessels are conveyed into the nervous substance.



VIEW OF THE CEREBRO-SPINAL AXIS.

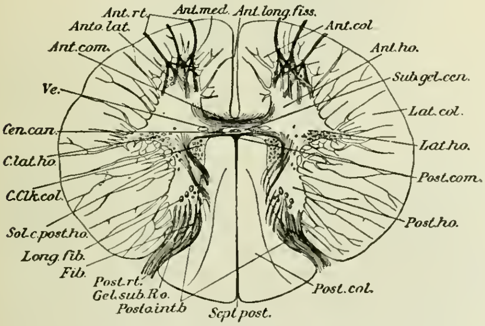
The right half of the cranium and trunk of the body have been removed by a vertical section; the membranes of the right side of the brain and spinal cord have been cleared away, and the roots and first part of the fifth and twelfth cranial nerves, and of all of the spinal nerves of the right side, have been dissected out and laid separately on the wall of the skull and on the several vertebræ opposite to the place of their natural exit from the cranio-spinal cavity.

Fron. lo., frontal lobe; *Temp. lo.*, temporal lobe; *Occip. lo.*, occipital lobe: *Cereb.*, cerebellum; *Po. var.*, pons Varolii; *Med. obl.*, medulla oblongata; *a and b*, upper and lower extremities of the spinal cord; *Cau. eq.* on the last lumbar vertebral spine marks the cauda equina; *Ner. trig.*, the three principal branches of the nervous trigeminus; *C. 1st*, the sub-occipital or first cervical nerve; *C. 8th*, the eighth or lowest cervical nerve: *D. 1st*, the first dorsal nerve; *D. 12th*, the last dorsal nerve; *L. 1st*, the first lumbar nerve; *L. 5th*, the last lumbar nerve; *S. 1st*, the first sacral nerve; *S. 5th*, the fifth sacral nerve; *L. sac. plex.*, the left sacral plexus; *Coc. ne.*, the coccygeal nerve.

The Cerebro-Spinal Nervous System. In describing this it is more convenient to begin with a description of the spinal cord, the study of which is essential to a proper appreciation of the higher and more complicated centres.

The Spinal Cord is that portion of the cerebrospinal axis which is contained in the spinal canal. It extends from the upper border of the first cervical vertebra or atlas above, to the middle or lower margin of the first lumbar vertebra below. The cord is continuous superiorly with the medulla oblongata, while its lower extremity tapers off into a slender cord, the filum terminale. At two levels, one in the cervical and one in the lumber region, the diameter of the cord is considerably larger than elsewhere. These are known respectively as the *cervical* and the *lumbar enlargements.* The *posterior median septum* and the *anterior median fissure* almost divide the cord longitudinally into two symmetrical halves, while the spinal nerve roots leaving the cord at quite regular intervals serve to divide it into *segments.* These segments correspond in number to the spinal nerves. There are thus eight *cervical,* twelve *dorsal,* five *lumbar,* five *sacral,* and one or two *coccygcal* segments. The internal structure of the cord can be best appreciated by studying a transverse section through the cervical enlargement stained by Weigert's method. Such a section shows that two substances enter into its composition, one situated centrally, the other on the periphery. On account of their appearance in fresh tissues, the former is called *gray matter,* the latter *white matter.* The gray matter is made up mainly of cells and their dendrites, and of non-medullated axones; the white matter consists mainly of medullated nerve fibres, its whiteness being due to the myelin. The gray matter presents somewhat the form of the letter H. Posteriorly, it is slender, and almost touches the surface—*posterior horns*—while anteriorly it is broad—*anterior horns*—and separated from the surface by a considerable layer of white matter. The expanded tip of the posterior horn is known as the head or *caput*, and contains a gelatinous substance, the *substantia gelatinosa* of Rolando. The narrow portion connecting the head with the central gray matter is called the neck or *cervix.* Laterally, the gray matter extends out somewhat into the white matter as the *lateral horn* or *processus reticularis lateralis.* The gray horns of the two sides of the cord are connected by a commissure containing the *central canal.* In fœtal life this canal is open and continuous with the ventricles of the brain. In adults it is usually more or less obliterated. It is surrounded by the *substantia gelatinosa centralis,* and divides the gray commissure into an *anterior gray commissure* and a *posterior gray commissure.* Passing out from the anterior horns to the surface of the cord are bundles of fibres which constitute the *anterior* or *motor spinal nerve roots.* Just to the median side of the posterior horns are seen the entering fibres of the *posterior* or *sensory nerve roots.* By the posterior horns the white matter of the cord is divided into *posterior columns* and *antero-lateral columns,* the latter being again rather indefinitely subdivided by the fibres of the anterior roots into lateral and anterior columns. The posterior columns are also usually subdivided at this level by a connective tissue septum from the pia mater into an internal portion, the *column of Goll,* and an external portion, the *column of Burdach.*

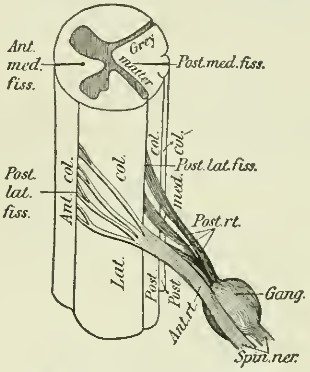
Fibre Systems or Tracts of the Cord. As already noted, the cell bodies of the neurones are grouped in the gray matter of the brain and cord in the ganglia of the cranial and of the spinal nerves and in the end organs of certain of the nerves of special sense. This grouping is for definite physiological purposes. The axones from many of these neurone groups pass into the white matter as distinct bundles and constitute fibre systems or fibre tracts. In the normal adult cord these various tracts of fibres present the same appearance and cannot be differentiated from one another. Certain of the methods described above, however, especially the method of embryology and the method of pathology, have enabled us to determine the following systems: (1) Descending tracts: (a) The direct pyramidal tract or column of Türck; (b) the crossed pyramidal tract; (c) the descending comma tract of the posterior column; (d) the descending cerebellar tract of Loewenthal. (2) Ascending tracts: (a) The column of Goll; (b) the column of Burdach; (c) the column of Lissauer; (d) the direct cerebellar tract; postero-lateral ascending tract or tract of Flechsig; (e) the tract of Gowers or the antero-lateral ascending tract. (3) Short systems, fundamental columns or ground bundles, composed of short ascending and descending fibres intermingled.



TRANSVERSE SECTION OF THE HUMAN SPINAL CORD AT THE LEVEL OF THE EIGHTH DORSAL VERTEBRA.

Ant. long. fiss., anterior longitudinal fissure; *Sep. post.*, septum posterium; *Ant. com.*, anterior commissure; *Sub. gel. cen.*, substantia gelatinosa centralis; *Cen. can.*, central canal; *Post. com.*, posterior commissure; *Ve.*, vein; *Ant. ho.*, anterior horn; *Lat. ho.*, lateral horn, and behind it the process reticularis; *Post. ho.*, posterior horn; *Anto. lat.*, antero median group of ganglionic cells; *C. lat. ho.*, cells of the lateral horn; *C. clk. col.*, cells of Clark's column; *Sol. C. post. ho.*, solitary cells of the posterior horn; *Ant. rt.*, anterior root; *Post. rt.*, posterior root; *Posto. int. b.*, postero-internal bundle; *Fib.*, bundle of fibres attached to the posterior root; *Long. fib.*, longitudinal fibres of the posterior cornu; *Gel. sub. Ro.*, gelatinous substance of Rolando; *Ant. col.*, anterior column; *Lat. col.*, lateral column; *Post. col.*, posterior column.

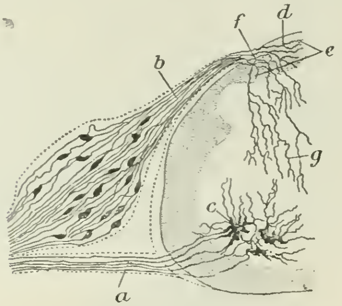
Location of the Fibre Systems of the Cord and Origin of Their Fibres. The location of the fibre tracts can be best understood by reference to the accompanying diagram: The *direct pyramidal tract* occupies a small oval area adjacent to the anterior fissure. It decreases in size as it passes downward and disappears entirely in the mid or lower dorsal regions. The *crossed pyramidal tract* occupies the postero-lateral region of the cord. In the cervical and dorsal regions it is separated from the surface by the direct cerebellar tract. In the lumbar region the latter tract is no longer present and the crossed pyramidal comes to the surface. This tract extends to the lowermost part of the chord, decreasing in size as it descends. The fibres of the pyramidal tracts are axones of cells situated in the brain in the region of the fissure of Rolando or motor area. These fibres descend through the internal capsule, pons, and medulla. In the medulla they form a large bundle of fibres known as the *anterior pyramids,* lying on either side of the anterior fissure. At the junction of medulla and cord most of these fibres cross over, in what is called the *pyramidal decussation,* to the opposite postero-lateral region, to continue down the cord as the *crossed pyramidal tract.* A small number of fibres remain in the anterior region and pass down the cord as the *direct pyramidal tract.* Both tracts as they descend send collaterals and terminals into the gray matter of the anterior horns, where they end in arborizations around the motor cells there situated. These tracts thus constitute the *motor pathway* connecting the brain and cord, carrying voluntary motor impulses from the brain to the cells of the anterior horns, which latter directly control muscular movements. The *descending comma tract* is a small tract of fibres in the dorsal region situated about the middle of the column of Burdach. By some investigators it is believed to



SPINAL CORD. SIDE VIEW.

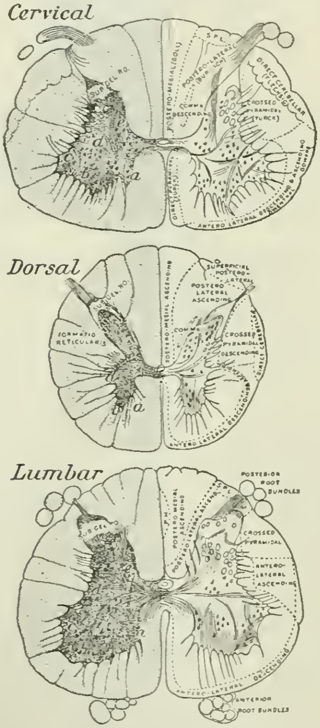
Plan of the fissures and columns. *Post. med. fiss.*, posterior median fissure; *Post. lat. fiss.*, posterior lateral fissure; *Post. rt.*, posterior root; *Gang.*, ganglion; *Spin. ner.*, spinal nerve; *Ant. med. fiss.*, anterior median fissure; *Ant. Lat. fiss.*, anterior lateral fissure; *Ant. rt.*, anterior root; *Ant. col.*, anterior column; *Lat. col.*, lateral column; *Post. col.*, posterior column; *Post. med. col.*, posterior median column.

represent descending branches from posterior root fibres, by others, descending axones of cells situated in the cord. The *descending cerebellar tract,* or tract of Loewenthal, consists, as its name intimates, of descending axones of neurones whose cells are situated in the cerebellum. The results of investigations as to the paths which these axones follow in passing from cerebellum to cord are not in accord.



TRANSVERSE SECTION OF THE SPINAL CORD OF A CHICK ON THE 9TH DAY OF INCUBATION.

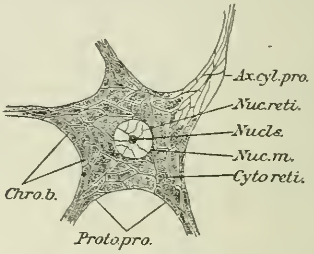
a, Axis cylinders of anterior root fibres issuing from large cells of the anterior horn (*c*); *b*, posterior root fibres passing from the bi-polar cells of the spinal ganglion into the posterior column of the spinal cord; *d*, when they bifurcate, and *e*, when they become longitudinal; *f* and *g*, collaterals from the fibres passing into the gray matter.



SECTIONS OF THE SPINAL CORD, IN THE LOWER CERVICAL, MID-DORSAL AND MID-LUMBAR REGIONS (ON THE RIGHT SIDE THE CONDUCTING TRACTS ARE INDICATED.)

Nerve cells: *a*, mesial group; *b*, lateral or ventro-lateral group; *c*, dorsal or dorso-lateral group; *d*, lateral cell column group; *e*, Clark's column group.

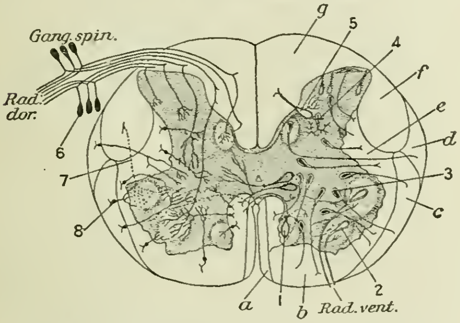
It is probable that in the case of many of the fibres two neurones are involved, the connection being made through the olivary nucleus of the medulla. These axones end in the gray matter of the cord. The *columns* of *Goll* and of *Burdach* are composed of the axones of the cells of the ganglia of the posterior roots of the spinal nerves. Entering the posterior columns, these axones divide into ascending and descending arms. The latter is short and soon ends in the gray matter. The ascending arm may be short, of medium length, or long. The short and medium length fibres end in the gray matter of the cord, after sending in collaterals at different levels. The long fibres pass up to the medulla and end, those of the column of Goll in the nucleus gracilis, those of the column of Burdach in the nucleus cuneatus. The *column of Lissauer* consists of the shortest fibres which enter the posterior roots. These fibres end in the posterior horns. These neurones, whose central axones form the entering fibres of the posterior roots of the spinal nerves taken in connection with the analogous sensory roots of the cranial nerves, constitute the *peripheral sensory neurone system.* It is by means of these neurones that all impulses are conveyed from the periphery or surface of the body to the cord and brain. By their influence over the motor cells of the cord they determine the *direct reflex actions.*



LARGE GANGLION CELL OF THE VENTRAL HORN OF THE SPINAL CORD.

Ax. cyl. pro., axis cylinder process; *Nuc. reti.*, nucleoreticulum; *Nucls*, nucleolus; *Nuc. m.*, nuclear membrane; *Cyto reti.*, cyto-reticulum; *Chro. b.*, chromophilic bodies; *Proto. pro.*, protoplasmic processes.

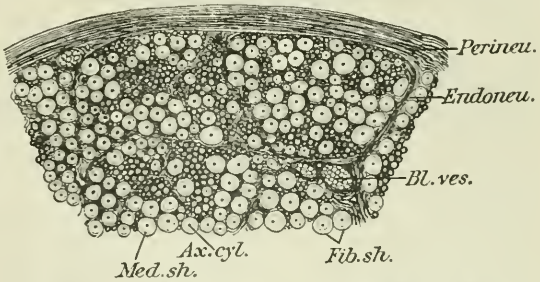
By their influence over other cells situated in the cord, medulla, and mid-brain, sensory impressions are transmitted through other systems of neurones to the brain, and thus enter into consciousness. By their influence upon motor cells of the cortex they complete the cycle of a sensory impression entering consciousness and being transformed into a voluntary motion. The *direct cerebellar tract* or *dorso-lateral ascending tract* lies near the lateral surface of the cord from the posterior horn to about the mid-lateral point. It begins in the upper lumbar region and extends to the cerebellum. Its fibres are axones of the cells of Clark's column or the nucleus dorsalis of the same side. This nucleus is a group of cells lying in the gray matter just to the median side of the base of the posterior horn. It extends as a continuous column from the mid-lumbar to the lower cervical region. In the medulla the direct cerebellar tract enters the restiform body and thus reaches the cerebellum by means of the inferior cerebellar peduncle. *Gowers's tract,* or the *ventro-lateral ascending tract,* lies along the periphery of the cord from the anterior limit of the direct cerebellar to the anterior nerve roots. The tract first appears in the upper lumbar cord and increases in size as it passes upward. Its fibres are axones of cells scattered through the gray matter of the same and opposite sides of the cord. Many of the fibres of this tract are probably spinal association fibres and reënter the gray matter to terminate there. Other fibres, however, pass upward to higher centres, their exact terminations being as yet undetermined. The remainder of the white matter of the cord is constituted by the short fibre systems (fundamental columns or ground bundles). It will be seen that in the main these short fibres lie adjacent to the gray matter and are more extensive in the anterior part of the cord. They are axones of cells situated in the gray matter of the cord. These axones enter the white matter, pass up or down, or, splitting, send one branch up, the other down, and finally terminate in the gray matter. Along their course they send collaterals into the gray matter. These fibres of the fundamental columns thus serve to connect the gray matter of different levels of the cord and may be considered of the nature of longitudinal commissural fibre systems. By means of these neurones an impulse coming into the cord by the posterior nerve root may be conveyed to many motor or sensory cells within the gray matter. In this way are accomplished the more *complex reflex actions.*



SCHEME OF THE STRUCTURE OF THE SPINAL CORD.

a, Fasciculus cerebro-spinalis ventralis; *b*, fasciculus ventralis proprius; *c*, fasciculus ventro-lateralis Gowersi; *d*, fasciculus cerebello spinalis; *e*, fasciculus cerebro-spinalis lateralis; f, fasciculus lateralis proprius; *g*, funiculus dorsalis; *Rad. dor.*, radix dorsalis; *Rad. vent.*, radix ventralis; *Gang. spin.*, ganglion spinale; 1, commissural cell, or heteromeric neurones; one is seen sending its axone into the gray substance of the other side, the others send their axones into the white matter of the opposite side; 2, motor cells; sides of fibrils are seen arising from their axones; 3, tautomeric neurones, the axones going to the ventral and lateral funiculi; among these are cells in the nucleus dorsalis and some of the cells in the substantia gelatinosa of Rolando, collaterals are coming off from the axones; 4, a Golgi cell, or dendraxone; 5, cells sending their axones to the dorsal funiculi; 6, cell bodies of peripheral sensory neurones situated in the ganglion spinale; their central prolongations are shown entering the spinal cord as dorsal root fibres which bifurcating send collaterals to terminate in different parts of the substantia grisea; 7, collaterals and terminals representing fibres from the fasciculi cerebro-spinales or pyramidal tract; 8, collaterals from the white fibres in the ventral and lateral funiculi.

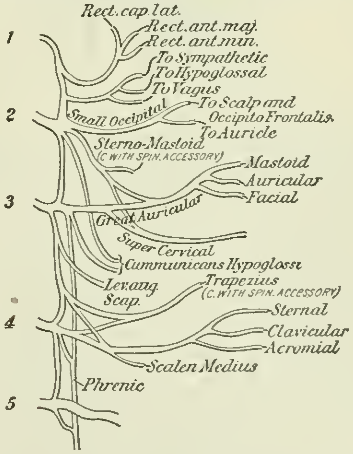
NERVE CELLS OF THE CORD. In describing the origin of fibre systems of the cord, many of the cells of the cord have been necessarily referred to, e.g. those cells the axones of which form the columns of Gowers and of Flechsig, and the fundamental columns. There are also found in the gray matter cells which have short axones which never leave the gray matter, but terminate in the vicinity of their cells of origin. The most important groups of cells remaining to be described are those of the anterior horns connected with the motor spinal nerve roots. These are large multipolar cells rich in chromatic substance. They are arranged in columns, two long columns extending the entire length of the cord for the innervation of the muscles of the trunk, while in the cervical and lumbar enlargements extra columns are added for the supply of the muscles of the extremities.



PORTION OF A CROSS SECTION OF THE HUMAN MEDIAL NERVE.

Perineu., perineurium; *Endoneu.*, endoneurium; *Bl. ves.*, blood-vessel containing blood corpuscles; *Fib. sh.*, fibre sheath; *Ax. cyl.*, axis cylinder; *Med. sh.*, medullary sheath.

THE SPINAL NERVES. These are the peripheral nerves connected with the spinal cord. There are 31 pairs of spinal nerves, which are named from the levels of the cord from which they originate: 8 cervical, 12 dorsal, 5 lumbar, 5 sacral, and 1 coccygeal. Each spinal nerve is connected with the cord by two roots, an anterior or motor root and a posterior sensory root. The anterior root consists of axones of the motor cells of the anterior horns. These pass out in small bundles, by the ganglion of the posterior root, beyond which they join the fibres from the ganglion to form the mixed spinal nerve. The fibres of the sensory root have been already described in connection with the posterior columns. These are the central processes of the spinal ganglion cells. The peripheral processes of these cells pass out of the outer end of the ganglion and join the motor fibres. The nerves leave the spinal canal through the intervertebral foramina, beyond which each nerve divides into two branches, a posterior and an anterior.

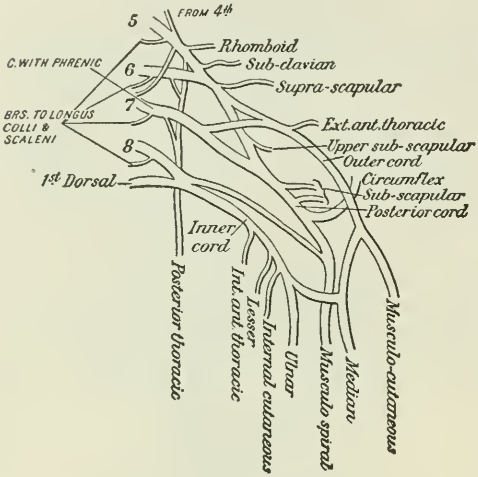


PLAN OF CERVICAL PLEXUS.

The posterior divisions of the spinal nerves are smaller than the anterior and are distributed to the muscles and skin of the back.

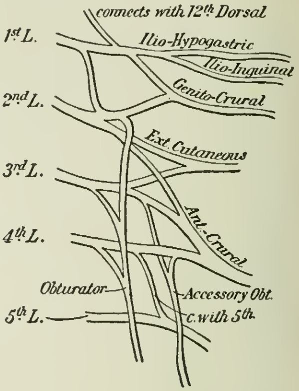
The anterior divisions of the spinal nerves supply the anterior parts of the body and the extremities. Each anterior branch is connected by some slender filaments with the sympathetic. In the dorsal region the anterior divisions are separate and distributed quite evenly, but in the cervical, lumbar, and sacral regions they unite to form intricate plexuses.

THE CERVICAL PLEXUS. This is formed by the anterior divisions of the first four cervical nerves. The branches of distribution of this plexus may be divided into a superficial set and a deep set, the former supplying the integument and the more superficial muscles of the side and front of the neck and upper part of the throat; the latter supplying the more deeply seated muscles of the neck and sending one very important branch, the phrenic, to the diaphragm.



PLAN OF THE BRACHIAL PLEXUS.

The *brachial plexus* is formed by the anterior divisions of the last four cervical and the first dorsal nerves. These five nerves unite to form three main cords known respectively as the outer, the inner, and the posterior cords of the brachial plexus. Before uniting to form these cords, four main branches or sets of branches are given off. These are (1) a communicating branch to the phrenic; (2) muscular branches to the longus colli, scaleni, rhomboidei, and subclavius; (3) posterior thoracic nerve, to the serratus magnus; (4) the supra-scapular, sending branches to supply the supra- and infra-spinatus. From the three main cords of the plexus branches are given off to the chest, shoulders, and arms. Those to the chest are the external and internal anterior thoracic, which supply the pectoralis major and pectoris minor muscles. The branches to the shoulder are the subscapular and the circumflex, the former supplying the subscapularis, the latissimus dorsi, and the teres major; the latter supplying the deltoid and the teres minor. The circumflex nerve also supplies part of the integument of the shoulder and sends filaments to the musculo-cutaneous nerve. This nerve in the arm supplies the biceps, coraco-brachialis, and part of the brachialis anticus muscles. In the forearm it becomes cutaneous, supplying the integument on the radial side. The internal cutaneous nerve is a small nerve to the integument of the front of the arm and forearm. The lesser internal cutaneous or nerve of Wrisberg, the smallest branch of the plexus, is a branch to the integument on the inner side of the arm. The musculo-spiral supplies the triceps, anconeus, supinator longus, extensor carpi radialis longior, and part of the brachialis anticus. It sends a cutaneous branch to the skin of the outer part of the forearm. It then divides into radial and posterior interosseous branches, the former passing to the skin of the radial side of the hand, including thumb, index, middle and radial side of ring fingers; the latter supplying the carpal articulations and muscles of the back of the forearm. The ulnar nerve supplies the flexor carpi ulnaris and inner part of the flexor profundus digitorum. In the hand it supplies the adductor and part of the short flexor of the thumb, the interossei, the two inner lumbricales, and the muscles of the ball of the little finger. It supplies a cutaneous branch to the back of the little and ulnar side of the ring fingers, and to the front of the same fingers. It also supplies articular branches to the elbow and wrist joints. The median nerve supplies all the flexors and pronators of the forearm except those supplied by the ulnar. In the hand it supplies the two outer lumbrical muscles, part of the short flexor of the thumb, the opponens and the abductor. It also innervates the skin of the palm and of the palmar surfaces of the fingers not supplied by the ulnar.



PLAN OF LUMBAR PLEXUS.

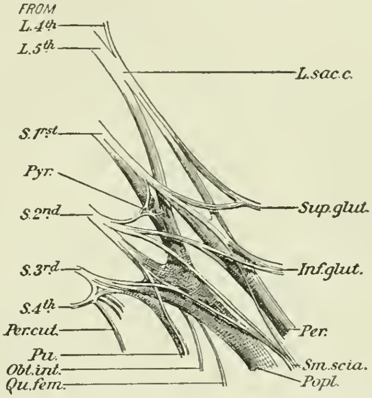
The *lumbar plexus* lies at the back of the abdominal cavity behind the peritoneum. It is formed by the anterior divisions of the four upper lumbar nerves. Communicating branches connect the plexus with the lumbar ganglia of the sympathetic. Some muscular branches pass directly from the plexus to the quadratus lumborum and psoas muscles. Cutaneous branches are the (1) ilio-hypogastric, which sends an iliac branch to the skin of the buttock and a hypoglossal branch to the skin of the lower abdomen; (2) the ilio-inguinal, to the skin of the groin; (3) the external cutaneous, to the skin of the outer side of the thigh. Mixed branches of the plexus are (1) the genito-crural, to the skin of the groin and to the cremaster muscle; (2) the anterior crural, a large and important branch which supplies the sartorius, the pectineus, the psoas iliacus, and the extensors of the knee joint, besides giving off three cutaneous branches, the internal cutaneous to the skin of the inner aspect of the thigh, a middle cutaneous to the skin of the front of the thigh, and the long saphenous to the skin of the inner side of the knee, leg, and foot; (3) the obturator, which supplies the obturator externus, the adductor longus gracilis, and adductor magnus. Branches of this nerve sometimes pass to the adductor brevis and pectineus. It forms the main nerve supply of the hip and knee joints and sometimes sends a cutaneous branch to the skin of the lower and inner part of the thigh. There is sometimes an accessory obturator nerve to the pectineus and hip joint. It is usually connected with the obturator.

The *lumbo-sacral cord* is formed by the union of the fifth lumbar nerve with a branch from the fourth lumbar. It gives rise to a communicating branch to the fifth lumbar ganglion of the sympathetic, and a muscular branch, the superior gluteal, to the gluteus medius and minimus and the tensor fasciæ femoris, after which the cord joins the sacral plexus.

The *sacral plexus* is formed by the union of the lumbo-sacral cord with the first, second, third, and part of the fourth sacral nerves. It is a large plexus situated in the cavity of the pelvis. Like the other plexuses, it gives rise to communicating muscular and mixed branches. The communicating branches pass to the upper sacral sympathetic ganglia. The muscular branches supply the quadratus femoris, the obturator internus, the gemelli, the pyriformis, and a part of the gluteus maximus. The mixed nerves are: (1) The small sciatic, which supplies part of the gluteus maximus and the skin of the back part of the thigh, buttock, popliteal space, and part of the leg. By means of the long pudendal branch it also supplies the skin of the perineum. (2) The pudic supplies the muscles and skin of the external generative organs. (3) The great sciatic. This nerve is the largest nerve of the body. It passes down the back of the thigh, giving off branches to the adductor magnus and the hamstring muscles. Above the popliteal space the nerve divides into the internal and the external popliteal branches. The internal popliteal sends a branch to the knee joint, supplies the popliteus muscle, and the muscles of the calf of the leg. It furnishes a branch called the communicans tibialis, which joins the communicans peronei to form the external saphenous nerve, which supplies the outer side of the foot. Below, the internal popliteal is continued into the posterior tibial, which supplies the long flexor of the toes, the tibialis posticus, and the skin of the heel. In the foot it divides into the internal and the external plantar nerves. The former supplies the skin of the sole of the foot, and the great, second, third, and inner side of the fourth toes, the flexor brevis pollicis, the flexor brevis digitorum, the abductor pollicis, and the two inner lumbrical muscles; the latter supplies the skin of the little and outer side of the fourth toes, and the muscles of the sole of the foot not supplied by the internal plantar. The external popliteal sends branches to the knee joint, gives off the communicans peronei to the skin of the outer side of the back of the leg, supplies the peronei longus and brevis, and divides into the external cutaneous and anterior tibial nerves. The former supplies the skin of the upper surface of the foot and of all the toes except the outer side of the little toe and adjacent sides of the great and second toes. The anterior tibial supplies the extensors of the toes, the tibialis anticus, and peroneus tertius, and ends as a cutaneous branch to the skin of the adjacent sides of the great and second toes.

The *sacro-coccygeal plexus* is a small plexus formed by the fourth and fifth sacral and the coccygeal nerves. It sends communicating branches to the sacral and coccygeal ganglia of the sympathetic, cutaneous branches to the skin of the arms and coccygeal region, muscular branches to the external anal sphincter, the levator ani, and coccygeal muscles, and branches to the pelvic plexus of the sympathetic, whence they supply the rectum and bladder.

PERIPHERAL TERMINATIONS OF SPINAL NERVES. The modes of terminations of these processes are extremely varied and complicated. The terminations are always 'free' in the sense that while possibly sometimes penetrating cells, they are never directly continuous with their protoplasm. The motor nerve fibres end in voluntary and involuntary muscle. On its way to a muscle a motor fibre, which, as noted above, is the axone of an anterior horn cell, may divide into several branches, a single cell thus innervating more than one muscle fibre. On reaching a voluntary muscle the bundle of nerve fibres breaks up to form a plexus in the connective tissue which surrounds the bundles of muscle fibres. From this plexus nerve fibres pass to the individual muscle fibres. Having arrived at the muscle fibre in which it terminates, the nerve fibre loses its medullary sheath, and its neurilemma fuses with the sarcolemma. The naked axone then (according to most observers) penetrates the sarcolemma and terminates in a more or less elaborate expansion known as a 'motor end plate.'



THE SACRAL PLEXUS OF THE RIGHT SIDE FROM BEHIND.

L. sac. c., lumbo-sacral cord; *Sup. glut.*, superior gluteal; *Inf. glut.*, inferior gluteal; *Per.*, perforating; *Sm. scia.*, small sciatic; *Popl.*, popliteal; *Pyr.*, nerves to pyriformis; *Per. cut.*, perforating cutaneous; *Obt. int.*, obturator internus; *Qu. fem.*, quadrator femoris; *Pu.*, pudic.

The sensory or afferent part of the spinal nerves is made by the peripheral processes of the spinal ganglion cells. In the skin, and in those mucous membranes which are covered with squamous epithelium, the nerve fibres lose their medullary sheaths in the subepithelial tissue, and, penetrating the epithelial layer, split up into minute fibrils which pass in between the cells and terminate there, often in little knoblike swellings. In addition to such comparatively simple nerve endings, there are also found in the skin and mucous membranes, especially where sensation is most acute, much more elaborate terminations. Among these may be mentioned Merkel's *tastzellen*, or touch cells, the tactile corpuscles of Meissner, and the Pacinian bodies. In tendons and in muscle, sensory nerve fibres, after losing their medullary sheaths, divide into minute fibrils which are often studded with irregular expansions. In gland tissue, nerve fibres usually end as fine fibrils, which pass to the epithelial cells.

PHYSIOLOGY OF THE SPINAL CORD AND SPINAL NERVES. The sensory nerve endings serve as the receptive apparatus by means of which external stimuli may induce a nervous impulse. The motor nerve endings serve as organs of distribution through which an impulse may so affect a muscle as to cause a contraction and consequent muscular action. The nerves themselves apparently serve merely as a conductive apparatus for transmitting the sensory impulses from the periphery to the spinal cord and the motor impulses from the cord to the muscles. The spinal cord must be considered as subserving several quite different though related physiological purposes, of which the following are the most important: (1) Its gray matter acts as a reflex centre, i.e. a centre in which an impulse brought to it by the fibres of the posterior nerve root (usually a sensory impulse) can determine an impulse passing out in the fibres of an anterior nerve root (usually a motor impulse). In this way a motion is produced by an external stimulus without any involvement of consciousness. A simple reflex is one in which the impulse passes directly from the posterior root fibres to the cells of the anterior horns. A compound reflex is one in which the impulse passes through another neurone situated within the cord in passing from the posterior root fibre to the anterior horn cell. (2) An automatic centre. By an automatic action is meant one which *apparently* occurs without any determining external stimulus, e.g. the rhythmical action of the heart or the contraction and expansion of the arteries. (3) A relay station in the transmission of impulses from and to the higher centres. This takes place through the fibre tracts of the cord and has been already referred to in connection with the description of those tracts. (4) A conduction path. This also has been noted in connection with the description of the fibre tracts of the cord.

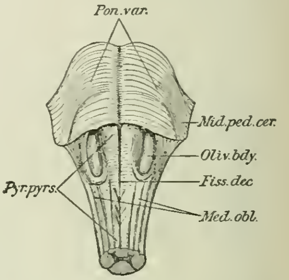
THE BRAIN.

By this term is usually meant all that portion of the cerebro-spinal axis contained in the cranial cavity.

SIZE AND WEIGHT OF THE BRAIN. The human brain is larger and heavier relatively to the size and weight of the body than the brain of any other animal, with the possible exception of some of the smallest birds and mammals. It is larger and heavier absolutely than that of any other animal except the elephant and larger whales. It is largest in the white races, smallest in some of the Central African savages. It is larger in the male than in the female. The average weight of the adult male brain of the white races of Europe and America has been estimated at from 49 to 50 ounces, of the female at from 43 to 45 ounces. The brain is much larger relatively to the size of the body in the infant than in the adult, the brain of the new-born child weighing on an average from 10 to 12 ounces. The brain increases in weight up to middle life. After sixty it usually decreases somewhat in weight. It is a common idea that large brains are apt to be associated with unusual intellectual development. Such is not, however, the case. While the brains of some men of great intellectual attainments have proved to be above the average in weight—Cuvier, 64 ounces; Abercrombie, 63 ounces; Goodsir, 57 ounces—the brains of other men apparently equally intellectual have not been above the average in weight, and Thurman reports a case of a male epileptic whose brain weighed 62 ounces, and Bicknill one from a similar case which weighed 64½ ounces. Brains weighing over 60 ounces have also been observed in the insane.

The brain may be subdivided into the medulla oblongata, the pons Varolii, the mid-brain, the cerebellum, the basal ganglia, and the cerebral hemispheres.

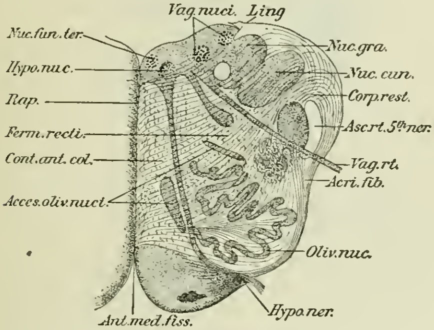
The medulla oblongata is the continuation upward of the spinal cord and extends from the lower limit of the pyramidal decussation below, to the lower margin of the pons above. The length of the medulla is about an inch, and its diameters, which at its lower portion correspond to those of the cord, increase from below upward. Externally the medulla shows the continuation upward of the anterior and of the posterior fissures of the cord. These fissures become more shallow as they ascend, the posterior fissure disappearing at about the middle of the medulla, where the central canal opens into the fourth ventricle. On either side of the anterior fissure is a prominence caused by the anterior pyramid, and to the outer side of the pyramid the bulging of the olivary body may be seen. The antero-lateral surface of the medulla is also marked by the exit of the sixth to the twelfth (inclusive) cranial nerves. The posterior surface shows two prominences on either side, one next the posterior fissure known as the clava, caused by the nucleus gracilis or nucleus of the column of Goll; the other just to the outer side of the clava, due to the nucleus cuneatus or nucleus of the column of Burdach. The internal structure of the medulla shows considerable resemblance to that of the cord. This is especially true of the lower part of the medulla, the structures of which are directly continuous with those of the cord. The fibre tracts of the cord, however, assume, in the medulla, new directions, and in doing so break up the formation of the gray matter. This, together with the appearance of some new masses of gray matter and some new fibre bundles, is the main factor in determining the difference in structure between cord and medulla. The internal structure of the medulla can be best understood by tracing into it the structures of the spinal cord. At the junction of medulla and



MEDULLA OBLONGATA AND PONS VAROLII.

Pon. var., pons Varolii; *Mid. ped. cer.*, middle peduncle of cerebellum; *Oliv. bdy.*, olivary body; *Fiss. dec.*, pyramidal decussation; *Med. obl.*, medulla oblongata; *Pyr. pyrs.*, anterior pyramids.

cord occurs the pyramidal decussation. Above this decussation the fibres of the main cortico-spinal motor tracts lie in two large bundles, one on either side of the anterior median fissure, and known as the anterior pyramids. In the decussation of the pyramids the majority of these fibres cross over to the opposite postero-lateral region and pass down into the cord as the crossed pyramidal tract, the few fibres remaining next the anterior fissure forming the direct pyramidal tract. The crossing fibres of the decussation separate off the anterior horns from the rest of the gray matter, while the intermingling of white matter and gray matter is known as the formatio reticularis. Shortly above the pyramidal decussation masses of gray matter begin to appear in the posterior columns. These are known respectively as the nucleus gracilis or nucleus of the column of Goll and the nucleus cuneatus or nucleus of the column of Burdach. In these nuclei terminate most or all of the fibres of the columns of Goll and of Burdach. The nuclei increase in size pari passu with the decrease in the size of the columns, the latter finally entirely disappearing. These nuclei are therefore nuclei of termination for the fibres of these columns and are of the nature of a relay station in the main spino-cortical sensory conduction path. From cells in these nuclei, axones pass around the central canal—internal arcuate fibres—decussate in the median line—sensory decussation—and then turn upward as the fillet or lemniscus. This is the main continuation brainward of the great sensory tract. Some axones from cells in the nuclei do not turn upward in the fillet, but, skirting the ventral surface of the pyramids, as the external arcuate fibres, pass to the cerebellum in the restiform body. Of the lateral tracts of the cord, the direct cerebellar tract joins the restiform body and thus reaches the cerebellum through its inferior peduncle, while the tract of Gowers continues upward in the lateral region of the medulla, its exact terminations being as yet undetermined. The posterior horns become, in the medulla, separated from the rest of the gray matter, and, becoming broken up, serve as nuclei of termination for the sensory divisions of some of the cranial nerves. As it passes up through the medulla, the central canal, surrounded by an increased amount of gelatinous substance, gradually approaches the posterior surface, to open at about the middle of the medulla into the fourth ventricle. Of the new masses of gray matter which appear in the medulla, the largest are the olivary nuclei. These are irregular convoluted masses of gray matter situated in the ventral part of the medulla behind and to the outer side of the pyramids. They extend from the upper limit of the sensory decussation to the pons. Each olivary nucleus has a central core of white fibres which cross the median line and pass to the opposite restiform body forming the cerebello-olivary tract. To the inner side of the lower part of the olivary nucleus is a smaller mass of gray matter known as the accessory olivary nucleus, while above the main mass of the olive is the superior olivary nucleus. The distinct line of decussating fibres which extends through the centre of medulla and pons is called the median raphé. The nuclei of certain of the cranial nerves form masses of gray matter in the medulla. These, together with the root fibres of the nerves, will be found described below in connection with the cranial nerves.



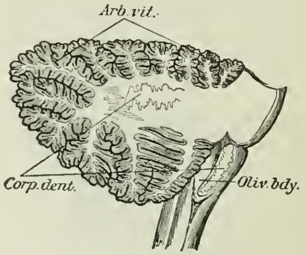
SECTION OF THE MEDULLA OBLONGATA AT ABOUT THE MIDDLE OF THE OLIVARY BODY.

Nun. fun. ter., nucleus of funiculus teres; *Vag. nuci.*, vagus nuclei; *Lig.*, ligula; *Nuc. gra.*, nucleus gracilis; *Nuc. cun.*, nucleus cuneatus; *Vorp. rest.*, corpus restiforme; *Asc. rt. 5th ner.*, ascending root of 5th nerve; *Vag. rt.*, vagus root; *Acri. fib.*, arciform fibres; *Oliv. nuc.*, olivary nucleus; *Hypo. ner.*, hypoglossal nerve; *Ant. med. fiss.*, anterior median fissure; *Hypo. nuc.*, hypoglossal nucleus; *Rap.*, median raphe; *Ferm. recti.*, formatio reticularis; *Cont. ant. col.*, continuation of the anterior column; *Access. oliv. nuci.*, accessory olivary nuclei.

The pons Varolii or bridge lies just above the medulla. Superficially its ventral surface is seen to be composed of fibres which pass transversely, forming a sort of bridge between the two cerebellar hemispheres. Internally the pons is composed of tracts of fibres (white matter) and of nuclei (masses of gray matter). The fibre tracts pass both longitudinally and transversely. The longitudinal fibres are mainly the continuation upward of tracts already mentioned in the description of the medulla, the pyramidal tract or main motor tract, and the fillet or main sensory tract. Some of the longitudinal fibres are, however, fibres connecting the nuclei pontis with higher centres and commissural fibres between the nuclei pontis. The transverse fibres of the pons are mostly fibres connecting the cerebellum with the nuclei pontis, and are consequently often called the middle cerebellar peduncles. They are composed of two sets of fibres, which from their location are known respectively as the superficial transverse pontile fibres and the deep transverse pontile fibres. In the median line the fibres decussate, forming a median raphé continuous with that of the medulla. Fibres of the roots of the fifth and some of the higher fibres of the roots of the sixth and seventh nerves pass from their nuclei of origin to the ventro-lateral surface of the pons. The gray matter of the pons consists of the nuclei of the nerves just mentioned and of nuclei scattered throughout the pons, which are known as the nuclei pontis and are connected with the middle cerebellar peduncles and with the cerebrum. Near the posterior surface of the pons is the fourth ventricle, which becomes narrow in the upper part of the pons as it approaches the aqueduct of Sylvius. In the floor of the ventricle is a group of nerve cells which are so deeply pigmented as to present a dark appearance to the naked eye. This dark area is called the locus cæruleus.

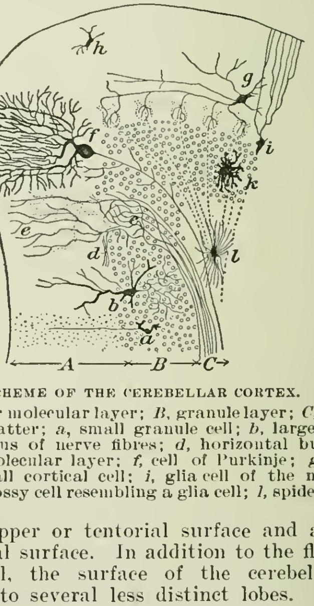
Above the pons is the mid-brain. Here the long fibre tracts are collected into two main bundles known as the cerebral peduncles or crura cerebri. Each peduncle, or crus, consists of a ventral portion or crusta, a dorsal portion or tegmentum, and, between these, a mass of gray matter, the substantia nigra. The dorsal part of the cerebral peduncle, or tegmentum, represents the continuation brainward of the main sensory tract to the cortex cerebri. Of the ventral part of the peduncles, or crusta, about the middle three-fifths are taken up by the fibres of the pyramidal system (including fibres to the motor nuclei of the cranial nerves). Medial to these fibres in the peduncle are the fibres which pass from the frontal lobe to the nuclei pontis, while external to the pyramidal fibres are the fibres connecting the temporal lobe with the nuclei pontis. As the peduncles approach the basal ganglia the substantia nigra disappears and the tegmentum lies just dorsal to the crusta. These bundles of fibres pass through the basal ganglia between the nucleus caudatus and the optic thalamus on the mesial side and the nucleus lenticularis on the lateral side. Here they form the internal capsule, which is directly continuous above with the corona radiata, through which the fibres enter the cortex cerebri. A bend divides the capsule into an anterior portion and a posterior portion. The anterior portion lies between the caudate nucleus internally and the lenticular nucleus externally. This part of the capsule consists mainly of fibres which connect the cortex cerebri and the optic thalamus. The posterior portion of the internal capsule lies between the lenticular nucleus on its outer side and the optic thalamus on its inner side. About the anterior two-thirds of this portion is occupied by the fibres of the pyramidal tracts (including descending fibres to the motor cranial nerve nuclei). The corticopontal fibres connecting the cortex cerebri with the nuclei pontis pass through the internal capsule in two separate bundles; one bundle, coming from the frontal lobe, passes down in front of the main motor tract; the other bundle, coming from the temporal lobe, passes through the posterior portion of the internal capsule just behind the pyramidal tract. Through the posterior part of the internal capsule also passes the continuation upward of the tegmentum or main sensory tract to the cortex. On the posterior surface of the mid-brain are the corpora quadrigemina or optic lobes. These are four in number, two anterior and two posterior. Their structure is complex. The anterior pair seems to be connected in some way with vision. In the mid-brain the fourth ventricle becomes narrowed and is known as the iter or aqueduct of Sylvius.

The *cerebellum*—or little brain—is that part of the brain which lies in the inferior occipital fossa. It is situated beneath the occipital lobes of the cerebrum, from which it is separated by the tentorium cerebelli. The average weight of the cerebellum is about 5½ ounces. Its size relative to that of the cerebrum is about 1 to 8. In the infant the cerebellum is relatively much smaller than in the adult, its weight being about $\frac{1}{20}$ that of the cerebrum. The cerebellum measures from 3½ to 4 inches in transverse diameter and about 2 inches from before backward at its centre. It consists of two hemispheres or lateral lobes and a smaller central lobe called the vermiform process. The cerebellum is connected with other parts of the nervous system by means of bundles of fibres known as peduncles. Two of these, one on either side, the superior peduncles, connect it with the cerebrum. Two others, the inferior peduncles or restiform bodies, connect the cerebellum with the spinal cord. The third set of peduncles, the middle peduncles, connect it with the pons. The hemispheres of the cerebellum are separated in front by a fossa which encircles the corpora quadrigemina. Posteriorly the furrow is deeper and narrower. On the superior surface of the cerebellum, between the anterior and posterior furrows, the central lobe has a very slight elevation and is called the superior vermiform process. On the inferior surface of the cerebellum the central lobe, called the inferior vermiform process, lies at the bottom of the furrow, where it forms a distinct projection and is subdivided into an anterior portion, the nodule, a middle portion, the uvula, and a posterior portion, the pyramid. Two small lobes stand out distinctly from the main bulk of the hemisphere, one, the flocculus, lying to the outer side of the nodule, the other, the tonsil, lying to the outer side of the uvula. Each hemisphere is divided transversely by a deep fissure called the great horizontal fissure, which separates it into an upper or tentorial surface and a lower or occipital surface. In addition to the flocculus and tonsil, the surface of the cerebellum is divided into several less distinct lobes. On the upper surface are the anterior or square lobe and the posterior or semi-lunar lobe. On the under surface may be seen from before backward the digastric lobe, the slender lobe, and the inferior posterior lobe. Besides the deeper furrows sepa-



VERTICAL SECTION OF THE CEREBELLUM.

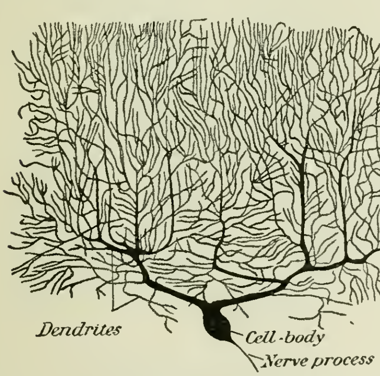
Arb. vit., arbor vitæ; *Oliv. bdy.*, olivary body; *Corp. dent.*, corpus dentatum.



SCHEME OF THE CEREBELLAR CORTEX.

A, Gray or molecular layer; *B*, granule layer; *C*, medulla or white matter; *a*, small granule cell; *b*, large granule cell; *c*, plexus of nerve fibres; *d*, horizontal bundle; *e*, fibres of molecular layer; *f*, cell of Purkinje; *g*, basket cell; *h*, small cortical cell; *i*, glia cell of the molecular layer; *k*, mossy cell resembling a glia cell; *l*, spider cell.

rating the lobes, the entire surface of the cerebellum is crossed by a multitude of transverse grooves which divide it into plates or lamellæ and give it a foliated or laminated appearance. On cutting into the cerebellum it is seen to consist of a central portion or core of white matter which extends outward into the cortex as a series of transversely disposed branching plates. These, covered over by a layer of gray matter, form the lamina already referred to and which on cross-section present the characteristic leaf-like appearance known as the "arbor vitæ." The white matter of the cerebellum is composed of medullated nerve fibres which pass out in a radial manner into the gray matter of the cortex. These fibres are axones coming from cells situated in the cerebellum and passing out to terminate either in some other part of the cerebellum or in some other part of the nervous system, or coming from cells located in other parts of the nervous system to their terminations in the cerebellum. The gray matter of the cerebellum is composed of three layers, an external or molecular layer, an internal or granular layer, and, between the two, a layer composed of a single layer of large cells, the layer of Purkinje cells. The molecular layer contains multipolar cells of various sizes known as 'basket cells' from the fact that while their dendrites pass mostly toward the surface, their axones pass downward and end in a basket-like network around the Purkinje cells. The granular or nuclear layer derives its name from the fact that after the ordinary methods of staining it appears to be composed of a mass of small closely packed cells, each cell consisting of a nucleus surrounded by an extremely small amount of protoplasm. Intermingled with these cells are medullated and non-medullated fibres. By the application of the method of Golgi these cells have been divided into small granule cells (by far the more numerous) and large granule cells. In the case of the small granule cell the dendrites ramify in the granular layer, while the axone terminates freely in the molecular layer. The large granule cells, on the other hand, send their dendrites into the molecular layer, while their axones form a rich plexus within the granular layer. The dense network of fibres found in the granular layer is derived from the cells just described, from axones and collaterals of Purkinje cells, and from fibres coming from the white matter. The cells of Purkinje form a single layer along the boundary between the molecular layer and the granular layer. From the outwardly directed part of the cell a thick neck is given off, from which arise two main dendritic processes, which subdivide and give rise to an enormous number of processes which ramify and terminate in the molecular layer. From the opposite pole of the cell is given off the axone which passes through the granular layer and becomes a medullated fibre of the white matter.



NERVE CELL (CELL OF PURKINJE).
From a section through the human cerebellar cortex.

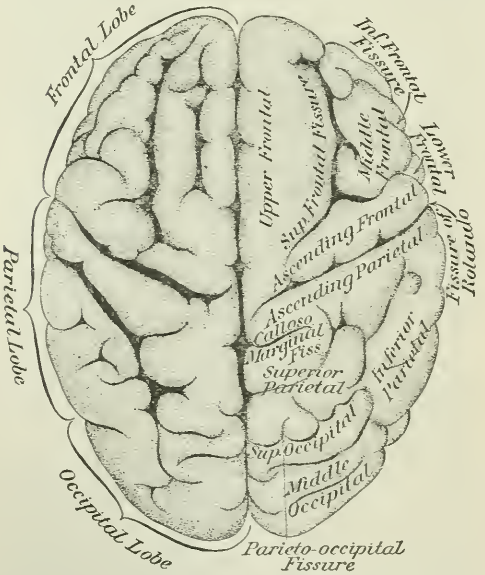
Besides the gray matter of the cortex, certain independent masses of gray matter occur in the cerebellum. These are the corpus dentatum, a convoluted body of gray matter situated to the inner side of the centre of the core of white matter, and the roof-nuclei of Stilling, situated at the anterior end of the superior vermiform process and projecting forward into the roof of the ventricle.

The functions of the cerebellum have been made the subject of much discussion and investigation. It is itself insensible to irritation, and has been cut away in various animals, without eliciting signs of pain; moreover, its removal or disorganization by disease is generally unaccompanied with loss or disorder of sensibility, animals from whom it has been removed being apparently able to smell, see, hear, and feel as perfectly as before. Flourens extirpated the cerebellum in birds by successive layers. Feebleness and want of harmony of the movements resulted from the removal of the superficial layers. When he reached the middle layers, the animals became restless; their movements were violent and irregular. By the time that the organ was entirely removed, the animals had completely lost the power of flying, walking, standing, and preserving their equilibrium. When a pigeon in this state was laid upon its back, it could not recover its former position, but fluttered its wings, and saw and tried to avoid a threatened blow. Hence volition, sensation, and memory were not lost, but merely the faculty of combining the actions of the muscles. From a large series of experiments of this kind, subsequently made on all classes of animals, Flourens inferred that the cerebellum belonged neither to the sensitive nor to the intellectual apparatus; that it was not the source of voluntary movements, although belonging to the motor apparatus; that it is the organ for the coördination of the voluntary movements, or for the excitement of the combined and harmonious action of the muscles.

In spite of the above facts, the extent to which muscular coördination is dependent upon the cerebellum cannot be considered as satisfactorily determined.

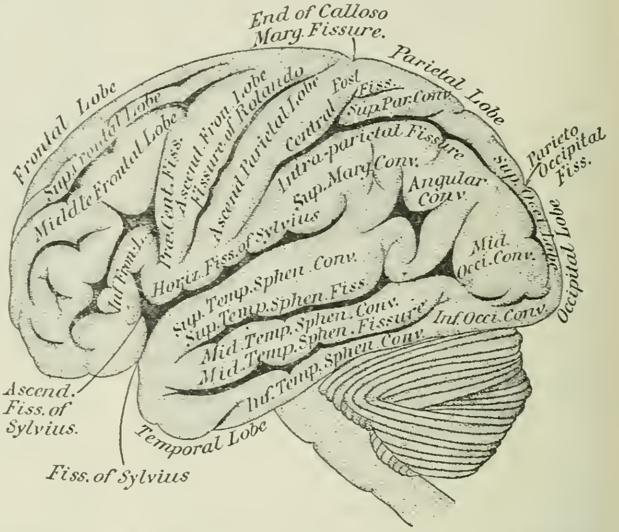
The *cerebrum*—sometimes called the brain proper—constitutes in man the largest part of the cerebro-spinal axis. Lying within the cavity of the skull, its shape conforms to that of the cranial cavity. Anteriorly, superiorly, and posteriorly, a deep fissure runs lengthwise of the brain, called the great longitudinal fissure, separating the brain into two equal halves or hemispheres. At the bottom of the fissure a broad band of fibres—the corpus callosum—unites the two hemispheres. Each hemisphere presents three surfaces—an outer, which is convex and corresponds to the inner surface of the skull; an inner, which is flat, lying against the similar surface of the opposite hemisphere, from which it is separated by the falx cerebri; and an under surface, which is somewhat concave and rests upon the anterior and middle fossæ of the skull and upon the tentorium cerebelli. The surface of each hemisphere is marked by numerous elevations and depressions, the former known as convolutions or gyri, the latter as fissures and sulci. These convolutions serve to increase the actual surface of the brain without increasing the actual size of the organ, and the number and extent of the convolutions are in direct relation to the intellectual development, increasing throughout the ascent of the mammalian scale, and reaching their highest complexity in civilized man.

FISSURES. Of the five principal fissures of the brain, two have already been mentioned—the great longitudinal fissure, separating the hemispheres, and the great transverse fissure, separating the cerebrum from the cerebellum. Each hemisphere presents three fissures which separate the hemisphere into lobes. These are: (1) The fissure of Sylvius. This begins at the base of the brain (see diagram) and passes upward and backward on the external surface of the hemisphere, where it divides into a shorter ascending limb and a longer horizontal limb. It separates the frontal and parietal lobes from the tempero-sphenoidal lobe. (2) The fissure of Rolando begins a little behind the mid-point of the great longitudinal fissure and extends downward and forward to a point somewhat above and behind the bifurcation of the Sylvian fissure. It separates the frontal lobe from the parietal lobe. (3) The parieto-occipital fissure begins about midway between the fissure of Rolando and the posterior extremity of the brain, sends a short branch outward, while its longer branch extends downward and forward on the inner surface of the hemisphere.

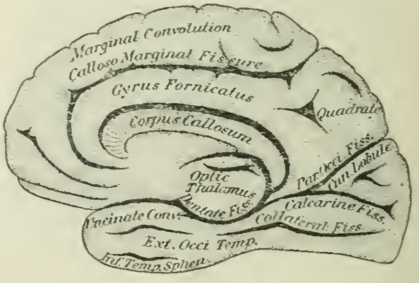


UPPER SURFACE OF THE BRAIN, THE ARACHNOID HAVING BEEN REMOVED.

LOBES. The *frontal lobe* includes that part of the brain which lies in front of the fissure of Rolando and above the fissure of Sylvius. It presents the following convolutions: (a) The ascending frontal convolution, lying just in front of the fissure of Rolando and separated from the rest of the lobe by the vertical or precentral sulcus. This remaining portion of the frontal lobe is divided by two longitudinal sulci into (b) the superior frontal convolution, (c) the middle frontal convolution, and (d) the inferior frontal convolution. The last is sometimes known as the convolution of Broca. These convolutions also extend more or less into the under surface of the lobe, which is also marked by a groove in which lies the olfactory bulb.



CONVOLUTIONS AND FISSURES OF THE OUTER SURFACE OF THE CEREBRAL HEMISPHERE.



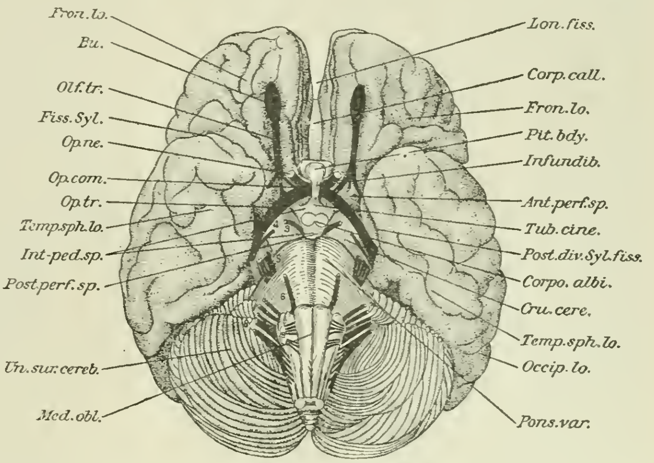
CONVOLUTIONS AND FISSURES OF THE INNER SURFACE OF THE CEREBRAL HEMISPHERE.

The *parietal lobe* is separated from the frontal lobe by the fissure of Rolando, from the tempero-sphenoidal lobe below by the horizontal limb of the fissure of Sylvius, from the occipital lobe by the parieto-occipital fissure. It may be subdivided into four fairly well marked convolutions: (a) The ascending parietal, lying just behind the fissure of Rolando. Behind the ascending parietal convolution is the intra-parietal sulcus. The portion of the parietal lobe above the horizontal part of the sulcus is known as (b) the superior-parietal convolution, and is continuous with the ascending parietal. That part of the lobe below the horizontal arm of the sulcus is divided by a vertical sulcus into (c) an anterior part, the supramarginal convolution, and (d) a posterior part, the angular convolution.

The *occipital lobe* is separated from the upper part of the parietal lobe by the parieto-occipital fissure, while it is more or less continuous with the lower part of the parietal lobe and with the tempero-sphenoidal lobe by small connecting convolutions. The lobe is rather indefinitely divided by two small transverse fissures into first, second, and third occipital convolutions.

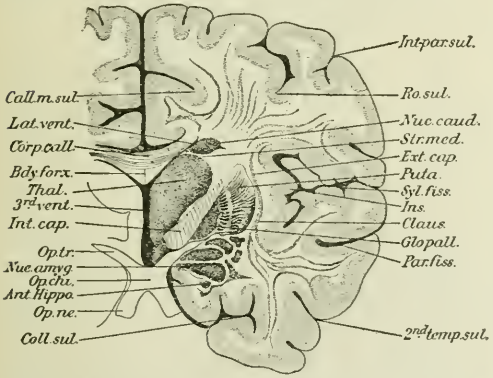
The *tempero-sphenoidal lobe* lies in the middle fossa of the skull and is bounded above and in front by the Sylvian fissure. Posteriorly, connecting convolutions unite it with the parietal and occipital lobes. It is divided by two horizontal sulci into three convolutions called from above downward, the first, second, and third tempero-sphenoidal convolutions.

The *central lobe* or *island of Reil* is situated in the depth of the fissure of Sylvius, and composed of five or six rather small convolutions.



BASE OF THE BRAIN.

Fron. lo., frontal lobe; *Bu.*, bulb; *Olf. tr.*, olfactory tract; *Fiss. syl.*, fissure of Sylvius; *Op. ne.*, optic nerve; *Op. com.*, optic commissure; *Op. tr.*, optic tract; *Temp. sph. lo.*, temporo-sphenoidal lobe; *Int. ped. sp.*, interpeduncular space; *Post. perf. sp.*, posterior perforated space; *Un. sur. cereb.*, under surface of cerebellum; *Med. obl.*, medulla oblongata; *Lon. fiss.*, longitudinal fissure; *Corp. call.*, corpus callosum; *Pit. bdy.*, pituitary body; *Infundib.*, infundibulum; *Ant. perf. sp.*, anterior perforated space; *Tub. cine.*, tuber cinereum; *Post. div. syl. fiss.*, posterior division of Sylvian fissure; *Corpo. albi.*, corpora albicantia; *Cru. cere.*, crura cerebri; *Temp. sph. lo.*, temporo-sphenoidal lobe; *Occip. lo.*, occipital lobe; *Pons var.*, pons Varolii.

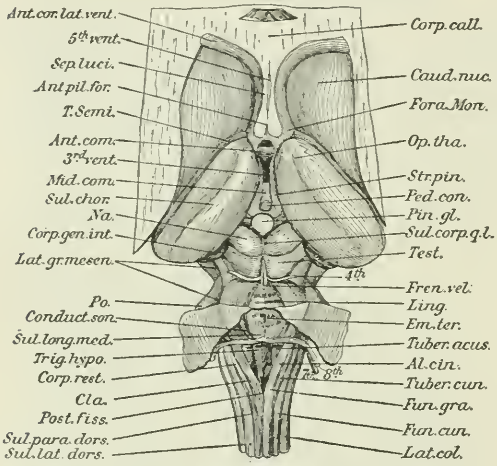


THE BRAIN VIEWED FROM BEHIND A FRONTAL SECTION THROUGH THE RIGHT HEMISPHERE TAKEN JUST BEHIND THE OPTIC CHIASMA.

Call. m. sul, calloso-marginal fissure; *Lat. vent.*, lateral ventricle; *Corp. call.*, corpus callosum; *Bdy. forx.*, body of fornix; *Thal.*, thalamus; *3rd vent.*, third ventricle; *Int. cap.*, internal capsule; *Op. tr.*, optic tract; *Nuc. amyg.*, nucleus amygdale; *Op. chi.*, optic chiasma; *Ant. Hippo.*, anterior end of Hippocampus major projecting into the descending cornu of the lateral ventricle; *Coll. sul.*, collateral sulcus; *Int. par. sul.*, intraparietal sulcus; *Ro. sul.*, Rolandic sulcus; *Nuc. caud.*, nucleus caudatus; *Str. med.*, stria medullaris; *Ext. cap.*, external capsule; *Puta.*, putamen; *Syl. fiss.*, Sylvian fissure; *Ins.*, insula; *Claus.*, claustrum; *Glo. pall.*, globus pallidus; *Par. fiss.*, parallel fissure; *2nd temp. sul.*, second temporal sulcus.

The internal surface of the cerebrum is less distinctly marked off into lobes than the external surface. The fissures on the internal surface are the calloso-marginal, the parieto-occipital, the calcarine, the collateral, and the dentate. The calloso-marginal is the longest of these fissures, begins on the superior surface just behind the mid-point, and runs forward parallel to the curve of the surface of the brain, separating the marginal or first frontal convolution from the gyrus fornicatus, which lies just over the corpus callosum. The quadrate lobule lies between the calloso-marginal sulcus and the parieto-occipital sulcus. The cuneus or occipital lobule lies between the parieto-occipital sulcus in front and above and the calcarine sulcus below. The uncinate gyrus lies below the Sylvian fissure and the dentate sulcus, while below it is separated from the tempero-sphenoidal lobe by the collateral sulcus. The tempero-sphenoidal lobe is continuous with the already described lobe of the same name in the outer surface of the cerebrum. It presents two convolutions in addition to those already described on its outer surface.

The under surface of the cerebrum shows some important features, which, passing from before backward, are as follows: (1) the longitudinal fissure, separating the frontal lobes. (2) The corpus callosum, appearing in the depth of the longitudinal fissure, and which serves as a great transverse commissure connecting the two hemispheres. (3) The olfactory nerve with its expanded extremity the olfactory bulb, lying in a groove in the under surface of the frontal lobe. (4) The fissure of Sylvius, separating the anterior from the middle lobe. (5) The anterior perforated space—so called from the perforations for the passage of blood-vessels—is the under surface of the corpus striatum (see below). (6) The pituitary body or hypophysis cerebri. (7) The infundibulum is a narrow tube of gray matter connecting the pituitary body with (8) the tuber cinereum, an eminence of gray matter lying between the diverging cerebral peduncles. (9) The corpora albicantia or corpora mamillaria are two small white protuberances each about the size of a pea just behind the tuber cinereum. They are composed externally of white matter, internally of gray matter, and are formed by the anterior crura of the fornix. (10) The posterior perforated space lies between the corpora albicantia and the anterior fibres of the pons. Its perforations are due to vessels which pass to the optic thalami. (11) The optic commissure is the crossing of the right and the left optic tracts to form the optic nerves. It is situated just in front of the tuber cinereum. (See also below—optic nerve, under *Cranial Nerves.*) (12) The cerebral peduncles or crura cerebri are two diverging bundles of white fibres which appear to come out from behind the anterior border of the pons. Each peduncle passes upward, forward, and outward, and enters the under surface of the hemisphere. (For description of cerebral peduncles, see above under *Mid-Brain.*) (13) The under surface of the cerebrum also shows the exit of the third and fourth cranial nerves, the former coming out from the inner margins of the crura in front of the pons, the latter from the outer margins in front of the pons.



METENCEPHALON, MESENCEPHALON, AND THALAMENACEPHALON FROM THE DORSAL SURFACE.

Ant. cor. lat. vent., anterior cornu of lateral ventricle; *5th vent.*, fifth ventricle; *Sep. Luci.*, septum lucidum; *Ant. pil. for.*, anterior pillar of fornix; *T. semi.*, tænia semicircularis; *Ant. Com.*, anterior commissure; *Sul. chor.*, sulcus choroideus; *Na.*, nates; *Corp. gen. int.*, corpus geniculatum internum; *Lat. gr. mesen.*, lateral groove of mesencephalon; *Po.*, pons; *Conduct. son.*, conductor sonorous; *Sut. long. med.*, sulcus longitudinalis medianus; *Trig. Hypo.*, trigonum hypoglossi; *Corp. rest.*, corpus restiforme; *Cla.*, clava; *Post. fiss.*, posterior fissure; *Sul. para. dors.*, sulcus paramedianus dorsalis; *Sul. lat. dors.*, sulcus lateralis dorsalis; *Corp, call.*, corpus callosum; *Cand. nuc.*, caudate nucleus; *Fora. mon.*, foramen of Monroe; *Op. tha.*, optic thalamus; *Str. pin.*, stria pinealis; *Ped. Con.*, pedunculus conarii; *Pin. gl.*, pineal gland; *Sul. cop. q. l.*, sulcus corpus quadratus longitudinalis; *Test.*, testis; *Fren. vel.*, frenulus veli; *Ling.*, lingula; *Em. ter.*, eminentia teres; *Tuber. acus.*, tuberculum acusticum; *Al. cin.*, ala cinerea; *Tuber. cun.*, tuberculum cuneatum; *Fun. gra.*, funiculus gracilis; *Fun. cun.*, funiculus cuneatus; *Lat. col.*, lateral column.

VENTRICLES OF THE BRAIN. The lateral ventricles represent the expanded anterior end of the embryonic neural canal, and are the cavities of the hemispheres. They are lined by a single layer of simple cylindrical epithelium, the ependyma, derived from the epiblastic lining of the neural canal. The two ventricles are separated from each other in the median line by a vertical septum known as the septum lucidum. The shape of the ventricles is irregular, each ventricle consisting of a main cavity or body and extending off from this three smaller cavities called cornua or horns. The anterior horn passes outward and forward into the anterior lobe. The posterior horn extends backward into the posterior lobe, while the middle horn descends into the substance of the middle lobe. The main cavity of the ventricle is roofed in by the under surface of the corpus callosum. Its floor is made by the corpus striatum and optic thalamus, although the tænia semicircularis, choroid plexus, corpus fimbriatum, and fornix are also situated in its floor. The third ventricle is a long narrow cavity lying between the optic thalami. Above it is bounded by the under surface of the velum interpositum, to which is attached the choroid plexus of this ventricle. Its floor is made by the lamina cinerea, tuber cinereum, infundibulum, corpora albicantia, and posterior perforated space. Three commissures cross the cavity of the ventricle, known respectively as the anterior, the middle, and the posterior commissures. Four openings connect the third ventricle with other cavities. In front the foramina of Monroe, one on each side, serve to connect the third ventricle with the lateral ventricles. Posteriorly, the aqueduct of Sylvius connects the third ventricle with the fourth. A fourth opening in the anterior part of the floor leads into the cavity of the infundibulum. The so-called fifth ventricle of the brain is, properly speaking, not a true ventricle, being simply a part of the great longitudinal fissure which has been cut off in the development of the brain, by the union of the two hemispheres, through the corpus callosum and the fornix. It is not lined by epithelium as are the other ventricles. The fourth ventricle is described above in connection with the medulla oblongata.

Certain structures remain to be described which have already been mentioned as lying in the floor of the lateral ventricles. The two largest of these, often called the basal ganglia, are the corpora striata and the optic thalami.

The corpora striata are two masses of mingled gray matter and white matter, the superior surfaces of which appear in front of the body of the lateral ventricles. The extra-ventricular portion is known as the lenticular nucleus. The intra-ventricular part known as the caudate nucleus is smaller than the extra-ventricular, from which it is separated by the internal capsule, a large band of fibres which represents the continuation upward of the main tracts of the cord and crura on their way to the cerebrum. A layer of white matter which covers the extra-ventricular portion of the lenticular nucleus is known as the external capsule.

The optic thalamus lies to the inner side and behind the lenticular nucleus, from which it is separated by a part of the internal capsule. Each thalamus is composed of white matter externally, of gray matter internally, and rests upon the corresponding crus cerebri. It forms a part of the lateral wall and floor of the body of the lateral ventricle. As the middle or descending horn of the ventricle descends the thalamus comes to form the roof of this portion of the ventricle. In front is a prominence known as the anterior tubercle, while its posterior part presents two small rounded eminences, the internal and the external geniculate bodies.

The tænia semicircularis is a narrow band of white fibres which lies in the depression between the caudate nucleus and the optic thalamus. Anteriorly, it follows the descending pillar of the fornix; posteriorly, it passes into the descending horn of the ventricle, and at the bottom of the horn enters a mass of gray matter known as the nucleus amygdalæ.

The velum interpositum is a vascular extension of the pia mater into the interior of the brain through the great transverse fissure. It enters the third ventricle beneath the corpus callosum and above the optic thalami, corpora quadrigemina, and pineal gland. Anteriorly, it bifurcates, a part entering each lateral ventricle through the foramen of Monroe. In the third ventricle two vascular fringes hang down from the velum. These are the choroid plexuses of the third ventricle. In the lateral ventricles similar fringes are attached to the lateral margin of the velum. These are the choroid plexuses of the lateral ventricles.

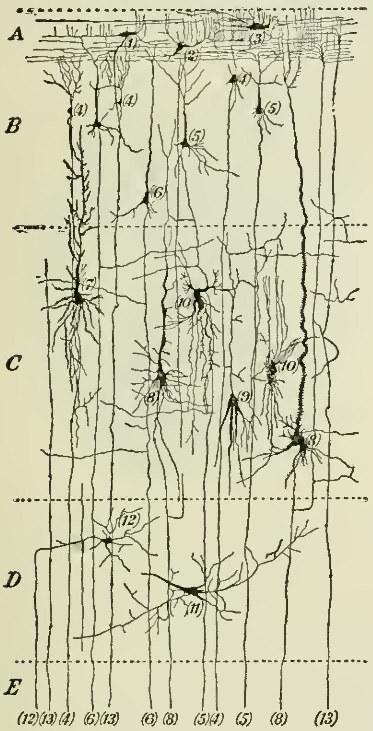


DIAGRAM OF THE CELLS OF THE CEREBRAL CORTEX.

A. Superficial or molecular layer; *(1)* fusiform; *(2)* triangular; *(3)* polygonal cells of Cajal. *B.* Layer of small pyramids; *(4)* smallest; *(5)* small; *(6)* medium-sized pyramidal cells with their axones descending to the white matter, giving off collaterals in their course. *C.* Layer of large pyramidal cells; *(7)* large pyramidal cells with very numerous dendrites; *(8)* largest giant pyramidal cells; *(9)* Martinotti cell with descending dendrites and ascending axone; *(10)* polygonal cells. *D.* Deep layer; *(11)* fusiform cells; *(12)* polygonal cells. *E.* The white matter containing axones from pyramidal cells: *(4)*, *(5)*, *(6)*, *(8)*, and from cells *(12)* of the deep layer: *(13)* neuroglia fibre.

The corpus fimbriatum or tænia hippocampi is the lateral edge of the posterior pillar of the fornix. It is a narrow white band lying just behind the choroid plexus of the lateral ventricle.

The fornix is an arch-shaped band of white fibres, running longitudinally, which bifurcates both anteriorly and posteriorly, forming the anterior and the posterior pillars of the fornix. The central portion or body of the fornix is triangular in shape, its narrow anterior end being attached to the septum lucidum, its broad posterior extremity being continuous with the corpus callosum. The anterior pillars curve downward in the lateral walls of the ventricle and enter the corpora albicantia, from which they pass into the optic thalami. The posterior pillars of the fornix pass downward in the descending horns of the lateral ventricle, their thin margin forming the already described corpora fimbriata.

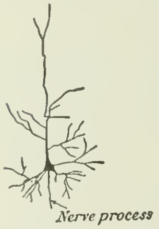
The hippocampus major or cornu Ammonis, so called from its fancied resemblance to a ram's horn, is a long curved body consisting of both gray matter and white matter which follows the curve of the floor of the middle horn of the lateral ventricle. It is formed by an extension inward of the dentate sulcus. The gray substance of the sulcus forms an irregular ridge along the margin of the hippocampus major, known as the fascia dentata. The lower end of the hippocampus major is marked by several rounded elevations which from their resemblance to the paw of an animal are known as the pes hippocampi. The hippocampus minor is a longitudinal eminence in the floor of the posterior horn of the lateral ventricle. It is due to the extension inward of the calcarine sulcus. The eminencia collateralis or pes accessorius is an eminence caused by the inward projection of the collateral fissure. It lies between the hippocampus major and hippocampus minor, and between the posterior and descending horns of the lateral ventricle.

General Histology of the Cerebrum. Each cerebral convolution consists of a central white core covered over by a layer of gray matter, which latter constitutes the cerebral cortex. The cerebral cortex may be divided into three fairly distinct layers: (1) an outer barren or molecular layer; (2) a middle layer, or layer of pyramidal cells; (3) an inner layer, or layer of polymorphous cells.

(1) The nerve cells of the barren or molecular layer are known as the cells of Cajal. They are fusiform, triangular, or irregular in shape, and both their dendrites and axones ramify in this outer layer, the axones passing mainly in a direction parallel to the surface. This layer also contains the terminations of the apical dendrites of the pyramidal cells, some medullated nerve fibres running parallel to the surface, called superficial tangential fibres, and a rich plexus of neuroglia.

(2) The layer of pyramidal cells is often described as two separate layers, an outer layer of small pyramidal cells, and a deeper layer of large pyramidal cells. Each pyramidal cell has passing off from its outwardly directed angle a large apical or main dendrite. Smaller dendrites pass off from the sides and base of the cell. The axone originates from the base of the cell and enters the white matter of the corona radiata. During its passage through the gray matter it sends off collateral branches. Some of these collateral branches are medullated and form the deep tangential fibres. Among the deeper cells of this layer are found some very large pyramidal cells, called the cells of

Betz. These cells are found only in the motor cortex, and it is believed that it is the axones of these cells which pass down through the internal capsule to the cord as the main motor tract. In this layer are also found cells—cells of Martinotti—the dendrites of which pass downward, while their axones pass upward to the molecular layer, where they turn and run parallel to the surface as the superficial tangential fibres. Cells of Golgi type II. are also found in this layer. The axones of these cells branch rapidly and end in the gray matter in the vicinity of their cells of origin. The fibres of this layer consist of the axones and dendrites of the cells above described, and of axones from cells in other regions which are passing to their terminations here.



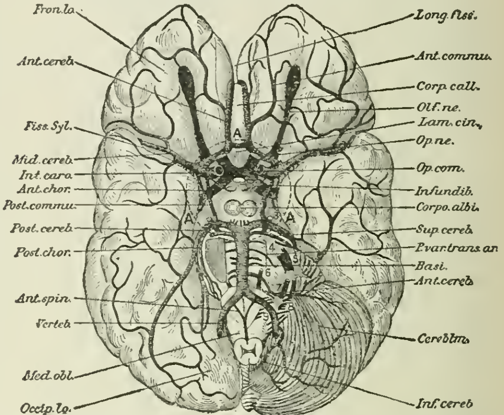
PYRAMIDAL CELL FROM A PERPENDICULAR SECTION OF THE CEREBRAL CORTEX OF ADULT MAN.

The terminal branches of the dendrites running toward the molecular layer are not visible.

(3) The cells of the third layer are fusiform or irregular in shape. They have no apical dendrites, their protoplasmic processes coming off irregularly and ramifying mainly in this layer. Their axones pass down into the corona radiata. The fibres of this layer consist of axones and dendrites of the cells just described. of the axones of pyramidal cells, and of axones of cells in other parts of the nervous system which are passing to their terminations here.

The corona radiata or central core of white matter radiating out into the gray matter consists of: (1) Descending fibres, which are axones of the large and small pyramidal cells and of the polygonal cells of the third layer. These axones become medullated and pass (a) to other convolutions of the same hemisphere—association fibres; (b) through the corpus callosum to the opposite hemisphere—commissural fibres; (c) to the internal capsule as fibres of the descending tracts—projection fibres. (2) Ascending fibres, which are axones of cells situated elsewhere in the nervous system, and which are here passing to their terminations. These fibres are (a) axones of cells situated in other convolutions of the same hemisphere—association fibres; (b) axones of cells situated in the opposite hemisphere, and which have come through the corpus callosum—commissural fibres; (c) axones which have come through the internal capsule from cells situated in lower centres—projection fibres.

Circulation. The arterial supply of the brain comes from two sources, the internal carotids and the vertebrals. At the base of the brain these four vessels form a remarkable anastomosis of large arterial trunks which is known as the circle of Willis. The arrangement of these vessels can be best appreciated by reference to the accompanying diagram. From this circle there pass off to the brain three main sets of branches: (1) The anterior cerebral, which pass forward in the great longitudinal fissure, curve around the anterior border of the corpus callosum, and, running backward on its upper surface, terminate by anastomosing with the posterior cerebral arteries. They supply the under surfaces of the anterior lobes, part of the internal surfaces of the hemispheres, the corpus callosum, the third ventricle, and the anterior perforated space. Near their origin from the internal carotids, the two anterior cerebrals are united by a short thick trunk, the anterior communicating. (2) The middle cerebral or Sylvian arteries, which pass outward along the Sylvian fissures, within which each divides into three branches—an anterior to the anterior lobe, a posterior to the posterior lobe, and a median to the small lobe near the end of the fissure of Sylvius. (3) The posterior cerebral arteries, which, arising from the basilar, pass backward and outward on the under surfaces of the occipital lobes, each terminating in three branches, which pass respectively to the uncinate gyrus, to the temporo-sphenoidal lobe, and to the lingual lobule, cuneus, and occipital lobe.



THE ARTERIES OF THE BASE OF THE BRAIN. (The right half of the cerebellum and pons Varolii have been removed.)

Fron. lo., frontal lobe; *Ant. cereb.*, anterior cerebral; *Fiss. Syl.*, fissure of Sylvius; *Mid. cereb.*, middle cerebral; *Int. caro.*, internal carotid; *Ant. chor.*, anterior choroid; *Post. commu.*, posterior communicating; *Post. chor.*, posterior choroid; *Ant. spin.*, anterior spinal; *Verteb.*, vertebral; *Med. obl.*, medulla oblongata; *Occip. lo.*, occipital lobe; *Long. fiss.*, longitudinal fissure; *Ant. commu.*, anterior communicating; *Corp. call.*, corpus callosum; *Olf. ne.*, olfactory nerve; *Lam. cin.*, lamina cinerea; *Op. ne.*, optic nerve; *Op. com.*, optic commissure; *Infundib.*, infundibulum; *Corpo. albi.*, corpora albicantia; *Sup. cereb.*, superior cerebellar; *P. var. trans. ar.*, pons Varolii transverse arteries; *Basi.*, basilar; *Ant. cereb.*, anterior cerebellar; *Cereblm.*, cerebellum; *Inf. cereb.*, inferior cerebellar; *A.*, circle of Willis.

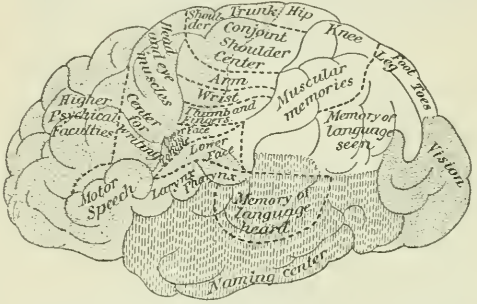
All these arteries ramify in the pia, where they anastomose freely. From this anastomosis are given off small branches which enter the substance of the brain, the shorter ones breaking up into a capillary network in the gray matter, the longer ones passing to the more deeply situated white matter. After entering the brain substance, there is no further anastomosis, the arterial capillaries passing directly into venous capillaries without communicating with the capillaries of neighboring arteries.

Besides these cortical branches, branches from the circle of Willis supply the basal ganglia. Like those in the cortex, these arteries do not anastomose after entering the brain substance.

The blood supply of the spinal cord is derived from three main arteries, the anterior spinal and two posterior spinal. The anterior spinals arise from the vertebrals, and, passing downward on the anterior surface of the medulla, unite to form a single trunk, which passes down the cord along the anterior median fissure. The posterior spinal arteries also arise from the vertebral arteries and pass down the posterior aspect of the cord along the line of the posterior nerve roots. Branches from the spinal arteries form an extensive anastomosis in the pia mater. From this network branches pass into the substance of the cord. These arteries, like those in the brain, do not anastomose after entering the nervous tissue proper.

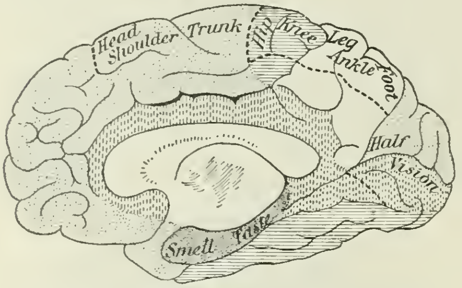
Functions of the Cerebrum. The brain, and more especially the cerebral hemispheres, must be considered as the organ of the mind. It is here that those material activities take place which underlie those mental attributes which we recognize as consciousness, intellect, emotions, and will. In the case of the higher animals removal of the cerebrum results so promptly in death of the animal that few conclusions can be drawn. In one of the lower animals, e.g. the frog, the result is the destruction of all volition and apparently of all consciousness. Stimulation, such as pinching the toes or applying the electric current to nerves or muscles, causes muscular contraction and consequent movement, but if left entirely alone the frog shows no sign of movement, with the exception of the automatic movements connected with the heart beat and with breathing. In some cases where after a time slight voluntary movements seemed to occur, it was found that small portions of the brain had not been removed. Professor Dalton's description of a pigeon from which the cerebrum had been removed is as follows: "The effect of this mutilation is simply to plunge the animal into a state of profound stupor in which it is almost entirely inattentive to surrounding objects. The bird remains sitting motionless upon his perch or standing upon the ground with eyes closed and head sunk between the shoulders. The plumage is smooth and glossy, but is uniformly expanded by a kind of erection of the feathers, so that the body appears somewhat puffed out and larger than natural. Occasionally the bird opens its eyes with a vacant stare, stretches its neck, perhaps shakes its bill once or twice, or smooths down the feathers upon its shoulders, and then relapses into its former apathetic condition." The brain would thus seem to be essential to any conscious activity. Whatever functions are carried on by the rest of the nervous system enter into consciousness only through the brain. Thus stimulation of a sensory nerve may be conceived as causing a motion (as in the case of the frog without a cerebrum) entirely independent of the brain, but in such a case there is neither any consciousness of the stimulation (sensation), nor any knowledge or control of the resulting motion. It is a purely reflex act. By means of the brain, then, stimulation of sensory nerves results in an activity in consciousness which we call sensation, and by the same means both knowledge of and control over motion are accomplished. The so-called higher mental activities, intellect or thought, and feeling or emotion, are also entirely dependent upon the cerebrum.

Our knowledge of the localization in the brain of its various functions is still far from perfect. Much of the experimentation upon cerebral localization has been done upon the monkey by exposing the brain and electrically stimulating its surface. The work of Ferrier along this line has been of extreme importance. By electrically stimulating the cortex in the monkey he determined the area stimulation of which caused motion of some part of the body, and, by comparing the convolutions of the monkey's brain with those of the human brain, he determined the probably analogous areas. The results may be briefly summed up as follows: There is a considerable area having the fissure of Rolando for its central line, which is known as the general sensory-motor area. The motor relations of this area are well shown in the accompanying diagrams. Stimulation of other parts of the brain failed to elicit any reaction. The sensory areas are not so well defined, and for obvious reasons are much more difficult of determination. Within this same region are probably located the areas which have to do with general sensations. The special senses have, however, special localizations. Thus the cortical visual centre is situated in the occipital lobe, the centre for the conscious appreciation of sound (hearing centre) in the front and upper part of the temporal lobe, while the sense of smell is located below the latter in the tip of the temporal lobe.



THE LEFT CEREBRAL HEMISPHERE (HUMAN) SHOWING THE DIFFERENT LOCALIZABLE AREAS ON THE EXTERNAL SURFACE.

That the frontal lobes are most concerned in the higher intellectual activities has long been believed. Stimulation of these lobes causes no reaction. According to Ferrier their complete removal causes no sensory or motor disturbances. His description of the monkey after complete removal of the frontal lobes is as follows: "The animals retain their appetites and instincts and are capable of exhibiting emotional feeling. The sensory faculties—sight, hearing, touch, taste, and smell—remain unimpaired. The powers of voluntary motion are retained in their integrity and there is little to indicate the presence of such an extensive lesion or the removal of so large a part of the brain. And yet, notwithstanding this apparent absence of physiological symptoms, I could perceive a very decided alteration in the animal's character and behavior, though it is difficult to state in precise terms the nature of the change. The animals operated on were selected on account of their intelligent character. After the operation, though they might seem to one who had not compared their present with the past fairly up to the average of monkey intelligence, they had undergone a considerable psychological alteration. Instead of, as before, being actively interested in their surroundings, and curiously prying into all that came within the field of their observation, they remained apathetic or dull, or dozed off to sleep, responding only to sensations or impressions of the moment, or varying their listlessness with restless and purposeless wanderings to and fro. While not actually deprived of intelligence, they had lost to all appearance the faculty of attentive and intelligent observation."



THE RIGHT CEREBRAL HEMISPHERE (HUMAN) SHOWING LOCALIZABLE AREAS ON THE MEDIAN SURFACES.

The separate localization of the different emotions, such as hate, love, fear, etc., which the teachings of phrenology would lead one to expect, has never been accomplished. In fact, there is every reason to believe that no such localization exists, the same parts of the cortex being concerned in very different emotions.

The Cranial Nerves. The cranial or encephalic nerves arise from the under surface of the encephalon or brain and leave the cranial cavity through foramina in its floor. According to the older classification of Willis, the cranial nerves were divided into nine pairs. The later and now more generally used classification of Sommerring recognizes twelve pairs of cranial nerves. The names of these nerves, taken in order from before backward, are, according to these classifications, as follows:

	Sommerring	Willis
	Pair	*Pair*
Olfactory	First	First
Optic	Second	Second
Motor oculi	Third	Third
Pathetic	Fourth	Fourth
Trifacial	Fifth	Fifth
Abducens	Sixth	Sixth
Facial (Portio dura)	Seventh	Seventh
Auditory (Portio mollis)	Eighth	
Glosso-pharyngeal	Ninth	Eighth
Pneumogastric	Tenth	
Spinal accessory	Eleventh	Ninth
Hypoglossal	Twelfth	

From the physiological standpoint these nerves fall into three groups, according to their functions. (1) Motor nerves: (a) oculo-motor; (b) pathetic; (c) abducens; (d) facial; (e) hypoglossal. (2) Sensory nerves: (a) olfactory; (b) optic; (c) auditory. (3) Mixed nerves: (a) trifacial; (b) glosso-pharyngeal; (c) pneumogastric; (d) spinal accessory. Of these the olfactory, optic, auditory, and parts of the glosso-pharyngeal and trifacial are sometimes classified by themselves as nerves of special sense.

The cranial nerves are connected with the surface of the brain at various points. These points are known as the apparent or superficial origin of the nerves. From these points their fibres can be traced into the substance of the brain to their real or deep origins in the gray matter.

The cranial nerves, with the exception of the first (olfactory) and the second (optic), are analogous, both embryologically and anatomically, to the spinal nerves.

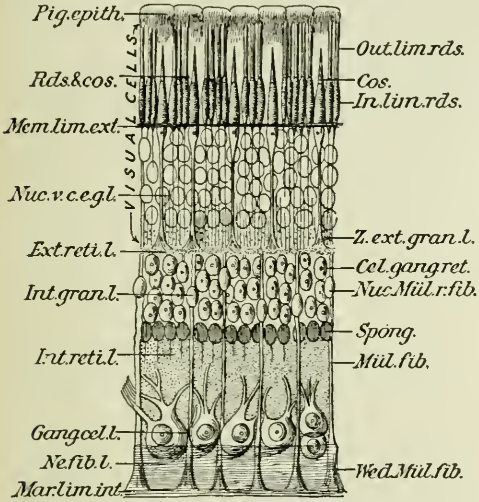
The motor root fibres of the cranial nerves are the axones of neurones whose cell bodies are situated in the gray matter of the medulla and parts above (motor nuclei of the cranial nerves), just as the motor root fibres of the spinal nerves are the axones of neurones whose cell bodies are situated in the gray matter of the cord (anterior horns). These motor nuclei are the nuclei of origin for these nerves. They are nuclei of termination for neurones of higher systems which serve to bring the peripheral neurone under the control of higher centres.

The neurones which constitute the sensory portions of the cranial nerves have their cell bodies situated in ganglia outside the central nervous system. These ganglia correspond to the posterior root ganglia of the spinal nerves. The outwardly directed processes of these cells pass to their peripheral terminations, as do those of the spinal ganglia cells. The central axones of these neurones enter the medulla and form longitudinal tracts of fibres in a manner quite analogous to the formation of the posterior columns by the central axones of the spinal ganglia cells. The sensory root fibres of the cranial nerves, however, do not ascend, as do those of the spinal nerves, but turn spineward, forming descending roots. These fibres terminate in the gray matter of the medulla (terminal nuclei of the cranial nerves) in the same manner as do the spinal sensory root fibres in the gray matter of the cord and medulla.

The first, or olfactory nerve, is properly not a nerve, but a slender process of the brain which terminates in an enlargement, the olfactory bulb, from which the olfactory nerves themselves are given off. The size and development of this olfactory process and bulb vary greatly in different animals, being in man quite rudimentary as compared with animals noted for their acute sense of smell. The olfactory process is connected with the rest of the brain by three roots called respectively the internal, or short root, the middle, or gray root, and the external, or long root. The olfactory nerves proper, that is the bundles of filaments extending from the under surface of the olfactory bulb through the foramina in the cibriform plate of the ethnoid to the mucous membrane of the nose, are made up of axones of neurones whose cell bodies are located in the nasal mucous membrane. In this respect the peripheral olfactory neurones differ from all other human peripheral sensory neurones. The short, hair-like processes of these cells which pass outward toward the surface are the dendrites. The centrally directed processes are the axones. They are non-medullated, and, passing through the cibriform plate in bundles (olfactory nerves), enter the olfactory bulb, where they terminate in end-arborizations in the olfactory glomeruli. In the glomeruli they come into relation with the dendrites of the mitral cells of the olfactory lobe. The axones of these mitral cells are medullated and form the main mass of fibres which pass back to the brain through the olfactory process or tract and its roots.

The second cranial, or optic nerve, is the nerve concerned in the special sense of sight. It is distributed entirely to the eyeball. The nerves from the two eyes, passing backward and inward, unite to form the optic commissure. From the commissure two large bundles of fibres —the optic tracts—pass backward and outward to the brain. The eye differs from all other sense organs in that its nervous apparatus is developed by a direct outgrowth from the embryonic neural canal. Later, the ingrowth of mesoblastic tissue separates the external or retinal part from the central nervous system. This retinal part is analogous to the posterior root ganglion of the spinal nerves, and, as is the case with the latter, its subsequent connection with the central nervous system is made by the growth of axones from the peripherally situated cells back into the central system. For structure of retina, see EYE.

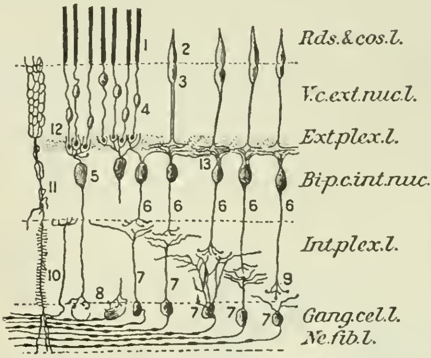
The third, or oculo-motor nerve, is a purely motor nerve. Its fibres are the axones of a group of cells situated just to one side of the median line in the floor of the iter beneath the corpora quadrigemina. Passing internally to the red nucleus, the nerve reaches the ventral surface of the mid-brain at the inner margin of the cerebral peduncle just in front of the pons. The nerve runs forward along the inner wall of the cavernus sinus, and, dividing into two parts, enters the orbit through the sphenoidal fissure. The superior branch of the nerve supplies the superior rectus and levator palpebræ. The inferior branch supplies the internal rectus, the inferior rectus, and the inferior oblique.



TRANSVERSE SECTION THROUGH THE RETINA OF MAN.

Pig. Epith., pigment epithelium; *Rds. & cos.*, rods and cones; *Mem. lim. ext.*, membrane limitans externa; *Nuc. v. c. e. g. l.*, nuclei of visual cells (external granular layer); *Ext. reti. l.*, external reticular layer; *Int. gran. l.*, internal granular layer; *Int. reti. l.*, internal reticular layer; *Gang. cel. l.*, ganglion cells layer; *Ne. fib. l.*, nerve fibres layer; *Mar. lim. int.*, margo limitans internus; *Out. lim. rds.*, outer limbs of rods; *In. lim. rds.*, inner limbs of rods; *Cos.*, cones; *Z. ext. gran. l.*, zone of external granular layer free from nuclei (Henlis external fibre layer); *Cel. gang. ret.*, cells of the ganglion retinæ; *Nuc. Mul. r. fib.*, nuclei of Miller's radial fibres; *Spong.*, spongiblasts; *Mül. fib.*, Müller's fibres; *Wed. mül. fib.*, wedge of Müller's fibres.

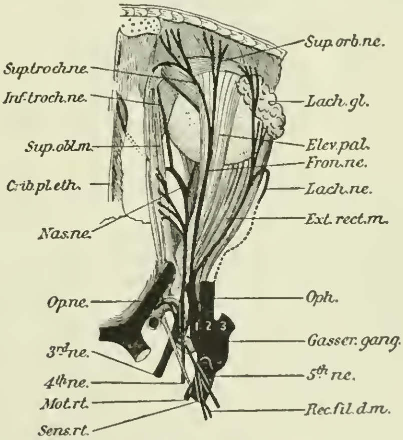
The fourth, or pathetic nerve, is the smallest cranial nerve. Like the preceding, it is a purely motor nerve. Its fibres originate in a group of cells in the floor of the iter just below the nucleus of the third nerve. The nerve winds around the outer side of the crus cerebri just in front of the pons, and, passing along the outer wall of the cavernus sinus, enters the orbit through the sphenoidal fissure. It supplies the superior oblique muscle.



SCHEME OF THE STRUCTURE OF THE RETINA, MAN.

Rds. & cos. l., rods and cones layer; *V. c. ext. nuc. l.*, bodies of visual cells (external nuclear layer); *Ex. plex. l.*, external plexiform layer; *Gang. cel. l.*, ganglion cell layer; *Ne. fib. l.*, nerve fibre layer; 1, rods; 2, cones; 3, cone granule and fibre; 4, rod granule and fibre; 5, bi-polar (rod) cells; 6, bi-polar (cone) cells; 7, ganglion cells branching in different layers of the internal plexiform zone; 8, lower branching of bi-polar (rod) cells; 9, lower branching of bi-polar (cone) cells; 10, centrifugal nerve fibre; 11, Müller's cells; 12, contact between the rods and the bi-polar (rod) cells; 13, contact between the cones and the bi-polar (cone) cells; *Bi. p. c. int. nuc. l.*, layer of bi-polar cells (internal nuclear layer); *Int. plex. l.*, internal plexiform layer.

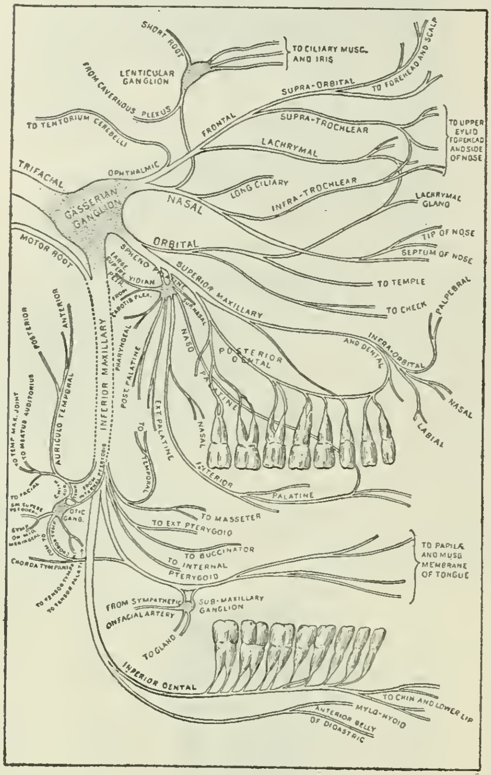
The fifth, trifacial, or trigeminus, is the largest of the cranial nerves. It resembles the spinal nerves in being composed of a motor part and a sensory part. The fibres of the smaller motor root come from cells situated in the medulla. The fibres of the sensory root come from cells in the Gasserian ganglion. The central processes of these cells enter the pons and pass to two nuclei in the floor of the fourth ven-



NERVES OF THE ORBIT, SEEN FROM ABOVE.

Sup. troch. ne., supratrochlear nerve; *Inf. troch. ne.*, infratrochlear nerve; *Sup. obl. m.*, superior oblique muscle; *Crib. bl. eth.*, cribriform plate of ethmoid; *Nas. ne.*, nasal nerve; *Op. ne.*, optic nerve; *3rd ne.*, third nerve; *4th ne.*, fourth nerve; *Mot. rt.*, motor root; *Sens. rt.*, sensory root; *Sup. orb. ne.*, supra-orbital nerve; *Lach. gl.*, lachrymal nerve; *Elev. pal.*, elevator palpebræ; *Fron. ne.*, frontal nerve; *Lach. ne.*, lachrymal nerve; *Ext. rect. m.*, external rectus muscle; *Oph.*, ophthalmic; *Gasser. gang.*, Gasserian ganglion; *5th ne.*, fifth nerve; *Rec. fil. d. m.*, recurrent filament to dura mater.

tricle. The Gasserian ganglion lies in a depression in the petrous portion of the temporal bone. From the anterior aspect of the ganglion three branches are given off—the ophthalmic, the superior maxillary, and the inferior maxillary. The ophthalmic divides into three branches, the lachrymal, frontal, and nasal, which enter the orbit through the sphenoidal fissure and supply the eyeball, lachrymal gland, mucous membrane of the eye and nose, and the skin of the eyebrow, forehead, and nose. Connected with the ophthalmic branch is a small ganglion called the ophthalmic or ciliary ganglion. The superior maxillary is the middle of the branches of the Gasserian ganglion. It crosses the spheno-maxillary fossa, in which it gives off three branches, the orbital, the spheno-palatine, and the posterior dental. The nerve next enters the infra-orbital canal, where it gives off the anterior dental branch. The nerve then passes to the face through the infra-orbital foramen and terminates in palpebral, nasal, and labial branches. The spheno-palatine or Meckel's ganglion is connected with this branch of the fifth nerve. It sends off four main sets of branches: ascending, to the orbit; descending, to the palate; posterior, to the pharynx; and internal, to the nose. The inferior maxillary is the largest branch of the Gasserian ganglion and receives the entire motor portion of the nerve. Just beneath the base of the skull the nerve divides into two branches, an anterior branch and a posterior branch. The anterior branch contains nearly all the motor fibres, and, splitting up into masseteric, deep temporal, buccal, and pterygoid branches, supplies the muscles of mastication. The posterior division is mainly sensory and is distributed as three branches—the auriculo-temporal, gustatory, and inferior dental. Two small ganglia, the otic or Arnold's, and the submaxillary, are connected with this branch of the fifth nerve.



PLAN OF THE FIFTH CRANIAL NERVE.

The sixth, or abducens nerve, is a small motor nerve whose fibres are axones of a group of cells situated in the floor of the fourth ventricle. The nerve reaches the under surface of the medulla just behind the pons between the pyramid and the olive. It passes through the sphenoidal fissure, enters the orbit, and is distributed entirely to the external rectus muscle.

The seventh, or facial nerve, is a motor nerve. Its nucleus of origin consists of a group of cells situated deep in the formatio reticularis of the upper part of the medulla. The nerve leaves the surface of the brain just behind the pons between the olive and the restiform body, thus lying to the outer side of the sixth nerve. The nerve passes forward and enters the internal auditory meatus with the sixth nerve. At the bottom of the meatus it passes into the Fallopian aqueduct, by means of which it traverses the petrous portion of the temporal bone, finding exit through the stylomastoid foramen. It then enters the parotid gland, and just behind the jaw divides into two main branches, the tempero-facial and cervico-facial. During its passage through the temporal bone it is connected with a small gray mass known as the geniculate ganglion. Its branches of distribution are as follows: Within the Fallopian aqueduct a tympanic branch to the stapedius muscle, and the corda tympani to the muscle of the tongue (lingualis); at its exit from the styloid foramen, the posterior auricular branch to the retrahens aurem and part of the occipito-frontalis, the stylo-hyoid to the muscle of that name, and the digastric to the digastric; on the face, the tempero-facial, dividing into temporal branches and malar branches, and the cervico-facial, distributed to the muscles of the head and face.

The eighth, or auditory nerve, is the nerve of the special sense of hearing and is distributed to the internal ear. The nerve is composed of two divisions, the cochlear division and the vestibular division. The fibres of the cochlear division are axones of bipolar cells in the ganglion of Corti. The peripheral processes of these cells end among the epithelial cells of Corti's organ within the cochlea. Their central processes enter the medulla at the junction of the medulla and pons and terminate in two nuclei known as the ventral and dorsal nuclei of the cochlear nerve. By means of neurones whose cell bodies are situated in these nuclei, auditory impressions are carried to higher centres. The neurones of the vestibular division of the nerve have their cell bodies located in Scarpa's ganglion or the ganglion vestibulare. These cells are bi-polar and their peripheral processes end among the hair cells of the crista and mascula acustica. Their central processes enter the medulla and pass to two nuclei of termination in which are cells whose axones carry the impulses to higher centres. See also EAR.

The ninth, or glosso-pharyngeal nerve, leaves the upper part of the medulla in the groove between the olive and the restiform body. It consists of a sensory part and a motor part. The nerve cells of the sensory part are situated in two small ganglia, the jugular ganglion and the petrous ganglion. The central processes of these cells enter the medulla and terminate in a nucleus in the floor of the fourth ventricle, which is common to this nerve and the tenth. The cells whose axones make up the motor root are situated in a nucleus called the nucleus ambiguous on account of its connection with both this nerve and the tenth, and which lies deep in the formatio reticularis. The two parts of the nerve unite and leave the skull through the jugular foramen. Branches of this nerve are distributed to the tympanum, to the carotid, to the muscular coat and mucous membrane of the pharynx, to the stylo-pharyngeus, to the tonsil, and to the tongue.

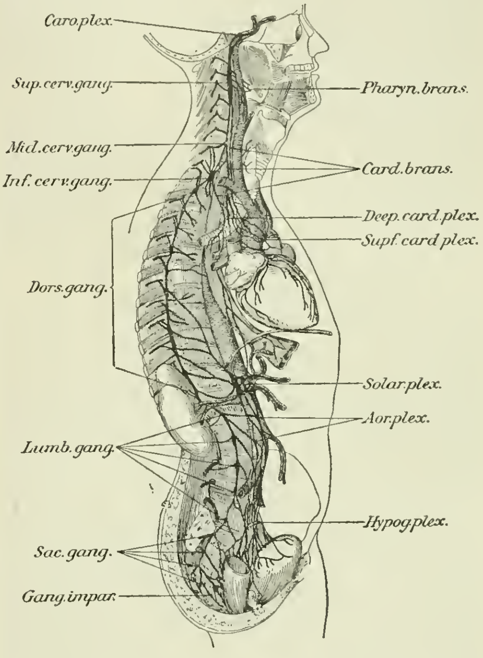
The tenth, vagus, or pneumogastric nerve, leaves the medulla just behind the ninth. It is composed of two portions, a sensory and a motor, which are connected with the already described nuclei common to both ninth and tenth nerves. The nerve leaves the cranial cavity through the jugular foramen. In the foramen it presents a swelling known as the ganglion jugulare or ganglion of the root, while just outside the foramen is a second ganglion, the inferior ganglion or ganglion of the trunk. It is in these two ganglia that the cell bodies of the sensory neurones of the nerve are situated. After its exit from the foramen, the nerve passes vertically down the neck within the sheath of the carotid vessels.

The eleventh nerve, or spinal accessory, is composed of two parts, a spinal part and a cerebral part, or part accessory to the vagus. The latter is the smaller, and arises from a group of cells situated in the medulla below the nucleus of the vagus. It leaves the medulla as three or four small filaments just below the exit of the vagus. It passes through the jugular foramen in a sheath common to it and the vagus. The spinal portion of the nerve originates in a long nucleus situated in the lateral region and extending from the middle of the medulla to the fifth or sixth cervical nerve. The fibres leave the cord in the mid-lateral region and pass through the jugular foramen.

The twelfth, or hypoglossal nerve, serves as the motor nerve for the tongue. Its nucleus is situated in the middle and lower part of the medulla, in the floor of the fourth ventricle, and ventral and lateral to the central canal. Fibres from this nucleus leave the medulla in bundles, from ten to fifteen in number, between the olive and the anterior pyramids. The nerve passes through the anterior condyloid foramen. The branches of distribution are the descendens noni, the thyro-hyoid muscular branches, and meningeal branches.

The Sympathetic Nervous System. This is composed of (a) two series of ganglia which are connected with one another by nerve fibres and extend along either side of the vertebral column from the base of the skull to the coccyx; (b) plexuses, three in number, which lie in front of the spine in the thoracic, abdominal, and pelvic cavities; (c) smaller ganglia which are situated in or upon various viscera; (d) nerve fibres which serve to connect the ganglia with one another, with the cerebro-spinal system, and with the periphery.

The series of ganglia is known as the gangliated cord and may be subdivided into three cervical, twelve dorsal, four lumbar, and five sacral ganglia. In the neck these ganglia lie upon the transverse processes of the vertebræ, in the thorax upon the heads of the ribs, in the abdomen and pelvis, upon the bodies of the vertebræ and upon the sacrum. As the two cords pass into the pelvis they unite in a ganglion called the ganglion impar, in front of the coccyx. Superiorly, the gangliated cord is continued into the sympathetic plexus on the carotid artery, this plexus being connected by filaments with the lower cranial nerves. The ganglia are connected with one another by bundles composed of intermingled gray fibres and white fibres, the white fibres being derived from the spinal nerves. The branches which connect the sympathetic ganglia with the cerebro-spinal system are composed of both white fibres (medullated) and gray fibres (non-medullated). The former are derived from the cerebro-spinal axis and pass to the sympathetic, the latter originate in the sympathetic system and end in the cerebro-spinal.



THE SYMPATHETIC NERVE.

Caro. plex., carotid plexus; *Sup. cerv. gang.*, superior cervical ganglion; *Mid. cerv. gang.*, middle cervical ganglion; *Inf. cerv., gang.*, inferior cervical ganglion; *Dors. gang.*, dorsal ganglia; *Lumb. gang.*, lumbar ganglia; *Sac. gang.*, sacral ganglia; *Gang. impar*, ganglion impar; *pharyn. brans.*, pharyngeal branches; *Card. brans.*, cardiac branches; *Deep card. plex.*, deep cardiac plexus; *Supf. card. plex.*, superficial cardiac plexus; *Solar plex.*, solar plexus; *Aor. plex.*, aortic plexus; *Hypog. plex.*, hypogastric plexus.

The three great gangliated plexuses are known respectively as the cardiac, the solar or epigastric, and the hypogastric. They are composed of nerve fibres and ganglia, the former coming from the cerebro-spinal nerves and from the gangliated cord. The cardiac plexus consists of a superficial portion which lies in the concavity beneath the arch of the aorta, and of a deep portion situated between the aorta and trachea, The solar plexus is the great plexus of the abdomen and supplies all the abdominal viscera. It is subdivided into several smaller plexuses, the names of which sufficiently indicate their location and distribution. They are known as the aortic plexus, the cœliac plexus, the phrenic (diaphragmatic) plexus, the supra-renal plexus, the renal plexus, the spermatic plexus, and the superior mesenteric plexus. The hypogastric plexus lies on the front of the sacrum between the two common iliac arteries. Below the hypogastric plexus is continued into the pelvic plexus, which is situated at the side of the rectum and bladder in the male; of the rectum, vagina, and bladder in the female. It sends branches to all the pelvic viscera and gives rise to the following subsidiary plexuses, the inferior hemorrhoidal, the prostatic, the vesicle, and in the female the uterine and vaginal.

Smaller ganglia are situated in certain viscera, notably in the heart, stomach, intestines, and uterus. They are mostly microscopic in size.

All of these ganglia serve as true nerve centres and from them pass off branches of distribution to the involuntary muscles of the blood-vessels and of the gastro-intestinal canal, to the thoracic and abdominal viscera, to the secreting cells of the various glands, etc.

Functionally the sympathetic system is quite distinct from the cerebro-spinal system. It has been called the system of vegetative existence because of its presiding over the processes of nutrition and growth, the so-called vegetative functions, in contra-distinction to the cerebro-spinal system, which presides over such distinctly animal faculties as sensation, motion, and intellect. The sympathetic system controls the so-called automatic mechanisms of the body, the rhythmical beating of the heart, contraction and dilatation of the arteries, the peristaltic action of the gastro-intestinal tract, the contraction of smooth muscle in general wherever found, the control of secretion of various glands, etc. It has also been customary to ascribe to the sympathetic a certain 'trophic' function by which was meant the determination of the nutrition of the various tissues and organs. It seems more proper to ascribe this nutritional control to its vaso-motor function, by means of which it determines the blood supply to the various parts. The sympathetic nerves contain both afferent and efferent fibres, so that impulses are transmitted both to and from the ganglionic centres. It is doubtful how many of the afferent impulses are sensory, while certainly many of the efferent impulses are not motor. The close anatomical relation which exists between the cerebro-spinal and the sympathetic system has been mentioned, and while the latter seems to be to a certain extent independent in its action, it is not infrequently brought under the control of the former even in our conscious activities. Thus in the case of blushing, an impulse reaching the cerebro-spinal centres through the eye, ear, or other sense organs causes such a reaction on the part of the sympathetic as to bring about a dilatation of the capillaries of the face. Again, in the case of the heart, quick beating and palpitation are frequently caused by the reaction of the sympathetic to impulses which have passed in through the cerebro-spinal nerves.

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For review of the finer structure of the neurone, consult *The Nervous System and Its Constituent Neurones,* by Lewellys F. Barker (New York, 1899). For gross anatomy of nervous system, consult: *Gray's Anatomy,* 14th edition; *Quain's Anatomy,* vol. iii., parts 1 and 2; Gardinier, *The Anatomy of the Central Nervous System.* For histology of the nervous system, consult: Stohr, *Text-book of Histology* (Philadelphia, 1901); Piersol, *Normal Histology;* Schafer, *Normal Histology.*

NERVOUS SYSTEM, Evolution of the. The nervous system comprises those tissues that have the property of irritability or of sensitiveness to external influences, and whose function it is to mediate between the outer world and the inner, and to convey to the muscles and other organs motor impulses so as to bring about movements harmonious and advantageous to the organism. In the nervous system also are centred those phenomena which we designate as thought, reason, will, etc. The origin of the nervous system is apparently independent of that of the muscular system, but the development of nervous tissue accompanies that of the contractile organs. In the most primitive organisms, such as the amœba, the whole protoplasm of the animal body is sensitive to external influences; there is a diffuse irritability. Thus the whole body of the amœba moves away from strong light. Moreover, it has the ability to move with reference to objects that stimulate it in some physical or chemical way.

Lower Invertebrates. In the Metazoa the nervous system develops in the ectoderm or outer layer of the body wall, which is the region that comes in contact with the outside world and hence is the one in which we should expect sensitiveness to become first developed and localized. Some of the cœlenterates have in the ectoderm superficial sensory cells with which the nerve cells are in contact. Fibres from the nerve cells connect in turn with the fibrillar part of the muscle cells. In the flatworms the nervous system is almost completely separated from the epithelium and lies in or close under the dermal musculature, and a 'brain' is best developed in some of the Polycladida and some trematodes. The nervous system of echinoderms has a development unknown in other animals. It is composed of three independent systems: (1) the superficial oral; (2) the apical oral; (3) the deeper oral. The superficial oral consists of a ring around the œsophagus, and of radial nerves which branch out from this ring to the arms and radii. This system innervates the intestine, ambulacral feet, and integument. The nervous system of Mollusca is of a complex type of its own, but shows some affinities to that of annelids and arthropods. In its simplest form (chitons) it consists of a cerebral part, from which four pairs of commissures are sent off. Passing ventrally from it there is a ring with ganglia, and passing backward two pairs of commissures, one called 'pedal' and the other 'pallial.' All of these contain ganglion cells along their whole length, and send off various branches and commissures. The pallial commissures are united posteriorly. In the Pelecypoda the nervous system is somewhat more complex, but it is always symmetrical, and consists of two ganglia, the cerebro-pleural, one on each side of the gullet, and united above by a commissure. Each ganglion gives off a nerve cord, which passes downward and backward to the bilobed pedal ganglion of the foot. Directly backward from the cerebral ganglia also proceed two other cords to the bilobed, fused, visceral ganglion, situated on the ventral side of the posterior adductor muscle; this ganglion sends out branches to the palps and mantle. The pedal ganglion innervates the foot, the viscera, the enteric canal, the heart, the gills, and a part of the mantle. The nervous system of gastropods varies in the different groups both in regard to the arrangement of the ganglia and the commissures. There is usually a pair of ganglia near together or some distance apart, which lie above the gullet, and give off the visceral nerve cords behind. The visceral cords pass eventually into a pair of ganglia, but only after they have passed through the pleural ganglia. Pedal and buccal ganglia with their commissures also exist.

The nervous system of annelids is well developed and has a bilateral and metameric arrangement. It consists of the bilobed cerebral ganglion or brain and of a double ventral chain of ganglia and commissures. The brain lies in the prostomium or a little farther back, as in the case of the earthworm. Branches are given off from it to the eyes, tentacles, and sensory epithelium. Two lateral commissures from it pass ventrally around the alimentary canal and unite below it into the double ventral nerve chain. One ganglion occurs in this nerve chain for each segment. In some forms the two halves of the chain are widely separated and are united by transverse commissures. The arrangement of the nervous system of arthropods is essentially like that of annelids. There is a supraœsophageal ganglion or brain that gives off commissures which pass downward and backward to unite with the first ganglion of the ventral nerve chain. Various degrees of concentration of the nervous system occur throughout the Crustacea and the insects. The higher Crustacea, as well as the insects, have a visceral nervous system. The brain of insects is relatively large and is lobed.

VERTEBRATES. The nervous system of the higher vertebrates consists of a double chain of ganglia lying in the median line on the dorsal side of the body, which consists of the spinal cord and the brain. The segmental origin of the spinal cord is shown by the regular repetition of the spinal nerves that branch out from it in pairs, one on each side. The visceral or sympathetic system of vertebrates consists of a series of ganglia on each side of the vertebral column. Fibres connect this system with the spinal and cranial nerves. Nerves from the neural axis pass to all the various sense organs, muscles, and glands. The spinal cord is made up of two kinds of nervous matter, a superficial white layer and an internal H-shaped rod of gray matter. The cord merges gradually into the brain (q.v.), which has a bilateral form and consists, in its simplest form, of three parts, the fore-brain, mid-brain, and hind-brain. The two lobes of the cerebrum comprise the most anterior part of the brain. The mid-brain connects the fore and hind brain. The hind-brain includes the bilobed cerebellum on its dorsal side and the pons Varolii and medulla oblongata on the ventral side. The brain is made up of two kinds of nervous matter, the white and the gray. Its surface is much convoluted, so as to give a greater surface for the gray matter which forms the outer coating. The cranial nerves arise from the lower surface of the brain.

The brain of the Acrania (Amphioxus) is the enlarged anterior end of the neural axis and in it the central canal enlarges to form the ventricle. The ventricle opens dorsally to the exterior of the brain. Anterior to the opening there is a pocket known as the olfactory lobe. The brains of cyclostomes and teleosts represent a low stage of development in that they possess an unpaired prosencephalon whose dorsal wall, the corti cerebri, consists of a single layer of cells covered by the pia mater. In the larva of cyclostomes (Ammocetes) the metencephalon is the largest part of the brain. Selachians possess a more complicated brain. They lead an active, predatory life, and correspondingly the prosencephalon is relatively large and shows a slight furrow or division into two lateral parts or lobes. A prominent pair of bulbi olfactorii pass from in front to the nose. The thalamencephalon gives rise to two small optic thalami and there are other modifications in the rest of the brain which render it a more complex organ. There is a bundle of fibres from each side of the prosencephalon that probably corresponds to the crus cerebri of mammals. The brains of ganoids and dipnoans resemble those of amphibians in the absence of the lobi inferiores. In all three the cerebral hemispheres show a marked development. The cerebellum exists only as a small fold at the anterior end of the medulla. In the Anura the optic lobes are well developed.

In Reptilia, as in Amphibia, the cerebellum is small. A well-developed median eye-like structure, the pineal eye, is present on the root of the mid-brain. The prosencephalon is the largest part of the brain. It is paired, and its surface is smooth. There is a large olfactory lobe and a well-developed corpus striatum. The avian brain is characterized by a considerable cranial flexure, by large cerebral lobes, by a cerebellum. In sagittal section the latter shows the arbor-vitæ structure so evident in the brain of man. Externally the brain is folded transversely or convoluted. The mammalian brain exhibits in the different groups a steady growth in complexity from the reptilian to the human condition. The cranial flexure is most pronounced in the mammalian brain.

That the degree of development of the different organs within the group of mammals is dependent upon their functional activity can hardly be doubted. Thus, the 'pyramids' are the motor nerves coming from the coördinating centres of movement. These are relatively small in the dolphins, which possess no hinder extremities. The frontal lobe of the cerebrum, upon which probably many of the higher functions, such as speech, depend, are best developed in man; so, too, the olfactory lobes are reduced in man in correspondence with the rudimentary condition of their function in man. While the mid-brain is more or less exposed in some of the lower mammals (e.g. marsupials, rodents, and insectivores), the hemispheres come gradually to cover the entire brain. The mammalian brain is characterized by the presence of large commissures, the corpus callosum and fornix, which connect the hemispheres. The pons Varolii is another large commissure and connects the two lateral lobes of the cerebellum, and a number of other bands serve as connectives. In mammals the mid-brain is relatively smaller than in other vertebrates. The brain of Tertiary mammals was relatively small. The reduction was especially evident in the hemispheres. In many points of structure their brain, too, was reptilian in character, although the possessors were related to groups as high as ungulates.

Three main and well-defined types of nervous system may be determined in the animal kingdom. There is first the radial type, such as has been described for the starfish. This consists of a ring of nervous tissue in the disk which surrounds the œsophagus and sends out a branch to each arm. This is the echinoderm type. Another type is the symmetrical, bilateral type of annelids and arthropods, to which the nervous system of mollusks may also be relegated. This type consists of a brain ganglion above the œsophagus, with commissures that pass around and below the digestive tract, where they unite ventrally with a chain of ganglia extending posteriorly. The pedal ganglion of mollusks represents the subœsophageal ganglion. The rest of the ventral chain is absent in unsegmented mollusks. The third type of nervous system is the bilateral type of vertebrates. Here the double nerve cord, segmental in origin, as is shown by the repetition of paired spinal nerves, lies on the dorsal side of the alimentary tract. Except in Amphioxus the vertebrate nerve cord widens anteriorly into a large and complex ganglion mass, the brain. The sympathetic system, which appears first in leeches and arthropods, is an almost independent nervous system, for while it is in direct union with the other nervous system, it is not at all under its control.

Sense Organs. As soon as sense organs appear the nervous elements of animals consist of three parts: (1) the so-called terminal, end, or sense organ; (2) the ganglia; and (3) the nerves. End organs appear first clearly defined in the Cœlenterata, although the pigment spots of Euglena are in a particularly sensitive region in that infusorian. The sense organs of the Cœlenterates are most developed in the medusæ and consist of the tentaculocysts with calcareous lithites, pigment spots or ocelli, and sensory pits known as olfactory pits. Pigment cells or 'eye spots' are found in many of the flatworms, some of the polyclads possessing several hundred. These eyes, in many forms, are grouped in pairs at the anterior end of the body or are scattered along the anterior margin, or even along the entire margin of the body. In many forms the eyes are simple pigment spots. In others a refractive body occurs. In triclads and polyclads the eye consists of a pigmented apparatus with retinal or light-perceiving cells within a cup-shaped organ. These cells connect with the optic nerve. Auditory organs also occur in the flatworms, each consisting of a fluid-filled sphere lying close to the brain in which is an otolith. The skin is everywhere very sensitive, due to tactile hairs, especially on the tentacles. The proboscis of certain forms contains an invagination which is capable of extrusion, and is believed to be a touching organ. The suckers of trematodes, too, are especially sensitive. There are ciliated pits in the epithelium of triclads and other forms to which an olfactory function has been ascribed.

Sense organs occur over the whole integument of mollusks. These cells, when in exposed positions, may have a tactile function. The pallial sensory organs and the ospharadium, which occur near the gills, are probably olfactory organs to test the condition of the water. The optic tentacles of pulmonates and the dorsal tentacles of opisthobranchs are stated by some authorities to be olfactory organs. Ciliated ridges in the mantle furrows of certain chitons are supposed to have an olfactory function. Auditory organs are absent in the Amphineura alone among mollusks. The auditory organ consists of a closed, fluid-filled vesicle, or 'otocyst,' in which a varying number of otoliths are inclosed. Sensory cells occur on the wall of the otocyst, which bear sensory hairs. The otocysts of cephalopods have been shown to have a statical function also. The simplest visual organs of mollusks are optic pits. The retina lies at the base of the pit, and along this base the optic nerve spreads out. The retina consists of cells with and without pigment. External to the retina is a gelatinous cuticle or even a lens. By the approach and fusion of the edges of the pit the vesicular eye is formed. That part of the epithelium which is free from pigment constitutes the cornea. This type of eye occurs on the tentacles of gastropods. By a further development the simple cup-like eye is differentiated into the complex, highly developed organ of cephalopods. The mantle eyes of the scallop resemble vertebrate eyes in that the visual rods are turned away from the light, that is to say, they are directed toward the body.

The sense organs of echinoderms comprise the auditory organs and eyes. The auditory organs are of two types. The first type is represented in holothurians, and consists of an otocyst which is lined with ciliated epithelium, container and otolith, and filled with fluid. In echinoids is found the second type of auditory or orienting organs, which are believed to be transformed spines. Organs of this type are known as 'sphæridia,' and are developed only on the oral side; they are spherical, stalked bodies and may be inclosed in a pit of the test. The organs of special sense in the annelids are the eyes, tentacles, cirri, and otocysts. The structure of the eye, when that organ is present, is very simple. The eyes are confined to the prostomium, but there are eye-like organs on many or all the body segments or on the branchial filaments of many species. Eyes are lacking in nearly all Oligochæta and some of the Polychæta. The eye is usually a capsule with a layer of elongated cells on the side toward the brain. A thickening of the cuticle may form a lens. Otocysts with otoliths are not common. Tactile cells occur generally all over the body and especially on the prostomium.

The organs of special sense in arthropods are eyes, olfactory setæ, auditory organs, and organs of touch. The eyes are of two sorts, median eyes and a pair of faceted, compound eyes. The median or 'nauplius' eyes sometimes occur in the larvæ only, and are composed of a cuticular lens and a group of specially modified epidermal cells.

The paired, compound eyes are covered by a transparent cuticula. A single visual element of the compound eye is called an ommatidium. Each element is composed of two parts, an outer vitreous and an inner sensory group of cells. The latter is known as the rhabdome and is made up of the retinule and a refracting rod. Each ommatidium is in a state of optical isolation. Fibres pass from the optic ganglia to the retinule. The organs of touch are bristled cells on the appendages, especially on the antennæ, the palpi, and on other parts of the body. The olfactory organs of the crayfish consist of a number of delicate setæ borne on the antennules. The auditory organ is a pit upon the exterior and lined with auditory setæ. Grains of sand in the case of Crustacea often serve the function of otoliths. These must be renewed after each molt.

Amphioxus possesses an olfactory pit. It is a ciliated depression at the level of the anterior end of the brain. It is connected with the olfactory lobe of the brain. This pit may correspond with the 'pituitary body' of Urochorda and Craniata. The organ of sight is merely a pigment spot. It is median and without a lens. Cells supposed to have a sensory function occur on the roof of the oral hood and tactile cells occur on the buccal cirri.

The organs of special sense of vertebrates comprise various kinds of tactile organs, of which may be mentioned the lateral-line organs, which in structure resemble the organs of chætopods. The lateral-line organs occur in amphibians and fishes, and are supposed to perceive vibrations in the water and also to have an auditory function. End-bulb organs likewise occur here and there over the entire surface of fishes. From amphibians upward they are restricted to the mouth. Specialized tactile cells, such as the Pacinian corpuscles of the duck's beak, occur in different vertebrates.

The olfactory organ is in fishes a pair of sensory pits near the anterior end of the snout. From the Dipnoi onward these pits communicate with the mouth cavity as well as with the exterior. From the Dipnoi onward also these organs are more or less inclosed either in a cartilaginous capsule or they are included in the cranium. The internal nostrils with their glands are developed in Dipnoi and Amphibia. The nasal cavity of Lacertilia is divided into an outer and an inner part. From the crocodiles onward the nasal organs recede in correspondence with the forward extension of the facial region. Both in reptiles and birds there is only one true turbinal bone in the nasal canal. Because of the extreme facial development of the skull of mammals, the nasal cavity is proportionately larger. The turbinals consequently greatly develop here. The nasal cavity of mammals communicates with certain sinuses of the face.

The sensitive elements of the vertebrate eye develop from outgrowths, primary optic vesicles, of the brain. The pigment epithelium develops from an inpocketing of this vesicle. The lens develops from thickened epidermal cells. In cyclostomes the lens and iris are absent and the sclerotic and cornea are undifferentiated. A globular lens is present in the eyes of true fishes. Amphibian eyes are simpler than those of fishes, but a ciliary muscle is present. The sclerotic is cartilaginous with bony plates even in lizards and birds. The eye-ball of nocturnal birds is elongated and tubular. The iris of birds may be highly colored owing to the presence both of pigment and of fat globules. The eye of mammals is more or less inclosed in the bony orbit, the sclerotic is fibrous, and the fibres of the optic nerve pass into the retinal cells. The retina is histologically a complicated structure and consists of seven layers; the light must pass through all the layers in order to reach the innermost rod and cone layer. The region of acutest vision is the fovea centralis, where only the cones persist.

As to auditory organs, it is the sacculus and cochlea in the vertebrate ear that attain a higher and higher degree of development. In fishes the cochlea is a knob-like appendage of the sacculus. In amphibians it is constricted off from the sacculus and only remains connected by a strand of cells. In mammals the cochlea becomes spirally coiled. There are three coils in man. A chain of three auditory ossicles appear in the higher vertebrates.

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NES'BIT, EDITH. An English poet. See BLAND, EDITH NESBIT.

NESS, LOCH. A lake in the County of Inverness, Scotland. It occupies, together with Loch Lochy and Loch Linnhe, the bottom of the great fracture which in an almost straight line severs the northwestern Highlands from the rest of Scotland, and which is known as Glen More, or Great Glen (Map: Scotland, D 2). Loch Ness is 23 miles long, from one-half to one and one-half miles broad, and connected by rivers and canals with the Firth of Lorne on the southwest and Moray Firth on the northeast. It receives the waters of several small rivers, and is surrounded by high and steep mountains which make the scenery very picturesque. Owing to its immense depth the Loch never freezes.

NESSELRODE, nĕs'sel-rō'de, KARL ROBERT, Count (1780-1862). A Russian diplomat, born at Lisbon, where his father then resided as Russian Ambassador. The young man devoted himself to a diplomatic career, won the confidence of the Emperor, Alexander I., and was in the diplomatic suite of the latter during the eventful year of 1813 and the negotiations at Paris after the first defeat of Napoleon. He was one of the signers of the treaty of the quadruple alliance at Chaumont, and also of the treaty with Marshal Marmont for the surrender of Paris. He was one of the most prominent of the plenipotentiaries in the Congress of Vienna, and in 1816 became Minister of Foreign Affairs, and accompanied the Emperor Alexander to the congresses of Aix-la-Chapelle, Troppau, Laibach, and Verona, where he always advocated a policy of moderation. Under Nicholas I., Nesselrode became Vice-Chancellor (1829) and Imperial Chancellor (1844). It fell to him to direct the Russian policy in the affairs of Greece and Turkey. Nesselrode was opposed to the policy which brought on the war of 1853-56 and retired from the Foreign Office after signing the Treaty of Paris in 1856, though he retained the dignity of Chancellor of the Empire and a seat in the Ministerial Council. He died at Saint Petersburg, March 23, 1862. His autobiography, which is not of especial value, was published in 1866.

NESSLER, nĕs′lĕr, Julius (1827—). A German agricultural chemist, born at Kehl. He established at Karlsruhe the important experimental station which afterwards passed under Government control. Among the preparations known by his name are Nessler's reagent for ammonia, a mixture of iodide potassium and iodide of mercury with free potash, and Nessler's insect powder, powdered tobacco, fusel oil, soap, and spirits of wine. He described his important studies on the culture of the vine and of tobacco, and on the tests of the purity of wine, in *Der Wein, seine Bestandteile und seine Behandlung* (2d ed. 1866); *Der Tabak, seine Bestandteile und seine Behandlung* (1867); and *Die Bereitung, Pflung und Untersuchung des Weins* (7th ed. 1897).

NESSLER, Victor (1841-90). A German composer, born in Baldenheim, Alsace. He received his musical education in Leipzig, where he was a student of theology, during which period he successfully conducted several singing societies. The success of his opera *Fleurette* (1864) determined his career; and after further study in Leipzig, he devoted himself entirely to composition. His works comprise half a score of operas and operettas of varying merit, the most successful of which is the universally popular *Der Trompeter von Säkkingen;* also choruses, song-cycles, and part-songs. He died at Strassburg.

NES′SUS (Lat., from Gk. Νέσσος). In Greek mythology, a centaur who carried travelers over the river Evenus. When Hercules came with Deïanira to the river, he swam across, but allowed the centaur to carry his wife. Nessus offered violence to her and was killed by Hercules. In revenge, he told Deïanira that his blood would prove an invincible love philter. Later, becoming jealous of Iole, she dipped a robe in the blood and sent it to her husband, who was so tortured by the venom from the arrows poisoned in the hydra's blood, that he sought death on the funeral pile. Sophocles deals with this myth in the *Trachiniæ*.

NEST. A receptacle for eggs or young, provided by many sorts of animals. The nest reaches its greatest elaboration among birds, where in some cases, as that of the cotton-bird, hangnests, weaver-birds, etc., it becomes a fabric woven with astonishing ingenuity. The nests of certain swifts (see Salangane) are further remarkable for edible qualities. Nests and the habits, instincts, and utilities connected with them are fully discussed under Nidification.

NES′TOR (Lat., from Gk. Νέστωρ). In the Homeric epic, the type of the wise yet vigorous old man. He was said to be a son of Neleus and Chloris, and at the time of the Trojan War had already outlived two generations. He is the persuasive speaker, drawing on his stores of wisdom and experience for the guidance of the younger leaders. In the war which Hercules waged against Neleus, all the brothers of Nestor were killed, but he escaped through his absence in Geronia. On his return to Pylos he punished the neighboring Epeians of Elis for their raids. He even took part in the war between the Lapithæ and Centaurs, but it is only in later writers that he appears as a participant in the Calydonian Hunt and the Argonautic expedition. His part in the *Iliad* is prominent, since the Ionian princes of Asia Minor regarded themselves as his descendants. He appears in the *Odyssey* as safely returned from Troy to Pylos, where he hospitably receives the young Telemachus. Of his death there was no tradition, but Pausanias mentions his grave at Pylos.

NESTOR (1056-1114). The first Russian chronicler. In 1083 he entered the convent at Kiev, where he died after a life of asceticism and holiness. The original of his chronicle has not come down to us, nor is there any faithful copy of it extant. One can only gather what it was from the numerous later chronicles, all based on one archetype directly ascribed to Nestor in one codex. Like the mediæval chronicles of Joannes Malalas and Georgios Hamartolos, on which it drew for much information in general history, Nestor's story begins with the distribution of mankind after the flood and then leads up to the Slavs—a branch of the Japhetic race—and their subdivisions. A note after the year 1110 shows that the subsequent narrative belongs to another person. Nestor made use of all possible sources of information, incorporating treaties with Greek emperors, didactic works written by princes for their children's instruction, lives of saints, church annals, popular legends and traditions, personal reminiscences of old people, and finally his own recollections. The rapid growth of Kiev inspired the author to a high pitch of patriotism, the narrative often attaining great poetic fervor and charm. Besides the chronicle, Nestor is reputed to have written the *Lives of Saint Boris and Glyeb* and the *Life of Saint Theodosius*. Consult: *Chronique dite de Nestor*, trans. by L. Leger (Paris, 1884); Pogodin, *Nestor*, trans. into German by F. Löwe (Saint Petersburg, 1844).

NESTO′RIANS. The name commonly given to one of the schismatic churches of the East, formely large and flourishing, but now small in numbers and with little influence. The name is derived from Nestorius (q.v.). It was first applied to them by a theological opponent, Philoxenus, Monophysite Bishop of Hierapolis, about the year A.D. 500, and although the Nestorians themselves never adopted the title, preferring to be known as Chaldæan or Oriental Christians, it passed into common use and has remained their usual designation. The Nestorians claim an Apostolic origin for their Church, appealing to an ancient tradition according to which the Apostle Thaddæus is said to have carried the Gospel to King Abgar of Edessa, but this story lacks historical confirmation. There is no clear evidence of the presence of Christianity in Persia before about 200, when the Bishop of Antioch held control over that section of the Church. Under the Neo-Persian kingdom of the Sassanidæ (q.v.), in the third century, a new bishopric was established at Seleucia-Ctesiphon, on the Tigris, which in time assumed ecclesiastical leadership. But it was not until the fifth century that the Nestorians began to call the Bishop of Seleucia their 'Catholicus,' or national patriarch, and still longer before his primacy was acknowledged by the other bishops.

The chief causes which gave rise to the separate existence of the Nestorian Church, during the fifth century, were as follows: (1) the reorganization of the Church by a synod of forty bishops, held in Ctesiphon in 410, after a severe persecution; (2) the condemnation of Nestorius, in 431; (3) the expulsion of Nestorius's sympathizers from Edessa by Bishop Rabulas, after the Council of Ephesus; (4) the rise of Nisibis as a centre of Christian learning and theological influence, from 435 onward; and (5) the final closing of the school at Edessa by the Emperor Zeno, in 489, on account of its persistent Nestorian leanings. All these things operated to centralize Persian Christianity, and to separate it from organic connection with the See of Constantinople. The Nestorian leaders succeeded in winning favor with the Persian kings to such an extent as completely to control the ecclesiastical situation. They had been aided in the earlier stages of their growth by the prestige of adherents like Aphraates, in the fourth century, and Ibas, Bishop of Edessa, in the fifth; but their most important leader, in the formative period, was Barsumas, one of those whom Rabulas had driven out of Edessa in 431. Barsumas became Bishop of Nisibis, and for more than half a century (435-489) he guided the fortunes of the Persian Church, wisely administering his See, winning royal favor, and establishing schools of learning (e.g. at Seleucia) to perpetuate the movement to which he had devoted his life.

During the sixth and seventh centuries the Nestorians greatly extended their numbers and influence, reaching out by means of missions into Arabia, Armenia, India, Tartary, Ceylon, and China. An ancient monument, erected in 781 at Si-ngan-fu and discovered by Jesuit missionaries in the seventeenth century, bears testimony to the existence of Nestorian Christianity in China from the year 636, when the mission appears to have been started. In 642, as a consequence of the Arab conquest of the Sassanid kingdom, the Nestorians passed under Mohammedan rule. But the caliphs granted them a considerable degree of religious toleration, and their Catholicus was treated as if he were patriarch of all the Asiatic Christians under Moslem rule. He took up his residence in Bagdad (in 762) and there remained as long as the caliphate endured. In Arabia also the Nestorians met with favor in the eyes of their Mohammedan neighbors. This friendly treatment was possibly due in part to the example of Mohammed himself, who is said once to have come into friendly contact in Arabia with a Nestorian monk, named Sergius, from whom he may have gained some knowledge of Christianity. From a Mohammedan historian of the eleventh century we learn that the Nestorians were then noted for their intellectual acumen, in which they surpassed their orthodox contemporaries. They differed somewhat from Catholic Christians in points of ritual observance, especially those relating to the calendar, and it has been thought possible that they were influenced by the customs and usages of their Jewish neighbors in Babylonia.

Nestorian Christianity culminated in the thirteenth century, when there were twenty-five metropolitans in the hierarchy, no one of whom had fewer than six bishops under his jurisdiction. The Catholicus was almost a pope in the extent of his ecclesiastical domain. But from this time onward their prosperity diminishes. After the fall of Bagdad before the Mongols (1258), the Catholicus was obliged frequently to change his residence, which was in itself a serious administrative disadvantage. In the fourteenth century came the Tatars, under the fierce Tamerlane (q.v.), who made sad havoc of the Nestorians. Internal dissensions split the Church in the sixteenth century, but those who claimed to be the true Nestorians adhered to the hereditary line of Mar Shimun, the family from which the Catholicus has been chosen ever since the fifteenth century. Their patriarch always bears the name of Simeon (Shimun). Some ultimately joined the Roman Catholic Church, admitting the supremacy of the Pope, but retaining special privileges, such as clerical marriage, which was a very ancient custom among them. These constitute the so-called Uniat Chaldæans. The Nestorian hierarchy at the present time consists of only one metropolitan and about ten bishops, in addition to their Catholicus. They number perhaps as many as 50,000 souls, but precise statistics are lacking. Some estimates are much larger than this.

The Nestorians take their stand upon the first two ecumenical councils, rejecting the decisions of Ephesus, and of course taking no part in subsequent councils of the Catholic Church. They have never been persuaded to accept the orthodox view of the Papacy, or of the doctrine of transubstantiation, or of purgatory. Their hierarchical organization culminates in the patriarchate. They have sanctioned clerical marriage ever since the fifth century, although this privilege does not extend to the bishops. Syriac is their official language. Their former generous philanthropy, exemplified in the foundation of asylums, almshouses, etc., has vanished along with their general prosperity as a Church and people, and at present they are themselves the objects of charity and of missionary effort. Friendly negotiations have been carried on with them by representatives of the Church of England, partly in the hope of bringing about ecclesiastical union. Protestant missionaries have been sent to them from America, especially by the American Board (Congregational), with a view to arousing them to new evangelical effort on their own behalf. But thus far these efforts have met with little success. In 1898 the Persian branch of the Nestorian Church, estimated at about 30,000 persons, formally joined the Orthodox Church of Russia, thereby gaining the political protection of the Czar.

The Christians of Saint Thomas (q.v.), dwelling on the coast of Malabar, India, are historically connected with the Nestorians.

Consult: Assemani, *Bibliotheca Orientalis*, vol. iii. (Rome, 1725-28); Badger, *The Nestorians and Their Ritual* (2 vols., London, 1852); Hefele, *History of the Councils*, vol. iii. (Edinburgh, 1883); Perkins, *A Residence of Eight Years in Persia* (Andover, 1843); Hore, *Students' History of the Greek Church* (London, 1902).

NESTO′RIUS (Lat., from Gk. Νεστόριος, Bishop of Constantinople, 428-431, and author of the Christological heresy known as Nestorianism. He was a pupil of Theodore of Mopsuestia, one of the leading theological teachers of Antioch, who was greatly revered throughout the Asiatic section of the Eastern Church.

In 428 Nestorius was summoned from his monastic retirement near Antioch to become Bishop of Constantinople, whither his fame as an ascetic and preacher had preceded him. As patriarch, Nestorius immediately declared war upon all heretics, and began persecutions against Arians, Quartodecimanians, Macedonians, etc. The popular theology of Constantinople did not escape. A presbyter named Anastasius, preaching in the cathedral church one day, declared with energy, "Let no man call Mary 'Mother of God,' for Mary was only a woman, and it is impossible that God should be born of a woman." Nestorius hastened to support and reiterate the position his presbyter had taken, which was an open defiance of the Alexandrian party.

A fierce controversy ensued. Cyril, supported by Cœlestine, Bishop of Rome, published twelve anathemas against Nestorius, to which Nestorius replied in kind. The Emperor, Theodosius II., was obliged to convene a general council to settle the disturbance. It met at Ephesus in 431. (See EPHESUS, COUNCILS OF.) Its stormy proceedings were directed by Cyril, and Nestorius was condemned. John of Antioch, who arrived late, entered an unavailing protest against this verdict. The writings of Nestorius were burned, by Imperial order, and his followers were branded with the opprobrious name of Simonians. Nestorius was allowed to return to his old monastery near Antioch, where he passed four years. He was then banished to Arabia, and afterwards to Egypt, where he endured many hardships, and won the title of martyr among his followers. He wrote a defense of his life and teaching, of which only a few fragments survive (in the works of his opponents). We have a melancholy picture of the closing years of his life in Evagrius's *Ecclesiastical History*, i. 7, which is evidently colored by the author's hostility. The place and date of his death are unknown. The Nestorians (q.v.), although bearing his name, do not cherish his peculiar teaching. An illustration of Monophysite detestation of his memory is found in the grim ceremony of the Jacobites, who once a year assemble and cast stones upon the spot where his body is supposed to have been buried. Consult: Smith and Wace, *Dictionary of Christian Biography*, article "Nestorius;" Harnack, *History of Dogma*, vol. iv. (Eng. trans., London, 1898); Schaff, *History of the Christian Church*, vol. iii. (3d ed., New York, 1889); Du Bose, *The Ecumenical Councils*, chs. 10 and 11 (2d ed., ib., 1897); Bright, *The Age of the Fathers* (London, 1903).

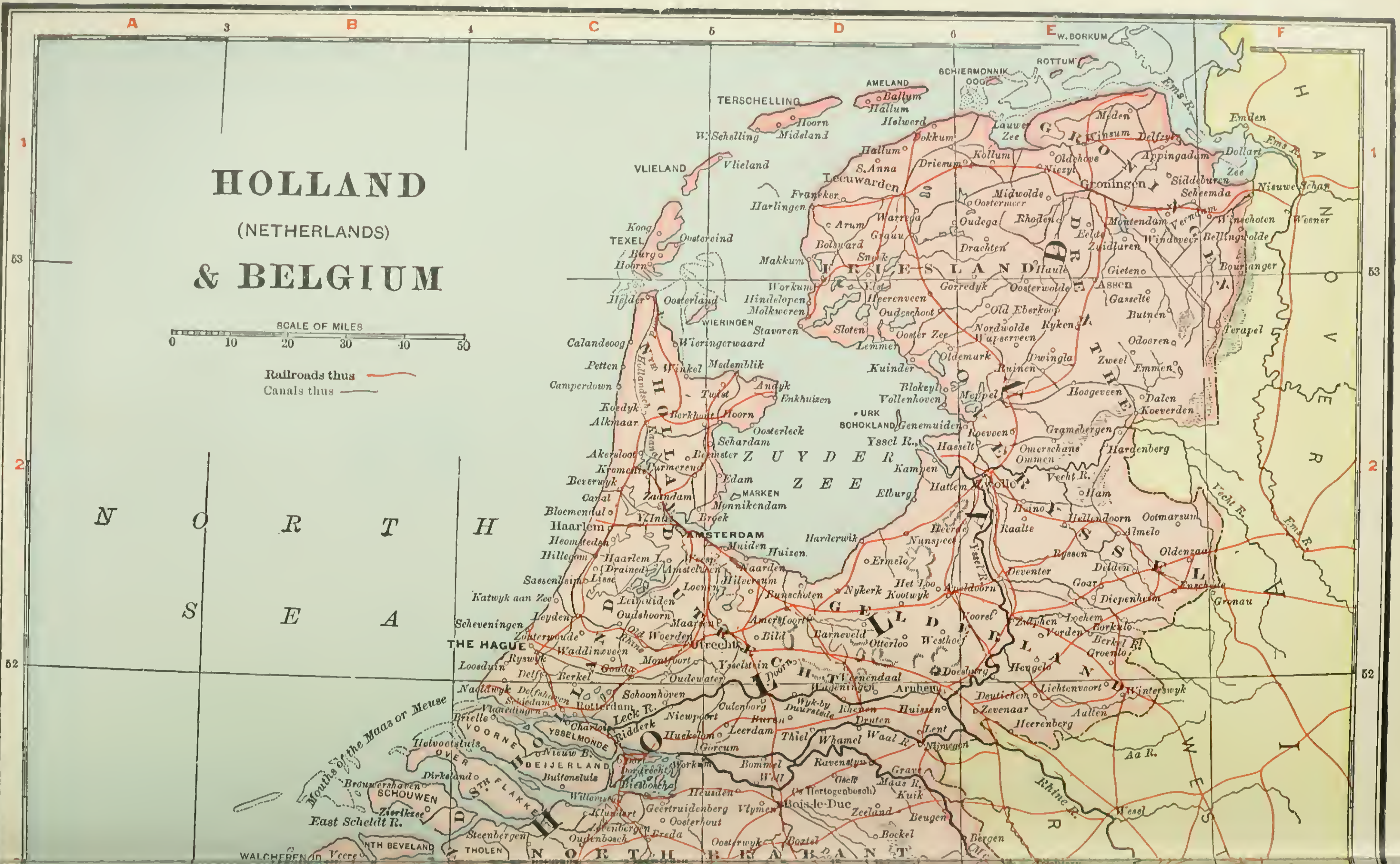
NETH'ERLANDS, THE; often called HOLLAND. The country forming, with the coastal region of Belgium, the lowest part of Europe. It is the western continuation of the low plain of North Germany and lies between latitudes 50° 45′ and 53° 30′ N., and longitudes 3° 22′ and 7° 12′ E. It is bounded on the west and north by the North Sea, on the east by Prussia, and on the south by Belgium. With an area of only 12,648 square miles, it is one of the smallest independent States of Europe. Its topography has had a leading part in shaping its history. The country is emphatically a maritime State. Half of its boundaries (465 miles) are formed by the sea, and no place in the kingdom is more than 120 miles from it.

TOPOGRAPHY. The northern part of the Netherlands is indented by the Zuyder Zee, which represents in part an ancient lake, the sea having broken through the intervening land in the thirteenth century. There are many considerable islands along the coast, distributed in two groups. Off the north coast are the Frisian Islands, comprising Texel, Vlieland, Ter Schelling, Ameland, and others. In the southwest are the numerous islands of the great Rhine-Meuse-Scheldt Delta, among which are Voorne, Overflakkee, Schouwen Tholen, North Beveland, South Beveland, and Walcheren. The country is the flattest part of the Continent, mainly a region of monotonous stretches of plains, interrupted only by sand dunes and some other undulations and low hills, particularly in the southeast. One-fourth of this region adjoining the sea front lies below the level of the sea, a considerable part of it in North and South Holland as much as 20 feet. Thirteen per cent. lies between sea level and 3 feet above the sea. The mean height of the entire kingdom is only 30 to 33 feet above the sea.

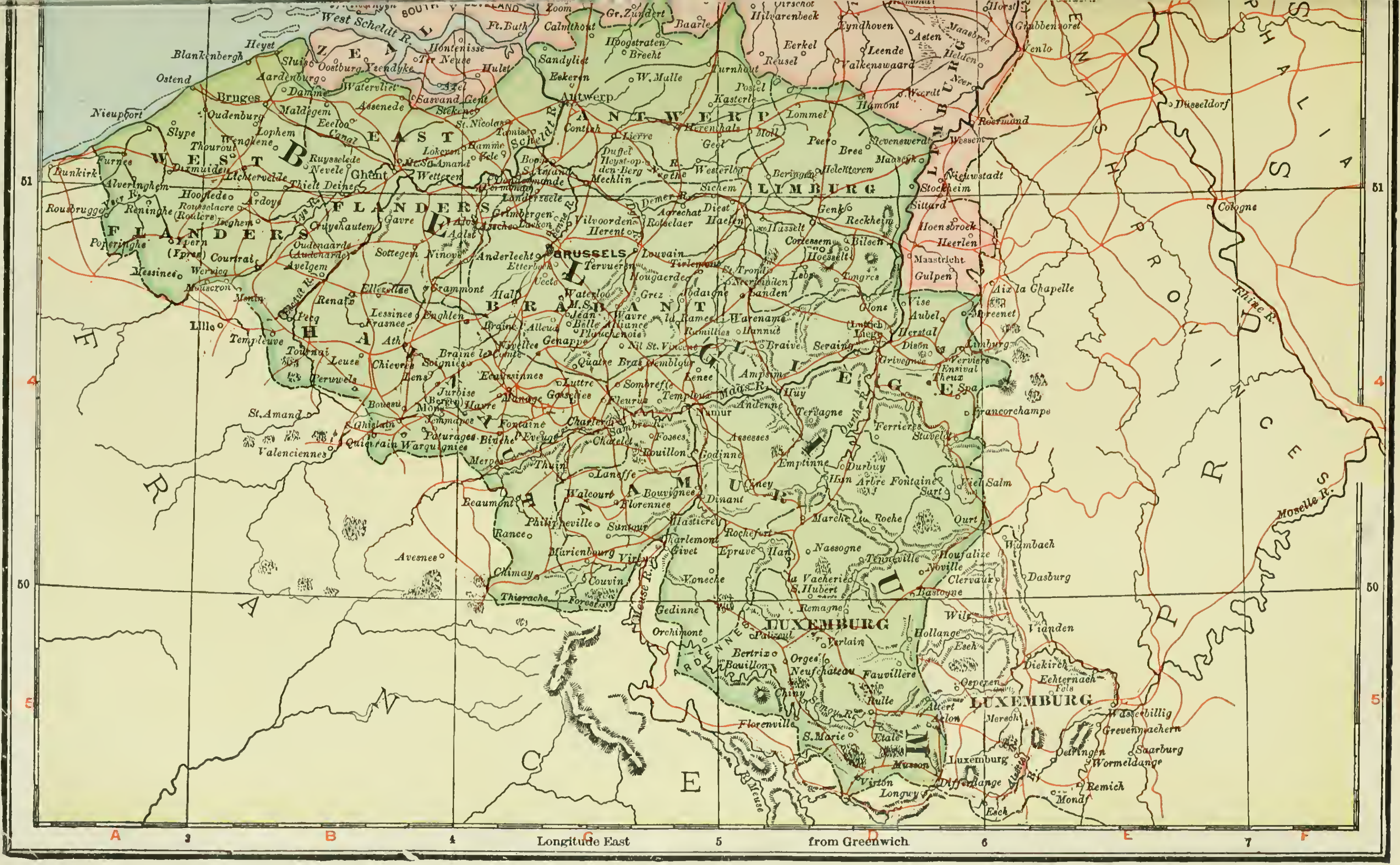
Three features, the dunes, dikes, and polders, characterize the north and south belt nearest to the sea. The dunes stretching along the coast were formed by the winds and sea, which heaped up the ocean sands into rows of hills from 20 to 60 feet apart and from 35 to 200 feet high. Wherever they front the coast they are adequate protection against the sea. These sand ridges and hills are sparsely wooded, but are saved from disintegration by natural or cultivated growths of plants. Few parts of them are tilled, but the sandy regions behind them are carefully cultivated. The dikes are gigantic artificial embankments of earth faced with stone or protected by stakes. They guard the country against the sea at the places where there are no dunes. The largest is the Helder Dike. (See HELDER.) There are also smaller dikes, as a precaution against floods, on the banks of the Rhine and other streams. Inside the line of dunes and dikes are great numbers of polders, which are areas of land inclosed by dikes that not only protect them from floods, but also render it possible to pump out the water from within the inclosure. The land thus won with enormous toil is exceedingly fertile and valuable.

The lands reclaimed from the sea along the coast and the basins of the rivers in the south are the most industrial and populous parts of the Netherlands. Here are the richest pastures, where most of the fine breeds of Dutch cattle are reared and the dairy industry thrives. Back of these lowest lands and polders stretch the low plains strewn with the gravel and sand brought down from the north, with swellings of ground caused by deeper accumulations of this material; and in the east are many moors or bogs covered with moss and heather, many of which have been drained, the peat cut away for fuel, and the land reclaimed for cultivation. The country is not quite destitute of important elevations, for there are hills in the extreme southeast, and to some extent in the central east. One of these ranges attains a height of 690 feet, and in the provinces of Drenthe, Gelderland, Overyssel, Utrecht, and Limburg are gravel hills from 150 to over 300 feet in elevation; near Limburg is the highest elevation in the kingdom (1055 feet).

HYDROGRAPHY. The numerous bogs and marshes testify to the imperfect drainage. There are many small streams, but no large rivers except in the south. These large rivers flow in the



HOLLAND (NETHERLANDS) & BELGIUM



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direction of the general slope of the country from east to west. They are all international streams, important in the commerce of Western Europe. The Rhine is the great highway between Western Germany and the sea. Entering Holland, it divides into numerous arms, the chief of which are the Waal, the Lek, and the Yssel. Four-fifths of the river trade of Holland is carried on the Rhine and the Waal, making Rotterdam a Rhine harbor. The Meuse (Dutch *Maas*) joins the Waal, thus mingling its waters with those of the Rhine, and is important in the commerce of Eastern Belgium. The Scheldt or Schelde, whose estuary is mainly in the Netherlands, carries ocean vessels to Antwerp, and small boats from the Netherlands ascend the river to the centre of Belgium. Lakes are scattered all over the country. Some of the lakes, such as the large Haarlem Lake, have been drained, and their beds converted into arable land. The stupendous undertaking of draining a great part of the Zuyder Zee is in progress.

CLIMATE. The climate is moist and with small range in temperature. The summers are not very warm, nor are the winters often very cold. With an average annual temperature of 50° F., the mean temperature is 49° in the spring and autumn, 64.4° in July and August, and 35.6° in January. The annual precipitation is about thirty inches, rain falling on about two days in three throughout the year. The fact that most days are misty and damp, a week of bright weather being a rarity, induces the diseases which characterize such conditions. Marsh fevers are also prevalent in the boggy districts; and though on the whole Holland is regarded as having a healthful climate, the annual death rate in the western lowlands is from 30 to 40 per 1000, which is about one-third greater than in other parts of the kingdom.

SOIL AND VEGETATION. The country is poor in vegetable products excepting cultivated plants. The most fertile regions are those with a stiff clay soil on the reclaimed lands of the northern and western provinces and on the fluvial clays along the large rivers. These are the chief agricultural and grazing lands, though the zone of cereals and some other crops also extends over a large part of the diluvial sands and gravels of the central regions. About one-fifth of the area is unproductive. The country is almost destitute of timber, scarcely one-fifteenth of the surface being occupied by woods. Pasturage covers about one-third of the country, and the arable lands, including the areas devoted to kitchen gardening, occupy rather less than a third of the surface.

FISHERIES. Fishing is an important source of wealth, the industry being divided into river and coast fishing and the deep-sea fishing. The chief product of the coast fisheries are sprats, which are packed for export, and the oyster, which thrives in the alluvial mud brought down by the rivers and is protected from high seas by the islands along the coast. The herring fishery is the most important branch of deep-sea fishing, the annual catch averaging about 250,000 tons.

GEOLOGY AND MINERAL RESOURCES. Nearly the whole surface is covered by very recent Quaternary formations, diluvium occupying 40 per cent. and alluvium 59 per cent. of the area. The coal measures, chalk, and Tertiary sands and loams occupy only about one per cent. of the surface and are found only in the extreme east and southeast. The diluvium was spread over the country during the Ice Age from Scandinavia in the north, while in a later glacial period the Meuse and Rhine spread coarse sand and grit over the south. The winds, sea, rivers, and vegetation coöperated in the formation of the alluvial strata. Most of the country being composed of water or ice-borne débris, the supply of minerals is very small. Building stone is imported from Norway; the lack of this material has stimulated the production of brick and tile, which are made in abundance, chiefly from the Rhine clays, and are of superior quality. Some coal is mined near Limburg, but there is no iron, except a small quantity of bog iron ore obtained from the bog regions of the east. Turf or peat is cut in very large quantities.

AGRICULTURE. Over 500,000 of the inhabitants are engaged in agriculture, which has reached very high development in the northern and western provinces and along the southern rivers; but scarcely three-tenths of the surface is arable land, and the production fails to meet the home consumption. Rye, buckwheat, and potatoes are the chief products of the sandy soils; hops, sugar beets, tobacco, and wheat, of the clay soils. Rye, vegetables, and beet sugar are the chief agricultural products. The beet farms are in the richer lands of the river valleys, the country ranking sixth in the production of beet sugar. Wheat from the United States supplements the home supply, only a small part of the people eating rye bread, as they prefer a mixture of rye and wheat. The cereal crops, in order of importance, after rye, are oats, wheat, buckwheat, and barley. Beans are also a large crop, and potatoes are the most important product after rye. Large quantities of vegetables are sent to England. The cultivation of flowers has reached a very advanced development, Haarlem being the centre of the flower industry, and exporting bulbs to all quarters of the world. Owing to very careful and scientific methods of tillage, the yield of all crops is large. In 1899 the land in farm crops was 2,139,144 acres; pastures, 2,929,123; gardens and orchards, 153,449; and forests, 624,421. Large areas of timber land were long ago cleared for cultivation, and the country is compelled to import most of its timber supply from various parts of Europe and from America.

STOCK-RAISING. As the moist climate promotes the growth of grass, animal rearing is the most important resource of the country. Cattle-raising has attained a development equaled in few other countries of the world. Cattle thrive best in the coast provinces. Dairy farming is also far advanced near the sea, and hundreds of thousands of the famous Dutch cheeses are sent to foreign markets, butter being also a large product. Horses are bred with great success in Friesland, Gelderland, and North Brabant. Sheep are reared more for their flesh than their wool, chiefly in North Holland and in the south. The poultry yards supply large quantities of eggs to England, and many tons of honey are produced, chiefly among the higher lands of the east.

MANUFACTURES. The country is of inferior importance as an industrial State. Coal and iron, the bases of large manufacturing development, are lacking, with the result that manufactures hardly meet the home demand, and only a few articles are exported. The metal industries have been little developed, though coal and iron are brought to Amsterdam, Rotterdam, and The Hague for the construction of railroad material, ships, machinery, and hardware. Many of the steel and iron ships owned in Holland are built in England. Tin plate is produced at The Hague, and gold and silverware are manufactured at Amsterdam; but few fancy articles in metals are produced. Textile manufactures have been largely developed since the separation from Belgium in 1830. Calicoes are made in large quantities for the East Indies, Africa, and China trade, representing usually an export value of about $7.000,000 a year. The number of spindles is about 300,000, the leading factories being in Overyssel and North Brabant. Amsterdam, Haarlem, and Leyden have dye works and calico-printing works. Linen is manufactured chiefly in the southeast and North Brabant. The best quality of sailcloth is made in North and South Holland. Tilburg is the leading centre of the woolen industry, and the carpets of Deventer are in much request; but with the growth of the woolen industries in England, France, and Germany, Dutch woolens have declined in importance. Many towns make leather, and the manufacture of earthenware is spread all over the country. Brick and tile works are found in many places; clay pipes are made in South Holland; Delft still produces the glazed earthenware that made the town famous; Maestricht also produces stoneware and glassware. The diamond-cutters of Amsterdam are still famous, though their business is declining on account of the competition of Paris, London, and Antwerp. This industry is entirely in the hands of the Jews. Many industries are connected with the transformation of agricultural products, such as liqueurs, distilled from orange peel and other materials in Amsterdam, Rotterdam, and Schiedam, the same cities also leading in the production of Holland gin, distilled from rye. There were 516 distilleries in 1900, 503 breweries, and 9 vinegar works. Large quantities of cigars and manufactured tobacco from home-grown or East Indies leaf are made, the most extensive factories being at Amsterdam and Utrecht. The sugar refineries, chiefly in Amsterdam and North Brabant, are using every year more raw sugar from beet root and less from sugar cane.

Commerce. The Dutch trade embraces every continent, and is therefore first and chiefly maritime. Most exports of home products go to the neighboring countries of Europe. England, Germany, and Belgium are the largest buyers of the live animals, butter, cheese, and oleomargarine which the country exports. In 1900 the leading exports to neighboring countries of home products were: 49,000 cattle, 6000 calves, 49,000 sheep, 4000 swine, 51,000,000 pounds of butter, 120,000,000 pounds of oleomargarine, 102,000,000 pounds of cheese, and 336,000,000 pounds of sugar, besides eggs, vegetables, flax, and fish.

The exports of colonial products are sold all over the world, and the chief trade of the Netherlands is in the import and re-export of these colonial commodities. The Dutch colonial possessions in the East Indies, extending from Sumatra to New Guinea, are about sixty times as large as the mother country, and have seven times the population. Most of the tea, sugar, coffee, quinine, tin, tobacco, indigo, dyewoods, spices, and gums they export are sent to the Netherlands, chiefly to Rotterdam and also to Amsterdam. Palm oil, rubber, and ivory from the Congo State, and guano and nitrates from South America are also imported. Some of these articles are greatly enhanced in value by manufacture in the Netherlands. Quinine, for example, is prepared for the market in the Netherlands, where also Java raw sugar is refined and Sumatra tobacco is made into cigars. The colonies, on the other hand, buy from the mother country great quantities of cottons and of other goods manufactured for them at home or purchased in other lands and sold by Dutch merchants in the colonies at a large profit. The colonies are the best customers of the Netherlands, excepting Europe.

Most of the imports for home consumption come from Northern Europe and the United States. The United States contributes about one-eighth of these imports, on an average, chiefly wheat, flour, maize, rye, petroleum, tallow, bacon, leaf tobacco, and lumber. Great Britain, Germany, Russia, and Belgium supply nearly all the other imports, consisting chiefly of coal, timber, metals, and manufactures. Most of the home trade, as distinguished from the colonial trade, is with these countries. The rapid growth of the imports for home consumption and the exports of home products may be seen from the following table, which shows the average annual trade:

	1882–86	1892–96	1901
Imports	$448,500,000	$602,500,000	$822,894,000
Exports	342,500,000	490,000,000	700,686,000

The value of the imports and exports of the largest classes of products in 1901 was:

	Imports	Exports
Food products	$230,136,960	$213,021,408
Raw materials	182,478,654	131,392,494
Manufactured products	103,004,460	91,884,336
Miscellaneous	163,701,234	127,290,486

The following table gives the trade with leading countries in 1901:

	Imports	Exports
Belgium	$90.791,200	$70,510,800
Brazil *	8,400,000	
British India *	18,894,000	700,000
France	9,165,600	5,185,800
Great Britain	99,816,600	171,131,400
Prussia	174,387,600	349,297,800
Russia	64.320,000	3,336,600
Spain *	16,400,000	1,300,000
Dutch East Indies	130,047,000	24,723,000
United States	121,846,200	31,838,400

* The figures for Brazil (imports), British India (exports), and Spain (imports and exports) are given for 1899.

The Dutch derive large profit from the forwarding trade. They find the business of carrying freight for other nations a very profitable branch of commerce, and their position at the mouth of the Rhine gives them unsurpassed opportunities to pursue this branch of business. A great deal of the trade of Germany and also of Austria and Switzerland with other countries passes through the Netherlands, and most of it is tributary to Rotterdam, the port of the Rhine mouth and one of the greatest forwarding ports of the world. Amsterdam's connection by river and canal with the Rhine enables that city to take a large though inferior part in the transit trade. The value of the goods carried in this transit business in 1900 was $243,936,000.

Free trade is the Government policy, duties being levied on a few articles only for purposes of revenue. No article pays more than 5 per cent. duty, and grain, iron, wool, cotton, coal, and many other commodities are on the free list. The chief centres of domestic trade are Rotterdam, Amsterdam, Flushing, Dordrecht (timber), Middelburg, Leyden, Utrecht, Alkmaar, and Hoorn (cheese).

Transportation and Communications. The largest routes of trade by water or rail converge on Rotterdam, Amsterdam, and Flushing. Great ship canals have given their preëminence to Rotterdam (318,507 inhabitants in 1900) and Amsterdam (510,900). Rotterdam, near the mouth of the Meuse, was threatened with being cut off from the sea by accumulations of sand in the river; a new waterway was therefore dug across the Hook of Holland through the dunes to the north of the Meuse, by which ships of the heaviest tonnage now reach the town. Fully three-fourths of the sea trade of the Netherlands pertains to Rotterdam, steamers plying between that city and all the largest ports of Western and Northern Europe and to the East Indies and United States. The traffic by sailing ships with the colonies and other distant lands is also very important. Amsterdam is also connected by regular lines of steamers with many ports of Europe, America, and Asia. The two ports command about nine-tenths of the total sea trade; Flushing, Middelburg, and Harlingen also have some importance. The Dutch merchant marine being small (213 steamers and 425 sailing vessels in 1900), a little more than one-half of the sea trade is carried under the British flag. Two ship canals connect Amsterdam with the sea. The older is the North Holland Canal, extending from Amsterdam to Alkmaar and Helder, 52 miles long, completed in 1825. By means of this canal the dangerous passage of the Zuyder Zee was avoided. In recent years, however, the importance of the canal declined, as it is not wide enough for the more modern large ships. The North Sea Canal was therefore built between Amsterdam and the North Sea, 16 miles in length and fully meeting the requirements of modern trade. These are the great ship canals of the Netherlands, but the whole country is a land of canals. All the towns and even the villages are connected with one another by these waterways. The larger canals are over 60 feet broad, 6 to 9 feet deep, and sometimes they lie higher than the fields through which they pass. The domestic traffic of the country is carried on the canals. There is little coasting trade, because commodities are carried from one port to another on the canals. The total extent of the canals is nearly 2000 miles, and the length of navigable waters outside of the canals is about 3000 miles.

The railroads are of more importance for international than for internal commerce. They carry most of the freight that England sends into Central Europe. Flushing, on the Scheldt, and Hook of Holland, near Rotterdam, are ports on the main rail routes between England and Germany. In 1900 the railroads had a length of 1830 miles, of which the State owned about one-half and private companies the remainder. Good wagon roads in all parts of the country, all paved with brick (klinkers), supplement the other excellent means of communication. Their total length is about 3000 miles.

Banking. All banks are private banks, but the Bank of the Netherlands is the only one that is permitted to issue bank notes, the amount of which, in 1901, was 221,869,000 florins, or $89,191,338 in our currency. The money in general circulation, however, is chiefly silver. Two-fifths of the paper money in circulation must be covered. The bank secured the right to issue bank notes in 1863 for twenty-five years; in 1888 the right was prolonged for fifteen years, with a continuation for ten years more unless rescinded by the Government or the bank, two years' notice being given. In accordance with notice given by the Government in 1901, the present arrangement will terminate in November, 1903. The bank of the Netherlands has branches in all important towns, and does the same business as other banks, but provides more guarantees. It is the depository of the State funds and of the cash of the Post-Office Savings Bank. In 1901 the total exchanges of the bank were $194,700,060; stock of gold, $29,868,600; stock of silver, $27,352,080; capital, $8.040,000; reserve fund, $2,211,000. The bank receives 5 per cent. of the profits, the balance being divided between the State and the bank. In 1899 there were 389 private savings banks, with 420,885 depositors and $30,900.534 deposits. The State Postal Savings Bank, in 1900, had 829,131 depositors and $44,048,194 deposits.

Finance. The sources of revenue in 1901 were: excise, $20,211,500; direct taxation, $14,500,872; indirect taxation, $9,027,915; post-office, $4,328,750; export and import duties, $4,007.500; pilot dues, $1,358.335; Government telegraphs, $936,875; State domains, $735,000; State lotteries, $271,250; fisheries, $55.000; railroads, $1,807,560. The expenditures were: national debt, $14,431,070; Department of War, $9,465,180; Department of Waterstaat, $12,241,695; Department of Finance, $10.461,715; Department of Marine, $6.940,705; Department of Interior, $6,652.815; Department of Justice, $2,645,795; Department of Colonies, $548.840; Department of Foreign Affairs, $355.505; royal household, $333,335; superior State authorities, $283,960; miscellaneous, $20,830. The total revenue was $56,971,100 and the expenditures were $64,481,445. The total debt amounted in 1901 to $482,806.435. About $130,000,000 of the revenue of the past half century has been applied to the reduction of the public debt.

Money, Weights, and Measures. The standard coin is the 10-florin gold piece, containing 6.048 grammes of fine gold. The unit of the silver coinage is the florin, containing 9.45 grammes of fine silver. The country has the gold standard, and gold and the silver coins issued before 1875 are legal tender. The value of the coins has for years been invariable. The principal coins are the guilder or florin of 100 cents, worth 40⅕ cents in our currency, and the gold piece of 10 florins. Metric weights and measures are used.

Population. The population is most dense in the provinces of North and South Holland and Utrecht, which contain almost half of it, although embracing less than one-fourth of the total area. In these provinces are the three largest cities of the country. The annual increase of population averages considerably over

1 per cent. (in 1898, 1.41 per cent.; 1899, 1.28; in 1900, 1.47). The increase is due almost wholly to the excess of births over deaths. The people numbered by the census of 1899 5,103,979. Of the total population in 1900 2,560,239 were males and 2,618,807 were females. There were in 1899 52,625 persons of foreign birth living in the Netherlands, of whom 31,865 were Germans, 14,903 Belgians, 1307 English, and 4550 of other nationalities. The emigration is very small, amounting in 1900 to 1899 persons, nearly all of whom went to the United States.

The table of provinces, with areas and populations, is as follows:

PROVINCES	Area sq. miles	Population Dec. 31, 1899
North Brabant	1,980	553,842
Gelderland	1,965	566,549
South Holland	1,166	1,144,448
North Holland	1,070	968,131
Zeeland	690	216,295
Utrecht	534	251,034
Friesland	1,282	340,262
Overyssel	1,291	333,338
Gronigen	790	299,602
Drenthe	1,030	148,544
Limburg	850	281,934
Total	12,648	5,103,979

EDUCATION. Attendance at school is not compulsory, and many of the people are illiterate, 14 per cent. of the adults in North Holland being unable to read. No religious instruction is given in the public schools, and a very large number of the youth attend denominational private schools. In 1900 there were 3108 public elementary schools, with 16,639 teachers and 508,276 pupils, and 1461 private elementary schools, with 7683 teachers and 231,534 pupils; 146 public infant schools, with 26,448 pupils, and 916 private infant schools, with 91,633 pupils. The polytechnic school (Delft) had 32 teachers and 714 pupils; 75 middle class schools, 1024 teachers and 10,299 pupils; 11 navigation schools, 71 teachers and 1564 pupils; 137 day and evening schools for working people, 1225 teachers and 18,478 pupils; 29 classical schools, 426 teachers and 2500 pupils. The four public universities at Leyden, Utrecht (qq.v.), Groningen, and Amsterdam have 167 teachers and about 3000 pupils. The Free University of Amsterdam charges no tuition. A number of art schools, museums, and military, music, normal, deaf mute, and technical schools are supported by the Government. Since 1889 public instruction has been diminishing and a larger number of school children have entered the private schools, which are now supported to a great extent by the State. The cost of public primary instruction is borne jointly by the State and the Communes.

RELIGION. There are numerous creeds and sects, and complete religious freedom. Most of the Protestants belong to the Dutch Reformed Church, and many other sects are represented. The Synod is the source of authority in most of the Protestant churches. The Roman Catholic Church is under an archbishop in Utrecht with the bishoprics of Breda, Haarlem, Bois-le-Duc, and Roermond; and the Old Catholics or Jansenists under an archbishop in Utrecht, and two bishops in Deventer and Haarlem. The Jews fall into two religious societies, the Dutch Israelites and the Portuguese Israelites. The adherents of the different churches in 1899 numbered: Dutch Reformed, 2,471,021; other Protestant, 598,111; Roman Catholic, 1,790,161; Jansenists, 8754; Jews, 103,988; other creeds, 132,102. The larger part of the Catholics live south of the Rhine, and most of the Jews in North and South Holland.

CHARITABLE INSTITUTIONS. About five per cent. of the population are wholly or in part provided for by charities—about half by Church institutions, and most of the remainder by municipal organizations.

ETHNOLOGY. Of the early peoples of the Netherlands little is known, except that portions of the country were inhabited successively by tribes of the Stone, Bronze, and Iron ages. In the time of Cæsar the tribes of the swampy lowlands of the south were of Celtic stock, as the Nervii and Menapii. In the north were the Frisians and in the central portion were the Batavians and Caninefates, of Teutonic stock, speaking Low Dutch. The Batavians belonged to the Chatti, who had moved in from the east, pushing the Celts into the outskirts. During the Roman occupation the Celts of the south were crushed, the Frisians were compelled to pay tribute, and the Batavians were conciliated and later supplied the best of soldiers for the Roman armies. In the fifth century the Roman power was broken by the Germans, and in this period of the swarming of nations those westward-moving tribes overflowed the Netherlands. The Saxons amid these changes occupied the country and crossed over to England. The ethnical components have remained constant in the centuries that have intervened. The home of the Frisians, who in the early part of the Middle Ages dwelt along the coast as far south as the Scheldt, has been contracted to a small area. The anthropological survey of the country shows a preponderance of the long-headed, blond, tall, Teutonic type in the north and east, with cephalic index of from 79 to 80. In North and South Holland there is a large element having Alpine affinity, with cephalic index from 83 to 84. In Zeeland the pure Alpine or Celtic head-form is found with measures of from 85 to 88, dark hair and skin and medium stature, which is 1.655 meters, while that of the Teutonic element, as in Overyssel, is 1.701 meters.

GOVERNMENT. The basis of the present Constitution of the Netherlands is the fundamental law of 1815, as successively revised in 1840, 1848, and 1887. According to this Constitution the State is an hereditary monarchy, having the system of parliamentary or responsible government. The law of succession is lineal primogenial, with preference for males. In default of all legal heirs, the successor is determined by a joint meeting of the two chambers of Parliament (each containing twice the usual number of members). The sovereign attains his or her majority at the age of eighteen.

The legislative power of the Netherlands is vested conjointly in the sovereign and Parliament, or States General. The Parliament consists of two chambers with considerable inequality of powers in legislation. The Upper Chamber is composed of 50 members elected by the legislatures (provincial councils) of the several provinces into which the kingdom is divided, and from among the highest taxpayers and certain high officials designated by law. Their term is nine years, one-third retiring every three years. Those members not residing at The Hague, the seat of government, are allowed a compensation of about $4.75 per day during the session of the Parliament. The Lower Chamber is composed of 100 members, chosen by districts and by direct suffrage. Those qualified to vote for members of the Lower Chamber include all male citizens twenty-five years of age, who are owners or tenants of houses or boats, or who possess certain evidences of capacity and business ability. At present, but little more than 11 per cent. of the population is qualified to vote under these provisions.

The members of the Lower Chamber serve for a term of four years, one-half retiring every second year. Any Netherlander who has attained the age of thirty years and who is in the full enjoyment of his civil and political rights is eligible to membership in the Lower Chamber. The members receive an annual salary of $850, besides traveling expenses. The sessions of the chambers are public, although each by a majority vote may hold secret sessions. Either may be dissolved by the Crown without the sitting of the other chamber being disturbed, but in case of dissolution new elections must be held within forty days and the chambers convoked within two months. Ordinarily both chambers meet at least once a year, and may be summoned in extraordinary session by the Crown. The presiding officer of each chamber is appointed by the Crown, but minor officers are elected by the chambers respectively. The Upper Chamber has no power of initiating legislative measures, its authority being confined to the simple approval or rejection *in toto* of bills sent to it from the Lower Chamber. The Lower Chamber has the special power of appointing commissions of inquiry; it shares with the Crown the right of initiating legislative measures and may amend the bills presented by the Government; to it the Government must submit the annual budget; and it alone has the right to impeach the ministers before the High Court at The Hague.

The sovereign, who is declared to be inviolable and irresponsible, is required to take an oath to maintain the Constitution, the independence of the country, and the liberties and rights of the citizens, and to execute the laws. The powers of the Crown include the dissolution of the chambers, either jointly or separately; the declaration of war; the superior direction of foreign affairs; the negotiation of treaties with foreign powers subject to the approval of the chambers, when the cession or exchange of territory is involved, or when rights established by law are affected; the command of the army and navy, and the appointment of military officers; the superior direction of the colonies; the general administration of the finances; the granting of pardons (but not amnesties); the fixing of salaries of public officers except in case of the judges; and the decision of administrative conflicts between the provinces. The executive powers of the Crown are exercised through ministers, one of whom must countersign every official act of the sovereign, and who thereby assumes the responsibility for it. The political responsibility of the ministers is to the Parliament, to each house of which they are entitled to have access whether members or not, and to speak, although not to vote unless they be members. Each minister presides over a department of administration, of which there are at present eight. They are the Ministries of Foreign Affairs; Interior; Finance; Justice; Colonies; Marine; War; and Public Works and Commerce. Each minister receives an annual salary of $5000. Besides the Cabinet there is a Council of State, presided over by the sovereign, and consulted by the Crown on a variety of important matters of State administration.

For the purpose of local government the Netherlands are divided into 11 provinces, and these are again subdivided into 1123 communes. The chief executive authority in each province is a commissioner of the sovereign. In each province is also a representative assembly consisting of members elected for a term of six years, one-half of the members retiring every second year. The number of members constituting an assembly varies from 35 to 80, according to the population of the province. The powers of the provincial assemblies are in general those of a local legislative body, and include such duties as the enactment of ordinances and the levy of taxes. All ordinances to be valid must be approved by the Crown. The assemblies exercise a supervisory control over the municipalities and elect the members of the Upper Chamber of the Royal Parliament. Ordinarily they hold sessions twice a year and are presided over by the commissioner of the sovereign. For the conduct of the provincial administration a deputation of six members is chosen from the body of the provincial assembly and is known as the 'Deputed States.' In each commune is a local council elected for a term of six years by the same electorate as that which chooses the members of the provincial assembly. The number of members varies from 7 to 41, according to the population of the commune, and one-third of the members retire every two years. The powers and duties of the communal council include the enactment of by-laws and ordinances relating to matters of purely local concern. These are all subject to the veto of the sovereign, while the budget and ordinances for the alienation of municipal property require the approval of the Deputed States of the province. The council is presided over by a mayor or burgomaster appointed by the sovereign for a term of six years. He is the chief executive officer in the commune, and is assisted by from one to four aldermen (the number depending upon the population of the commune) elected by the council from its own membership. The mayor exercises a supervisory power over the actions of the council and may suspend its resolutions for a period of thirty days. He also has charge of the municipal police.

The judicial system of the Netherlands consists of one High Court of Cassation, which sits at The Hague, five Courts of Appeal, 23 District Courts, and 106 cantonal tribunals. The High Court of The Hague has original jurisdiction in matters concerning the State, the royal family, and the impeachment of ministers and misdemeanors committed by the higher officials. It has appellate jurisdiction in cases appealed from the provincial courts and the courts in the colonies. All judges are appointed by the Crown for life, except the cantonal judges, whose tenure is limited to five years, and they are irremovable except by resolution of the High Court. Trial by jury does not exist in the Netherlands. Consult:

De Mombynes, *Constitutions européennes* (2 vols., Paris, 1881). For army and navy, see under Armies and Navies.

Defense. There are few fortresses protecting the national boundaries. The chief, most effective defense lies in the ability to open the dikes and flood the region between the Lek and the Zuyder Zee.

Colonies. The Netherlands are one of the important colonial powers. The Dutch colonies form two groups: the Dutch East Indies (q.v.) and the Dutch West Indies. The statistics—totals—are approximately: Area in square miles, Dutch East Indies, 736,400; Dutch West Indies, 50,230; total, 786,630; population in 1897, Dutch East Indies, 34,090,000; Dutch West Indies, 133,300; total, 34,223,300. The Dutch West Indies comprise the colony of Dutch Guiana, or Surinam (see under Guiana), area 49,800 square miles, population 82,000; and the colony of Curaçao (q.v.), including the adjacent islands of Aruba (q.v.), Buen Ayre (q.v.), Eustatius (q.v.), Saba (q.v.), and half of Saint Martin (q.v.), total area 430 square miles, population 51,000.

History. The name Netherlands or Low Countries originally covered the territory included in the present kingdoms of the Netherlands and Belgium, with Luxemburg. This region was inhabited in Roman times by the Frisii in the north, the Batavi in the central portion, and the Belgæ in the south. These tribes were successively subjugated by the Romans—the Belgæ by Cæsar; the Batavi after Claudius Civilis, a Batavian leader, whose native name is unknown, had broken the Roman alliance and attempted to form a united Batavian kingdom (A.D. 69-70); and the Frisii still later after an obstinate resistance. The Low Countries were incorporated in the Empire of Charles the Great and Christianized. Upon the breaking up of the Carolingian Empire the new Frankish kingdom acquired the southern portion, Lotharingia (Lorraine) the central, and the new Germany the northern part. Coincidentally with this division came the rise of feudalism, and duchies like Brabant (originally Lower Lorraine), counties like Artois, Flanders, Holland, and Hainault, and bishoprics like Utrecht and Liège, developed a semi-independent authority in this remote district, where the weakened royal authority of the period reached with difficulty. (See Belgium.) It resulted also from the division of the country that, while the people as a whole retained certain traits due to their environment, the Dutch or northern provinces were distinctly Germanic in language and customs, the Flemings or Central Netherlands showed in both respects a mingling of French and German elements, while the Walloons on the south were as markedly French as the Dutch were German. In the latter part of the Middle Ages the cities of the Netherlands rose through their commerce and manufactures to an extraordinary state of prosperity, and some of them were for a time virtually independent republics. Next to the Italian States they figured most prominently in the revival of art. The cities of Flanders and Brabant were especially flourishing. Bruges, Ghent, and Antwerp had the largest share in this prosperity—Antwerp, at the beginning of the sixteenth century, eclipsing all other cities of Europe in the volume of its trade and its financial transactions. A marriage alliance between the House of Flanders and that of Burgundy (1369) gave the Burgundian dukes, with their unbridled ambition for empire, a foothold in the Netherlands which they used to such purpose as to bring the whole country under their sway. (See Burgundy; Flanders.) The Hapsburg-Burgundian alliance (the marriage of Maximilian of Austria and Mary of Burgundy) in 1477 made the Low Countries an appanage of the House of Hapsburg. Charles V., the grandson of Maximilian, in 1549 formally united this rich inheritance with the Spanish crown. In 1555 he resigned the sovereignty over the Netherlands to his son Philip II. At this time they comprised the four duchies of Brabant, Gelderland, Limburg, and Luxemburg; the seven counties of Artois, Flanders, Hainault, Holland, Namur, Zutphen, and Zeeland; the margraviate of Antwerp, and the seigniories of Friesland, Groningen, Mechlin, Overyssel, and Utrecht. These provinces were very largely independent of each other and prized this independence. The States-General, to which each sent deputies, served to unify them to some extent, and a supreme tribunal had jurisdiction over all; but the States-General was, like similar bodies in that age, politically weak, without power of legislation or taxation. The acquisition of the country by Spain brought into close political conjunction two bitterly antagonistic forces, for all save the Flemish or Southern Netherlands was becoming strongly Protestant, while Spain was the most Catholic country in Europe. Under Charles V. the Netherlands, which were included in the Burgundian Circle of the Holy Roman Empire, had been declared indivisible, and not subject to the Imperial courts. He had subjected the Protestants to severe persecution and had established the Inquisition, but it was reserved for Philip II. to show to what lengths bigotry, cruelty, and bad faith could be carried in the oppression of a people. The Government during the regency of Margaret of Parma was carried on by Cardinal Granvella (q.v.), who began at once to break the royal pledges and to trample upon the liberties of the people. Spanish troops were kept in the country and time-honored privileges and rights were ignored. Protest and resistance soon began under the leadership of William of Orange, Stadtholder of Holland, Zeeland, and Utrecht, Count Egmont, and the Count of Hoorne, which brought about the dismissal of the hated Minister (1564), but effected no change in Philip's policy toward the Netherlands. The league of the Beggars (see Gueux) arose in 1566, and field preaching by proscribed Protestant ministers was carried on under the protection of armed multitudes. Mob violence broke out in many parts of the country and the resentment of the people showed itself in the plundering and desecration of churches and the destruction of images and relics. Philip II. proceeded to summary measures, strengthened by the support of a large peaceful element among the population who viewed with alarm the proceedings of the Beggars. In August, 1567, the Duke of Alva (q.v.) arrived with an army of Spanish veterans and authority to deal with the country as rebellious and conquered territory. Alva's Bloody Council, an irresponsible tribunal, condemned by wholesale Netherlanders guilty of no offense save their religion and love of country, and in February, 1568, the Holy Office of the Inquisition pronounced a death sentence against all the inhabitants of the Netherlands as heretics, with a few named exceptions. Among the notable victims of the tribunal were Counts Egmont and Hoorne. In the spring the Prince of Orange, who had fled the country, raised a small army and with his brother, Count Louis of Nassau, took the field for the liberties of the Netherlands, thus opening a desperate struggle lasting for forty years, during which most of the principal towns endured sieges by the Spaniards and suffered wholesale massacres when taken. In May Louis of Nassau defeated Count Aremberg, the Spanish Governor of Groningen, but he was driven from the field by Alva and fled to Germany with only a remnant of his troops. The first decisive triumph for the national cause was the capture of the fortified seaport of Briel by the 'Beggars of the Sea' under the Count de la Marck in April, 1572. This was followed by the revolt of the principal cities of Holland, Zeeland, and Friesland, and many cities in Gelderland and Overyssel. The Prince of Orange was proclaimed as lawful Statdholder of the King of Spain. The fortress of Mons, in the south, was taken by Count Louis of Nassau, but the expected reënforcements from France did not arrive and the Massacre of Saint Bartholomew was a severe blow to the Protestant cause in the Netherlands. Mons was retaken by the Spaniards in September, and in rapid succession other places (Mechlin, Zutphen, and Naarden) fell into their hands, their course everywhere being marked by ruthless cruelty. Haarlem was defended by a garrison of 4000 men against an army of 30,000 men under Don Frederick, a son of the Duke of Alva, and after enduring a siege of seven months surrendered only when reduced to the very verge of starvation. The little town of Alkmaar repelled all assaults by the Spanish soldiery, and drove off an army of 16,000 men by cutting the dikes and flooding the country. In 1573 Alva was recalled by Philip II. and succeeded by Requesens.

On sea the Dutch repeatedly defeated the Spanish fleets, but on land they suffered a severe reverse in the battle on the moor of Mook, near Nimeguen (April 15, 1574), in which Louis of Nassau and his brother Henry were slain and their entire army destroyed. Leyden, besieged by an army of 8000 Spaniards under Valdez, held out for five months, and was saved by the cutting of the dikes, which enabled the vessels of the Gueux to bring relief to the town. The death of Requesens in March, 1576, was followed by a mutiny of the Spanish troops (the so-called Spanish Fury). Freed from all discipline and clamorous for their pay, which had long been withheld, they brought a reign of terror on the country. Ghent, Utrecht, Valenciennes, Maestricht, and Antwerp were taken and plundered, and in the last-named city 8000 citizens are reported to have been put to death. The southern provinces turned in terror to William of Orange for aid, and, with the exception of Luxemburg, entered into an alliance with the northern provinces, known as the Pacification of Ghent (November 8, 1576). The authority of Philip was still nominally recognized. The pacification was completed by the Union of Brussels, January, 1577, the object of which was primarily the expulsion of the mutinous Spanish soldiers. The new viceroy, Don John of Austria, the half brother of Philip II., in order to gain time, was compelled on his arrival to grant the demands of the estates, and issued the Perpetual Edict, confirming the terms of the Pacification of Ghent. He won a great victory at Gembloux on January 31, 1578, but died in the same year, and was succeeded by Alexander Farnese, Duke of Parma, one of the ablest men of his day as well as one of the most unscrupulous, who administered affairs with energy until 1592. A shrewd judge of men, he used bribery as well as force to divide and weaken the resistance, and he succeeded in fomenting dissensions between the northern and southern provinces, who had little sympathy save that arising from resistance to common oppression. The southern provinces were in great part won back for Spain, but at Utrecht in January, 1579, the seven northern provinces, Holland, Zeeland, Gelderland, Utrecht, Groningen, Overyssel, and Friesland, entered into a union that was virtually the founding of the Dutch Republic, and on July 26, 1581, at The Hague, the seven provinces constituting the modern kingdom of the Netherlands declared their independence. William of Orange became the ruler of Holland and Zeeland, while the sovereignty over the other provinces was offered to the Duke of Anjou, brother of Henry III. of France. The latter, however, aroused the enmity of the people by his attempt to seize Antwerp, and left the country in 1583. On July 10, 1584, William of Orange was assassinated at Delft by an emissary of the Duke of Parma; but the United Provinces were saved from the full effects of the blow by affairs in France, where the struggle between the monarchy and the Catholic League diverted the attention of the Spanish King and led for a time to the withdrawal of the greater part of the Spanish troops from the Low Countries. In 1585 Antwerp, after a memorable siege of 14 months, was forced to surrender to the Duke of Parma. In 1585 an English army under the Earl of Leicester was sent by Elizabeth to the aid of the Dutch, but the incapacity of their commander made their assistance of little use, and in 1587 Leicester returned to England. The United Provinces nevertheless continued the struggle, guided by the statesmanship of Barneveldt (q.v.), and under the leadership of Maurice of Nassau, the eldest son of William of Orange. Maurice concluded a series of triumphant campaigns with the decisive victory of Nieuport, over the Archduke Albert of Austria, July 2, 1600. On sea the Dutch navies overwhelmed the Spanish forces and made themselves masters of the Spanish-Portuguese possessions in the East Indies. These years of warfare completed the desolation of the Spanish Netherlands. A respite came in 1609 with a twelve years' truce, which was a virtual acknowledgment of the independence of the Dutch Republic. For additional details of the struggle with Spain up to the truce of 1609, see articles on Alva; Egmont; Farnese; Gueux; John of Austria; Philip II.; William, Prince of Orange; Maurice, Prince of Nassau.

Political and religious dissensions now arose in the Republic. The Arminian controversy in the Church mingled itself unhappily with the political differences between Prince Maurice, of Nassau, and Barneveldt. Finally Barneveldt was seized, condemned without fair trial, and executed May 13, 1619. See Dort, Synod of; Barneveldt; Grotius.

In the course of the struggle with Spain the foreign trade of the provinces had undergone a rapid expansion. The Dutch East India Company was organized in 1602. Following the discovery of the Hudson River by Henry Hudson, sailing for the Dutch East India Company in 1609, the Dutch established by degrees a trading colony in New Netherland, the later New York. The New Netherland Company was given a trading charter in 1615, and in 1621 the Dutch West India Company came into existence and began to people the new colony, which remained a Dutch possession until 1664, when it was taken by the English, to be recovered in 1673 for fifteen months, and then finally lost to the Republic.

In 1621, the twelve years' truce having expired and the Dutch refusing to acknowledge allegiance to Spain, the war was renewed by Philip IV. The Dutch, led by Prince Maurice until his death in 1625, and then by his brother Frederick Henry, with the French as allies, carried on a struggle for the possession of Flanders, the incidents of which served to increase the hostile feeling between the Catholic and Protestant parts of the country. In the meantime the religious dissensions in the United Provinces themselves died out and a spirit of toleration arose which made the country the asylum for European Protestant refugees. In 1646 Spain began negotiations for peace with the Republic, and the Dutch, already suspicious of the growing French influence, and themselves weary of the long struggle, made terms which became a part of the general Peace of Westphalia in 1648. The United Provinces were now fully recognized as free and sovereign States. The Scheldt was closed to commerce, and the right of the Dutch to a share in the trade of the Indies was acknowledged. William II., who succeeded Frederick Henry as Stadtholder of the Republic, attempted to become a sovereign with the aid of France, but died at the age of twenty-four, and the danger his ill-advised attempt had shown led the States to hold the stadtholdership in abeyance. Holland, the wealthiest of the provinces, now became the real controlling force, and the executive power in Holland was vested in the Grand Pensionary, an office which from 1650 to 1672 was held by John de Witt (q.v.). This was the golden age of the Republic, when its fleets fought successfully against the English (1652-54 and 1665-67), and made it the leading sea power of Europe. The prosperity, wealth, and power of the Republic brought it new enemies in the place of decadent Spain. Having united in 1668 with England and Sweden to hold Louis XIV. in check, the Republic found itself, in 1672, facing both France and England, the former attacking by land, the latter by sea. In this struggle William III., the young Prince of Orange, posthumous son of William II., by his generalship and patriotism won the approval of a large party of the nobles and common people, who demanded the restoration of the stadtholdership. France had demanded the restoration of the House of Orange to its authority, but William had declined to receive a gift forced by the enemies of his country. John and Cornelius de Witt, who opposed vesting any further powers in the House of Orange, were murdered by a mob (1672), and the Prince of Orange became once more Stadtholder and the central figure in the United Netherlands. In the shifting European policies of the succeeding years, the Republic found itself sometimes with one ally, sometimes with another, sometimes single-handed, but with the calling of the Stadtholder William to the English throne (1688) it was brought into the large scheme of the Grand Alliance against Louis XIV. William of Orange and Heinsius (q.v.), the Grand Pensionary of Holland, were the soul of the resistance to the schemes of the French King. (See LOUIS XIV.) By the Peace of Utrecht, in 1713, closing the War of the Spanish Succession (see SUCCESSION WARS), the Spanish Netherlands were handed over to Austria. By the Barrier Treaty, concluded with England and Austria in 1715, the Dutch were given the right of maintaining garrisons in the fortified towns of the Austrian (Belgium) Netherlands.

There was a decline in the prosperity of Holland in the first half of the eighteenth century. The stadtholdership had been again set aside, but it was restored in 1747 and made hereditary in William IV. of Nassau-Dietz. There were forty years of peace with the exception of a brief naval war with England, which broke out at the close of 1780. In 1782 the States-General formally recognized the United States of America as a sovereign and independent nation, being the second Government in Europe so to do. The Stadtholder's Government was essentially aristocratic, and in 1786 the rising democratic tide drove out William V., who, however, was restored in the following year through the intervention of Prussia. The revolutionary movement in France found an echo in the United Provinces, where the democratic party welcomed the conquests of Pichegru (q.v.). The stadtholdership was again overthrown, and the Batavian Republic was organized under French sympathizers and in close alliance with France in 1795. Napoleon made the Batavian Republic into the Kingdom of Holland, with his brother Louis as King (1806), but the latter was too faithful to the country to suit his Imperial brother and master, and he was compelled to abdicate (1810), and the country was annexed to the French Empire. In 1813 the French were expelled and the House of Orange was restored, and the Congress of Vienna (1815) annexed Belgium to Holland and created the new kingdom of the Netherlands under the sovereignty of William I., the son of the last Stadtholder. Luxemburg (q.v.) was at the same time erected into a grand duchy for the King of the Netherlands. In the course of the Napoleonic wars England seized the Dutch colonial possessions, and at their close was allowed to retain Cape Colony, Ceylon, and a great part of Surinam. The Catholics of the Belgian provinces were not content with the union with Holland, and revolted in 1830, and after fruitless attempts by the King to suppress the revolt, the Powers intervened and created the independent Kingdom of Belgium, under a guarantee of neutrality. (See BELGIUM.) A final settlement with Belgium was not effected until 1839, when Limburg and Luxemburg were divided between the countries. William I. abdicated in 1840 in favor of his son, William II., who was better able to enter upon harmonious relations with Belgium.

William II. was succeeded by William III. in 1849. The country for more than half a century has enjoyed a peaceful and prosperous development, untroubled by other problems than those of national finance, internal politics, and colonial administration. The last is a question of much magnitude, as the Dutch control over 35,000,000 more or less barbarous subjects, their colonial possessions embracing in the Western Hemisphere, Dutch Guiana and Curaçao, and in the Eastern, Java, part of Borneo, Sumatra, Timor, the Moluccas, Celebes, and the western half of New Guinea. These are run as commercial ventures and are kept under rigid Government control. Slavery existed in the Western Dutch colonies until 1862 and a system of obligatory labor under official supervision still obtains in the Dutch East Indies. The Constitution, which had been much liberalized under the revolutionary influence of 1848, was further modified in 1887, when the suffrage was extended, the Upper House of the States-General, elected by the provincial estates, was enlarged to fifty, and the succession to the throne defined. King William III. died November 23, 1890, and was succeeded by his daughter, Wilhelmina Helene Pauline Maria, who was born August 31, 1880. She married Prince Henry of Mecklenberg-Schwerin, February 7, 1901. In 1898 The Hague was the seat of the International Peace Conference called at the suggestion of the Czar of Russia, and the Dutch capital was made the seat of the international arbitration tribunal established by the conference. (See HAGUE PEACE CONFERENCE.) See POLITICAL PARTIES, sections on the Netherlands.

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NETHERLANDS SCHOOLS OF PAINTING. Under this title may best be grouped Flemish and Dutch schools, which possess in common certain distinctive qualities and have had a similar development. The Flemish school may be said to begin with Huybecht and Jan van Eyck (died 1440), whose remarkable improvement of oil painting revolutionized the art. The chief characteristics of the early Flemish school are a pronounced realism, highly detailed finish, and the use of landscape background; its best painters had a good sense of color, perspective, atmosphere, light and shade. Jan van Eyck founded the school of Bruges, the chief centre in Flanders; and his follower or rival, Roger van der Weyden (died 1464), founded the school of Brabant, with a centre at Brussels, which was more emotional and dramatic in character. In the sixteenth century the chief seat of the Flemish school was at Antwerp, where Quentin Massys (died 1530) founded a school, which in the seventeenth century found its culmination in Rubens (1577-1640) and his pupils, Van Dyck and Jordaens. The productions of the later Flemish school are characterized by brilliant line and color, though they are materialistic and lack beauty of face and tenderness of feeling. Although Flemish as regards its characteristic realism, it was much influenced by Italian painting, especially in color. Contemporary with Rubens and his followers were a number of important genre painters, who were thoroughly Flemish, untouched by Italian influence. The chief representatives were Teniers the Younger, Brouwer, and Gonzales Coques. In the eighteenth century Flemish painting declined, and was of little importance.

The painting of the early Dutch school resembles that of the Flemish, and was much influenced by the Van Eycks. Haarlem is recorded as being the chief centre, but none of the works of the reputed founder of the school, Aelbert Ouwater (fifteenth century), survive. Its chief masters were Dierick Bouts (died 1475) and Lucas van Leyden (1494-1533). The sixteenth century was a period of Italian influence and unimportant productions, but the seventeenth was the golden age of Dutch painting. Haarlem remained the chief centre, and there was an important school at Amsterdam. With an entire absence of Italian influence, there arose an art more realistic, more distinctly national than the Flemish. The overthrow of Spain and Catholicism did away with the demand for religious paintings, which were superseded by portrait, genre, landscape, and animal subjects. In these the Dutch achieved perfection alike in color and design, but they seldom attempted larger compositions, in which they were indifferently successful. Among the Dutch artists in the seventeenth century, the chief masters in portraiture are Frans Hals and Rembrandt; the latter was equally great in landscape, and introduced light effects, which have not yet ceased to influence painting. In genre painting the most important were Adriaen van Ostade for peasant scenes, and Gerard Terburg for more refined subjects, besides Gerard Dou, Jan Steen, Pieter de Hooghe, and Jan van der Meer. The Dutch were the first to practice landscape and animal painting for its own sake; their greatest landscapists were Ruysdael and Hobbema, while in animal painting Wouverman, Paul Potter, Adriaen van de Velde, and Aelbert Cuyp are preëminent. In marines the greatest names are Willem van de Velde the Younger and Backhuisen; and in all the branches of still-life painting the Dutch excelled predecessors and contemporaries. In the nineteenth century a new school, distinctly Dutch, arose, including important artists like Israels, the peasant painter, the brothers Maris in landscape, Mesdag in marines, and Mauve in animal subjects.

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NETH'ERSOLE, OLGA (1870—). An English actress, born in London, January 18, 1870. She appeared on the London stage in 1888 at the Royal Adelphi Theatre, having begun her career at Brighton the year before. She was soon a member of John Hare's company at the Garrick, where one of her early successes was in *The Profligate*. In 1890 she made a tour to Australia. Late in 1894 she first came to America, where she soon became well known in *Camille*, *Carmen*, *Sapho*, and other characters, one of her best being Paula in A. W. Pinero's *The Second Mrs. Tanqueray*, in which she appeared in New York in 1899. Consult Strang, *Famous Actresses of the Day in America* (Boston, 1899).

NETHINIM, nĕ'thē̇-nē̇m' (Heb., given [to God], from *nāthan*, to give). The lowest order of ministers of the Temple at Jerusalem, mentioned only in Chronicles and Ezra-Nehemiah. They are distinguished from the Levites (q.v.), but were of sufficient importance to make Ezra solicitous for a large following of them with his mission to Jerusalem (Ezra viii. 17-20). They enjoyed the immunities of the priesthood (ib. vii. 24), possessed a distinct quarter on the Temple hill, along with allotments in the towns (Neh. iii. 31; Ezra ii. 70), and shared in the civic life of Israel (Neh. x. 28). Their name, along with their subordinate position, shows that the caste originally consisted of slaves piously devoted to the sanctuary, like the Greek hierodules, to perform its menial duties. The tradition is preserved that David and his princes 'gave' these servants (Ezra viii. 20), one division of them being associated with Solomon (ib. ii. 55). The large number of foreign names among the Nethinim suggests that they were largely drafted from prisoners of war (cf. Joshua ix. 23). But time broke down the racial distinction, and their voluntary return after the Exile seems to have obliterated all degradation. The Talmud, with its often abstract view of history, outlaws them as heathen, but this view is contradicted by the Bible. Consult: Baudissin, *Die Geschichte des alttestamentlichen Priesterthums untersucht*, p. 142 (Leipzig, 1889); Ryle, *Nehemiah*, in the *Cambridge Bible for Schools and Colleges* (Cambridge, 1893); Joseph Jacobs, *Studies in Biblical Archæology* (London, 1894).

NÉTHOU, nȧ'tōō', PIC DE. The highest peak of the Pyrenees. It is situated in the Spanish Province of Huesca, immediately south of the French boundary, 40 miles west of Andorra. Its height is 11,169 feet, and it forms with the neighboring Pic de la Maladetta (10,867 feet) and Pic du Milieu (11,010 feet) the Maladetta group, a steep and jagged granite mass. On its northern slope lies an extensive glacier. The summit is often ascended for the splendid view which it affords.

NETS (AS. *net*, Goth. *nati*, OHG. *nezzi*, Ger. *Netz*, net, of doubtful etymology; possibly connected with Lat. *nassa*, weel). Open fabrics of cotton, linen, hemp, silk, or other material, whose threads usually cross each other at right angles, leaving a comparatively large open space between them. The open spaces in nets are called *meshes*. The threads may be tied at their intersection, thus constituting a true netting, or they may be simply crossed by the process of weaving. The art of net-making has been practiced from the earliest times. Even where the art of weaving was quite unknown, as in some of the South Sea Islands when first discovered, that of netting was well understood; hence we find among savage tribes, almost universally, nets are used not only for fishing, but also for entrapping land animals. Numerous illustrations of the use of nets for both purposes are found in the bas-reliefs of Assyria, Greece, and Rome, and in the mural paintings of Egypt.

A great variety of nets are in use among fishermen, but the principal are the *seine* and the *trawl*. The *seine* is a very long but not very wide net, one side of which is loaded with pieces of lead, and consequently sinks; the other, or upper side, is buoyed with pieces of cork, and consequently is kept up to the surface. When stretched out they constitute walls of net-work in the water, and are made to inclose schools of fish. The *trawl* is dragged along the bottom by the fishing-boat. It is a large net, often 50 feet wide and 100 feet deep, narrowing into a fine-meshed *purse* at the extremity, with pockets at the sides to retain the entangled fish. Sometimes the mouth is stretched apart by an iron beam, which rests upon supports shaped like runners, holding the distended net up about three feet from the sea bottom, while the belly of the net, held in front by the ground rope, drags along the bottom. Such nets, called *beam-trawls*, are operated in deep water by large fishing smacks.

Various kinds of nets are used in bird-catching, and also in catching quadrupeds, chiefly for the purpose of inclosing spaces within which they are, but sometimes also for throwing upon them to confuse and entangle them. Nets are used by gardeners to protect crops from birds; also to protect the blossoms of trees from frost.

Other fabrics for various uses, with wide, open meshes are also called nets, as *hair-nets, mosquito nets*, etc. See also LACE; BOBBINET; BRUSSELS NET; KNITTING.

NETSCHER, nĕt′shĕr, KASPAR (1639-84). A Dutch genre and portrait painter, born at Heidelberg. He was the pupil of Koster at Arnheim, but belongs to the school of Terburg and Metsu. On a proposed journey to Italy he got as far as Bordeaux, and although he paid a second visit to France, he afterwards lived at The Hague, and was free of the guild in 1663. His best work is in portraiture on a small scale, and in small genre subjects. His earlier and middle works are superior to his later painting, in which his colors are often harsh and unpleasing. In his best period, Netscher is distinguished for the elegance and grace of his figures, especially of children—his mellow, golden tone, and his fondness for and skill in treating draperies and accessories. The Dresden Gallery is rich in good pictures by him. They include: "Gentleman with Guitar" (1665); "Lady with a Spaniel," "Lady at the Piano," and "Woman Singing," and two portraits of Madame de Montespan. The National Gallery, London, has his "Lady at a Spinning Wheel" and "Children Blowing Bubbles;" the Louvre, his "Singing Lesson" and "Violoncello Lesson;" the Metropolitan Museum, New York City, the "Portrait of a Dutch Lady;" and the Historical Society, "Madame de Montespan as Saint Cecilia." Several of his best works are in private collections in England. He also painted historical subjects, but with less success. His son and pupil CONSTANTYN (1668-1722), born at The Hague, was a genre and portrait painter in the same style. Another son, THEODORUS (1661-1732), born at Bordeaux, also a portrait and genre painter, lived in England for some time, and was esteemed there for his portraits.

NETSUKÉ, nĕt′s′-kā′ (from Jap. *ne*, wood, root + *tsuké*, to suspend). A button of wood, crystal, or porcelain, but usually of ivory, by which the Japanese smoker suspends his outfit of tobacco. flint and steel, pipe, etc., from his girdle. Often the netsuké is elaborately carved, and is among the most characteristic products of native skill. The best specimens, which have engraved on them the mark of the carver, are very costly, and are valued by both native and foreign collectors, as objects of art.

NETTEMENT, nĕt′mäN′, ALFRED FRANÇOIS (1805-69). A French journalist and historian, born in Paris. He early began to contribute to the magazines, and was a consistent Catholic in religion and legitimist in politics. In 1848 he founded the review *L'Opinion Publique*, and in it expressed his own opinions so forcibly that, after the coup d'état of 1851, the paper was suppressed and Nettement imprisoned. Among his works are: *Histoire de la Révolution de juillet* (1833); *Histoire de la littérature française sous la Restauration* (1852); *Histoire de la littérature française sous la royauté de juillet* (1854); *Histoire de la Restauration* (1860-68); *Etudes critiques sur le feuilleton roman* (1845-46); and *Vie de Madame la marquise de la Rochejacquelin* (1858).

NET′TER, THOMAS, also called WALDENSIS. from his birthplace, Saffron Walden, Essex (c.1375-1430). An English Carmelite monk. He studied at Oxford, and rose to eminence as a man of learning and business capacity. He was elected provincial prior of the English Carmelites in 1414, and was confessor to Henry V. and to Henry VI. He died at Rouen, France, November 2, 1430. He threw himself with great ardor into the lists against the Lollards, and so won the sobriquet of 'Prince of Controversialists.' His chief writings against them are *Doctrinale Fidei Ecclesiæ Catholicæ contra Wiclevistas et Hussitas*, and, especially valuable for its documents, *Fasciculi Zizaniorum Johannis Wyclif* (ed. by Shirley, London, 1858).

NETTLE (AS. *netele, netle*, OHG. *nezzila, nezila*, diminutive of *nazza*, nettle, Ger. *Nessel*, Ir. *nenaid*, nettle, probably connected with OPrus. *noatis*, Lith. *noterē*, Lett. *nâtres*, Gk. *ἀδίκη, adikē*, nettle). A common name of Urtica, a genus of plants of the natural order Urticaceæ having unisexual flowers. The species are annual or perennial herbs with occasionally shrubby bases, many of them covered with stinging hairs, which emit an acid juice and pierce the skin when touched, often causing much inflammation and pain; when grasped in such a way as to press the hairs to the stem, no stinging ensues. The species of a number of distinct genera were formerly included in the genus, especially those having stinging hairs, as Laportea, Pipturus, and Pouzolzia. Some of these are shrubs or even trees, the giant nettle tree of Australia attaining great size. The sting of East Indian species is much more severe than that of European and American species. *Urtica crenulata* or *Laportea crenulata* is said to produce a sensation similar to the continual application of a hot iron, and even after the lapse of several days this may return upon the application of cold water, a sensation more or less pronounced with other species. The roots of nettles, boiled in alum, afford a yellow dye; and the juice of the stalk and leaves has been used to dye woolen stuffs a beautiful and permanent green. The small nettle (*Urtica urens*) and the great nettle (*Urtica dioica*), introduced European species, are abundant in America. Whatever gives nettles their stinging power is dissipated by boiling. The high value of nettles as food for swine, poultry, and particularly for turkeys, is well known to the peasantry of many countries; the great nettle is cultivated in Sweden for fodder. The seeds are nutritious to poultry, and it is claimed are given to horses by jockeys, in order to make them lively when they are to be offered for sale. The stalks and leaves of nettles are employed in some parts of England for the manufacture of a light kind of beer, called nettle beer. The bast fibre of nettles is used for textile purposes. Yarn and cloth, both of the coarsest and finest descriptions, can be made of it. The fibre of *Urtica dioica*, used by the ancient Egyptians, is still employed in Piedmont and other countries. When wanted for fibre, the plant is cut in midsummer, and treated like hemp. The names nettle yarn and nettle cloth are, however, now commonly given in most parts of Europe to particular linen and cotton fabrics. The fibre of *Urtica* *cannabina*, a native of the south of Siberia and other middle parts of Asia, is much used; and from other species both fine lace and strong ropes can be manufactured. The fibre of *Urtica japonica*, or *Pouzolzia riminea*, is much used in Japan, and also that of *Urtica argentea* (or *Pipturus argenteus*) in the South Sea Islands, and of *Urtica gracilis* in Canada. *Urtica tuberosa*, or *Pouzolzia tuberosa*, produces nutritious tubers, which are eaten in India raw, boiled, or roasted. Australia produces a magnificent tree-nettle, *Laportea Gigas*, abundant in some parts of New South Wales, which sometimes reaches a height of 140 feet with a trunk of great thickness, and very large green leaves, which, when young, sting violently. In some places it forms scrub forests, and its stinging leaves form a great impediment to the traveler. The common nettle tree of the United States is a species of Celtis (see HACKBERRY); the name dead nettle is given to certain species of Lamium, a genus of the order Labiatæ. Bœhmeria nivea, often called false nettle, supplies China grass or ramie (q.v.).

NETTLE-BUTTERFLY. Any of several species of butterflies, whose eggs are laid upon the leaves of nettles, namely *Pyrameis Atalanta*, *Pyrameis cardui*, and *Vanessa urticæ*, the last, as its scientific name shows, being an especial frequenter of these plants. The two former are cosmopolitan, while the Vanessa is European.

NETTLE FAMILY. A natural order of plants. See URTICACEÆ.

NETTLE RASH. An affection of the skin of nervous origin, due to the poison of the nettle, and consisting of wheals of red color, extremely tender and also itching. The slightest contact with the hair or spine of the nettle will cause an efflorescence of the eruption, which first appears as white elevations, but rapidly turns red. The true primary cause of the eruption is the special susceptibility of the vaso-motor nervous system. Hence for a few people the saying is true: "Grasp the nettle and it will not sting you." See URTICARIA.

NET'TLESHIP, HENRY (1839-93). An English classical scholar, born in Kettering, Northamptonshire, England, May 5, 1839. He was educated at private schools, the Cathedral School, Durham, and at Charterhouse. He was elected Fellow of Lincoln, and gained the Chancellor's Latin Essay Prize. From 1868 to 1873 he was assistant master at Harrow. In 1870 he married the eldest daughter of Rev. T. H. Steel, his colleague at Harrow. In 1873 he was appointed fellow and tutor of Corpus Christi College and classical lecturer at Christ Church, Oxford, which appointments he resigned on being made corpus professor of Latin literature in the University of Oxford, 1878. He published and edited many classical works, among them a commentary on *Æneid* x. and xii.; a revised edition of Conington's *Vergil* (London, 1883); *Lectures and Essays on Subjects Connected with Latin Literature and Scholarship* (Oxford, 1885; second series, edited by Haverfield, Oxford, 1895); and *Contributions to Latin Lexicography* (Oxford, 1889).

NETTLESHIP, JOHN TRIVETT (1841-1902). An English animal painter and author, born at Kettering. He was a pupil at Heatherley's and at the Slade School, under Poynter, and studied animal life at the Zoölogical Gardens. His favorite subjects were lions, bears, and tigers. His drawing is accurate, and his treatment broad and masculine. He began to exhibit in 1874. His pictures include: "The Destroyer" (1889); "A Death Grip" (1892); "Rich Spoil" (1893); "A Big Drink" (1893); "The Blood Trail" (1895); "The Honey Stealer" (1896); "Into the Silent Sea" (1900); "Wandering" (1902). He also wrote *Robert Browning: Essays and Thoughts* (1890), a valuable and illuminative work, and *George Morland, and the Evolution from Him of Some Later Painters* (1898).

NET'TLETON, ALFRED BAYARD (1838—). An American soldier and journalist, born at Berlin, Delaware County, Ohio. He studied at Oberlin College, but at the outbreak of the Civil War enlisted as a private in the Federal army, and before the conclusion of peace rose to the rank of colonel of the Second Ohio Cavalry and brevet brigadier-general. He then studied law, but afterwards did newspaper work in Sandusky, Ohio, Chicago, Philadelphia, and Minneapolis. From 1870 to 1875 he was actively interested in the construction of the Northern Pacific Railroad, and for the next five years in various mining and manufacturing enterprises. He was Assistant Secretary of the United States Treasury from 1890 to 1893, and for a short time after Secretary Windom's death served as Secretary.

NETTLE TREE. Various American ornamental trees and shrubs of the natural order Urticaceæ, known by sundry popular names, as hackberry (q.v.).

NEUBAUER, noi'bou-ẽr, ADOLPH (1832—). An English Semitic scholar, born in Hungary, and educated at Prague, Munich, and Paris. He was sub-librarian of the Bodleian Library at Oxford in 1873-99, and reader of Rabbinical literature to the university in 1886-1900. Neubauer published *Mediæval Jewish Chronicles and Chronological Notes* in the Semitic Series of the "Anecdota Oxoniensa;" *Histoire de la lexicographie hébraïque* (1861-62); *Géographie du Talmud* (1868); *The Book of Hebrew Roots* (1875); *The Book of Tobit* (1878); *Catalogue of Hebrew Manuscripts in the Bodleian Library* (1886); and *On the Dialects Spoken in Palestine at the Time of Christ* (1888).

NEUBER, noi'bẽr, FRIEDERIKE KAROLINE (1697-1760). A German actress. She was born in Reichenbach, and her maiden name was Weissenborn. From the undue restraint of her father's house, she fled in 1718 with her lover, Neuber, to Weissenfels, where they joined some strolling comedians. Seven years afterwards, with another company which she had entirely reorganized, she appeared at Leipzig. Meeting Gottsched, she became a convert to his gospel of French classical methods. In 1737 she presented the play *Vertreibung und Tod des Hanswurst.* A short tour to Saint Petersburg (1740) seems to have been the turning point in her career. She quarreled with Gottsched on her return, lost her company twice, and she failed in her attempt to rehabilitate her fortunes as an actress. Consult the biography by Von Reden-Esbeck (Leipzig, 1881).

NEUBRANDENBURG, noi-brän'den-bo͞ork. A town in the Grand Duchy of Mecklenburg-Strelitz, Germany, near Lake Tollense, about 18 miles northeast of Neustrelitz (Map: Germany, E 2). Its old walls, still standing, and its four handsome Gothic gates give the town a mediæval appearance. The Gothic Marienkirche dates from the thirteenth century. Near by is the grand ducal pleasure palace of Belvedere. There are manufactures of machines, pianos, paper, and brandy. Population, in 1900, 10,560. Neubrandenburg was founded in 1248.

NEUCHÂTEL, nẽ′shȧ′tĕl′, or **NEUFCHÂTEL.** The capital of the canton of the same name in Switzerland, situated on the Lake of Neuchâtel, about 25 miles west of Bern (Map: Switzerland, A 2). It is a well-built town, with a picturesque location and fine public buildings. A beautiful avenue extends along the waterfront, and one of the squares is adorned with a statue of the Neuchâtel merchant, David de Purry, to whose generosity the town owes many of its institutions. The twelfth century abbey church contains a fine monument, erected in 1372, to the counts of Neuchâtel. The old château is now the seat of the cantonal government. Neuchâtel is well provided with educational institutions, which include a Latin college with a valuable natural history collection, an academy with four faculties, a gymnasium, a museum of natural history, an historical and ethnographical museum, a museum of fine arts, and a library of 100,000 volumes. There are a number of private boarding-schools, attended mostly by foreigners. Near the town is the cantonal observatory. The industries of Neuchâtel include the manufacturing of watches, electrical apparatus, and jewelry. The trade is of some importance. Population, in 1900, 20,843, chiefly French Protestants. For history, see the article on the Canton of Neuchâtel. Consult Bachelin, *Neuenburg und Umgebung* (Zurich, 1883).

NEUCHÂTEL, or **NEUFCHÂTEL**, nẽ′shȧ′tĕl′ (Ger. *Neuenburg*). A western canton of Switzerland, bounded on the north by the Canton of Bern, on the east by the Canton of Bern and the Lake of Neuchâtel, on the south by the Canton of Vaud, and on the west by the French Department of Doubs. Area, 312 square miles (Map: Switzerland, A 2). The whole country belongs to the region of the Jura, and is generally divided into three parts: the region along the lake, ranging in altitude from about 1400 to over 2000 feet, and famous for its wine; the central portion, with an average altitude of over 2700 feet and producing principally cereals; and the forest region of the west, devoted chiefly to pastoral purposes. Hydrographically the canton belongs partly to the Aare and partly to the Doubs. The principal minerals are asphalt, cement, and building stones. Besides agriculture, viticulture, and stock-raising, the fundamental industries of the canton, the inhabitants are engaged in watch-making, distilling, and in manufacturing cables, electrical apparatus, paper, and chocolate. The Constitution of the canton, originally adopted in 1858, provides for a grand council elected directly for three years at the rate of one member to every 1000 inhabitants. The five members of the executive council are appointed by the grand council for three years. The referendum was adopted in 1879, and the initiative in 1882. For the administration of justice there are a number of justices of the peace, several industrial arbitration courts, and a court of appeals at Neuchâtel. The canton is represented by five members in the National Council. For administrative purposes Neuchâtel is divided into six districts. Population, in 1890, 108,153; in 1900, 126,279. Most of the inhabitants are Protestants and speak French. Capital, Neuchâtel (q.v.).

The mediæval countship of Neuchâtel passed in 1504 to the House of Orléans-Longueville. In 1707, on the extinction of the Neuchâtel branch of the latter family, 15 claimants came forward, among them Frederick I., of Prussia, whose mother was a princess of the House of Orange, which was connected by descent with the House of Châlons, to whose overlordship Rudolph of Hapsburg had subjected Neuchâtel in 1288. Frederick I. was the successful candidate; and from his time Neuchâtel continued associated with Prussia till 1806, when Napoleon bestowed it upon General Berthier. In 1814 it was restored to the House of Brandenburg, and in the same year became a member of the Swiss Confederacy. It became a republic in 1848. Its connection with the Prussian monarchy has been dissolved since 1857.

Consult: Grandpierre, *Histoire du canton de Neuchatel sous les rois de Prusse* (Leipzig, 1889); Quartier-la-Tente, *Le canton de Neuchâtel. Revue historique et monographique* (Neuchâtel, 1897).

NEUCHATEL, Lake of (Ger. *Neuenburger See*). A lake in the western part of Switzerland lying along the eastern base of the Jura range, 19 miles north of the Lake of Geneva (Map: Switzerland, A 2). It is 24 miles long and from 2 to 5 miles wide, being the third largest lake of Switzerland. Its shores, which are very little indented, are partly low and marshy, partly hilly, and covered with forests or vineyards. The lake may be considered as an expansion of the River Thièle, which enters at the southern end, and leaves it at the north on its way to the Aare. It was an important commercial route until railroads were built along its banks, and is traversed by regular lines of steamers between the towns of Neuchâtel and Estavayer.

NEUDÖRFER, noi′dẽr-fẽr, Johann (1497-1563). A German writing-master and calligrapher, born at Nuremberg. He became the foremost representative of his profession, which, despite the invention of printing, was still widely and skillfully practiced, and highly esteemed. His manuscripts were beautifully decorated with gold and other colors, but his chief attention was directed toward an elegant formation of the letters of the German alphabet. He thus developed the German Gothic characters to their perfection, and secured their general use. Of his autographs there are known to exist only the signatures to the Gärtner copies of Dürer's two paintings, "The Temperaments" (in the Germanic Museum, Nuremberg), and a letter of June 7, 1556 (in the municipial archives of Nuremberg.) He also wrote in 1547 the *Nachrichten von nürnbergischen Künstlern und Werkleuten*, whose 79 brief notices are important sources regarding the history of Nuremberg of the early sixteenth century.

NEUENDORFF, noi′en-dôrf, Adolf (1843-97). A German-American musician, conductor, and operatic impresario. He was born in Hamburg, Germany, but at the age of twelve years came to America, where he completed his musical education. He first came before the public in 1859 as a concert pianist, and in 1860 became the solo violin in the Stadt Theater orchestra of New York. The following year he toured Brazil, and on his return was appointed musical director of the German Theatre in Milwaukee, Wis. To him is due the credit of introducing Wagner's *Lohengrin* into the United States, at the Stadt Theater, New York. He also introduced Wachtel (the famous tenor), and the following year (1872) conducted the season of grand opera at the Academy of Music (New York). *Die Walküre* also received its first presentation in this country at his hands (1877), and in 1878 he was appointed conductor of the New York Philharmonic Society. From 1884 to 1889 he was a concert director in Boston, after which he became associated with the management of several successful opera companies. His wife, Georgine von Januschowsky, was prima donna of the Imperial Opera, Vienna, in which city he spent two years (1893-95), returning in 1896 to become musical director of the Hebrew Temple Emanuel. In 1897 he conducted the Metropolitan Orchestra. He was the composer of operas, symphonies, overtures, and many songs, which enjoyed considerable success. He died in New York.

NEUENKIRCHEN, noi′*e*n-kẽrK′*e*n. A town of Austria. See NEUNKIRCHEN.

NEUFCHÂTEAU, nẽ′shȧ′tȯ′. FRANÇOIS DE. See FRANÇOIS DE NEUFCHÂTEAU.

NEUFCHÂTEL, nẽ′shȧ′tĕl′. A canton and a city of Switzerland. See NEUCHÂTEL.

NEUHAUS, noi′hous. A town of Bohemia situated 70 miles southeast of Prague (Map: Austria, D 2). It contains a mediæval castle and a college, and manufactures cloth and woolen goods. Population, in 1900, 9316.

NEUHÄUSEL, noi′hoi-zel (Hung. *Ersekújvár*). A town of Hungary, situated on the Neutra, 55 miles northwest of Budapest (Map: Hungary, F 3). It has a fine church, a Franciscan monastery, and a gymnasium. Prior to 1724 it was a strong fortress and played a prominent part in the Turkish wars. Population, in 1900, 13,385, mostly Catholic Magyars.

NEUHOF, noi′hōf, THEODOR VON, Baron (c.1686-1756). A German adventurer and King of Corsica. He was born in Metz, the son of a Westphalian nobleman in the French service, and became page to the Duchess of Orleans. He then enlisted in the French army and later in the army of Sweden, where the Minister Goertz discovered him, and employed him on secret diplomatic missions. In 1719 Neuhof was in Spain, enjoying the protection of Riperda. There he married Lady Sarsfield and ran away with her diamonds in France. Beggared by Law (q.v.), he lived in misery till 1735, when the Emperor Charles VI. made him chargé d'affaires at Florence. In Florence Neuhof rendered some service to several Corsican patriots, who in return invited him to become King of Corsica and fight its battles against Genoa. He landed in Corsica in March, 1736, was proclaimed King as Theodore I., and with help obtained from the Dey of Algiers defeated the Genoese. He left the island soon to seek assistance abroad, and came back in 1738 with reënforcements from Holland. But the French had come to the aid of the Genoese and Neuhof fled. He made one more attempt on Corsica in 1743, when the islanders displayed remarkable devotion to his cause, but failed, and after long wandering went to England in 1749. There he was thrown into prison by his creditors and was released through the intercessions of Horace Walpole only a few months before his death. Neuhof's son published his *Mémoires pour servir à l'histoire de Corse* (1768). Consult Fitzgerald, *King Theodore of Corsica* (London, 1890).

NEUILLY, nẽ′yē′. A suburban municipality of Paris, in the Department of Seine, on the right bank of the river Seine, and bordering on the city wall to the north of the Bois de Boulogne (Map: Paris, C 5). It is a favorite residential section of Parisian merchants, and has sanatoriums, hospitals, and five parks, and in connection with Parisian houses, establishments manufacturing patent leather, chemicals, and starch, and preserving meat. In a large and beautiful park along the Seine formerly stood the Château de Neuilly, built by Louis XV., and the favorite residence of Louis Philippe, who after his deposition assumed the title of Count of Neuilly. The château was destroyed in the Revolution of 1848; and the park, afterwards divided into lots for sale, became an elegant residential quarter. Population, in 1900, 37,493.

NEUKOMM, noi′kōm, SIGISMUND VON (1778-1858). An Austrian composer and orchestra leader, born at Salzburg. He studied under Weissauer the organist, and Michael and Joseph Haydn, the latter of whom was devoted to his protégé's interests, and was mainly instrumental (in 1804) in securing for Neukomm the leadership of the German opera at Saint Petersburg. In 1809 he went to Paris, where he gained the friendship of Grétry, Cherubini, and Talleyrand, and in 1815 received the Cross of the Legion of Honor. In 1816 he went to Rio de Janeiro and was appointed music teacher to the Crown Prince Dom Pedro. He returned in 1821, and lived at Talleyrand's house in Paris. He was a prolific composer and has nearly 300 compositions to his credit, ranging from opera to simple ballad. His sacred music alone survives, the oratorios *Mount Sinai* (1831) and *David* (1834) being still popular in England and Germany. He died in Paris.

NEUMANN, noi′män, FRANZ ERNST (1798-1895). A German physicist, born at Joachimsthal, near Berlin. He took part in the War of 1815, and afterwards studied at the universities of Jena and Berlin. He received his doctor's degree in 1826, and in 1828 he was made professor of physics and mineralogy in the University of Königsberg. His researches were chiefly along the line of mathematical physics, and he contributed to the theories of the reflection and refraction of light, and of double refraction, to the study of crystals of double axes, and to the methods of determining the specific heat of bodies. His chief publications (published by his pupils) are: *Vorlesungen über die Theorie des Magnetismus* (1881); *Einleitung in die theoretische Physik* (1883); *Vorlesungen über elektrische Ströme* (1884); *Vorlesungen über theoretische Optik* (1885); *Vorlesungen über Theorie des Potentials* (1887); *Ueber ein allgemeines Princip der mathematischen Theorie inducirter elektrischer Ströme* (1892). About a hundred of his memoirs appeared in the *Annalen*, *Crelle's Journal*, and the *Astronomische Nachrichten*. Consult Volkmann, *Franz Neumann* (Leipzig, 1896).

NEUMANN, JOHANN BALTHASAR (1687-1753). A German architect, born at Eger, Bohemia. In 1711 he entered the artillery service at Würzburg, and through the patronage of Prince-bishop Johann Philipp von Schönborn, was enabled to travel in Italy, France, and the Netherlands, as a result of which he developed into one of the foremost architects of the Rococo style of his time. He built the magnificent episcopal palace at Würzburg (1720-42), whose imposing staircase is its most notable feature. Even more original, though on a smaller scale, is the palace at Bruchsal. Regarding other structures by him, consult Keller, *Balthasar Neumann* (Würzburg, 1896).

NEUMANN, KARL FRIEDRICH (1793-1870). A German Orientalist, born at Reichmannsdorf, Bavaria. He was educated at the universities of Heidelberg, Munich, and Göttingen, in 1821-25 was an instructor in the gymnasium at Speyer; and later, at the Mechitarist cloister and academy on the island of San Lazzaro, Venice, made a study of the Armenian language and literature, some results of which appeared in his *Geschichte der armenischen Litteratur* (1836). He also made several translations into English of Armenian chronicles for the Oriental Translation Fund of London. During a visit to China he acquired an extensive knowledge of the Chinese tongue and a library of 12,000 printed books, which he presented to the Bavarian Government. In 1833 he was appointed at Munich professor of the Armenian and Chinese languages, but in 1852 was retired because of his expression of liberal political views. He further wrote a *Geschichte des englischen Reichs in Asien* (1857), and a *Geschichte der Vereinigten Staaten von Amerika* (1863-66).

NEUMANN, KARL GOTTFRIED (1832—). A German mathematician, son of Franz Ernst Neumann, the physicist. He was born and educated in Königsberg, was professor at Halle, Basel, and Tübingen, and in 1868 became professor at Leipzig, founding in the same year the *Mathematische Annalen*. He devoted himself mainly to the theory of functions, and to mathematical physics, and may be considered the founder of the theory of logarithmic potential. Neumann edited various papers written by his father and published: *Theorie der Besselschen Funktionen* (1867); *Ueber die elektrischen Kräfte* (1873 and 1898); *Vorlesungen über die mechanische Theorie der Wärme* (1875); *Untersuchungen über das logarithmische und Newtonsche Potential* (1877); *Hydrodynamische Untersuchungen* (1883); *Vorlesungen über Riemanns Theorie der Abelschen Integrale* (1884); and *Allgemeine Untersuchungen über das Newtonsche Princip der Fernwirkungen* (1896).

NEUMANN-SPALLART, späl′lärt, FRANZ XAVER VON (1837-88). An Austrian political economist, born and educated in Vienna. He was professor of economics there in the Commercial Academy (1864-68), at the Military Academy (1868-71), and at the university and the Agricultural College. With Bodio he was one of those most influential in forming the International Statistical Institute; and he was long connected with the Austrian Central Commission on Statistics. As an economist he was a zealous worker in the interest of free trade in Austria, and founded the Association for Economic Progress. Neumann published: *Oesterreichs Handelspolitik* (1864); *Volkswirtschaftslehre mit besonderer Anwendung auf Heerwesen und Militärverwaltung* (1873); and the valuable year-book *Uebersichten in der Weltwirtschaft* (1878-89), continued by Juraschek.

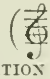
NEUMARK, noi′märk, GEORG (1621-81). A German poet. He was born at Langensalza and studied at Königsberg. At Kiel, where he was engaged as a tutor, he wrote his famous song "Wer nur den lieben Gott lässt walten." Neumark was a member of the poetical guild called the *Palmenorden*, and he wrote its history, *Der neusprossenden deutschen Palmbaum* (1668). Consult Knauth, *Georg Neumark nach Leben und Dichten* (Langensalza, 1881).

NEUMAYER, noi′mī-ẽr, GEORG (1826—). A German meteorologist and hydrographer. He was born at Kirchheimbolanden, Bavaria, was educated at the Polytechnic and the University of Munich, and in 1857 was sent by Maximilian II. to Australia to make magnetic observations. At Melbourne Neumayer founded Flagstaff Observatory. He returned to Germany in 1864, interested himself in the formation of expeditions to the North and South Poles, and in founding the German African Company, and, after a long connection with the hydrographic bureau at Berlin, in 1876 became director of the German Marine Observatory at Hamburg. He was prominent in behalf of the international polar expedition planned in 1882, and in arranging for the German Antarctic expedition of 1901. Neumayer wrote: *Results of the Observations at the Flagstaff Observatory* (1858-63) and *Results of the Magnetic Survey of Victoria* (1869); *Beobachtungsergebnisse der deutschen Stationen im Systeme der internationalen Polarforschung* (with Börgen, 1886); *Die deutsche Expedition und ihre Ergebnisse* (1890-91); *Atlas des Erdmagnetismus* (1891); *Anemometer-Studien* (1897); and *Auf zum Südpol!* (1901).

NEUMAYR, noi′mīr, MELCHIOR (1845-90). An Austrian geologist. He was born in Munich, studied there and at Heidelberg, where, after four years in the Imperial Geological Institute at Vienna, he became docent in 1872. He soon returned to Vienna and became full professor of geology and paleontology in 1880. Neumayr traveled widely in Southern Europe, making an especial study of the life and coördination of the Jurassic formations, the results of which appeared in the German geological magazines. He coöperated on *Geologische Studien in den Küstenländern des griechischen Archipels* (1880); and wrote *Die Stämme des Tierreichs. Wirbellose Tiere* (1890), and a general work on geology entitled *Erdgeschichte* (1885-87; 2d ed. 1895). The last-named work, while written in a popular style, may be commended for its comprehensiveness and scientific accuracy.

NEUMEISTER, noi′mīs-tẽr, ERDMANN (1671-1756). A German hymn-writer, born at Uechteritz, near Weissenfels, and educated at the University of Leipzig. He is chiefly remembered for his hymns, some of which are of great merit and are still in use, such as "Jesus nimmt die Sünder an," "Will ich sagen," and "Lass irdische Geschäfte stehn," which have been translated into English. He also published a *Specimen Dissertationis Historico-criticæ de Poetis Germanicis* (1695). His poetical works include *Fortgesetzte*

Fünffache Kirchenandachten (1716-17) and *Zugang zum Gnadenstuhle* (1705).

NEUMES, nūmz (OF. *neume*, from ML. *neuma, pneuma*, song, musical sign, from Gk. *πνεῦμα, pneuma*, breath, from *πνεῖν, pnein*, to breathe). In Gregorian music, melodic ornaments, especially series of notes sung to one syllable. Also characters in a peculiar system of musical notation which was in use from the eighth or ninth to the eleventh century. The oldest preserved manuscript written in this notation is the Antiphonary of Saint Gall (ninth century). No staff was used. The notes were represented by a system of dots and hooks and their respective pitch by the height at which they were placed above the syllables of the text. A single long note was indicated by the *virga* (ͻ), two notes on one syllable by the *bivirga* (ͻͻ), three by the *trivirga* (ͻͻͻ), etc. A shorter note was indicated by the *punctus* (•), two by the *bipunctus* (••), etc. The rising and falling of the voice was marked by a corresponding higher or lower position of the signs. In order to obviate the difficulty of determining the exact pitch of the various tones, a red line was drawn horizontally across the parchment (tenth century), and the signs were written above and below this line. Any sign upon the line denoted F. Before another century a second line was drawn above the red one. This was yellow and the note upon it was C. But in the plainer manuscripts the distinction of color was soon abandoned, and two black lines were drawn with the letters F and C placed at the beginning. In the course of time these letters underwent a series of conventional modifications, until they finally assumed the shape in which they are used to-day as clef-signatures (,). The G cleff, which was added later, underwent a similar change (). See MENSURABLE MUSIC; MUSICAL NOTATION; PLAIN SONG.

NEUMÜNSTER, noi′mụn-stẽr. A manufacturing town in the Province of Schleswig-Holstein, Prussia, on the Schwale, 36 miles north of Hamburg (Map: Prussia, D 1). The principal industrial establishments are woolen and linen mills, tanneries, paper-mills, dye-works, machine and railway shops. Population, in 1890, 17,539; in 1900, 27,335.

NEUNKIRCHEN, noin′kẽrκ-en, or **NEUENKIRCHEN.** A town in the Austrian Crownland of Lower Austria, on a branch of the Danube, 39 miles south-southwest of Vienna. It has a large iron foundry, metal and textile industries, boiler works, and soap factories, and lies in an important coal-mining district. Population, in 1900, 10,831.

NEUQUEN, nā′ōō-kān′. A territory of Argentina, situated on the western frontier of the Republic, and bounded by Chile on the west, the Province of Mendoza on the north, and the Territory of Rio Negro on the east and south (Map: Argentina, D 11). Its area is about 42,000 square miles. The greater part of the territory is covered by the ramifications of the Andes, which are drained by the headwaters of the Rio Negro. On the southern boundary is Lake Nahuel-Huapi (q.v.). The population in 1895 was 14,517, mostly Indians, though many Chileans have settled in the territory since the Indians were subjugated in 1884. The capital is the village of Chosmalal.

NEURALGIA (Neo-Lat., from Gk. *νεῦρον, neuron*, nerve + *ἄλγος, algos*, pain). A sensory neurosis classed as functional and characterized by pain in the course of a nerve or of nerves. Neuralgias are divided into (1) symptomatic, as when they are due to a toxin or a reflex irritation, and (2) idiopathic, when developing from organic disease of the nerve at the site of the pain. But the latter are cases of neuritis in reality, and should not be classed with the neuralgias. Neuralgias are also divided into classes named from their causes, as gouty, traumatic, hysterical, etc., as well as from their anatomical location, as trigeminal, lumbar, crural, sciatic, gastric, renal, visceral, cervico-occipital, brachial, and intercostal. The trigeminal, or facial, neuralgia is the most frequent, and the sciatic ranks next in frequency.

Among the causes are anæmia, gout, rheumatism, diabetes, carious teeth, toxic agents, infections, exposure to cold, malaria, fatigue, mental shock, and injuries. Children never suffer from neuralgia. It is most frequent between the ages of fifteen and twenty-five. It is rare in old age. Women are oftener victims of neuralgia than men, in the proportion of five to three.

The most prominent symtom is pain, which is of a sharp, lancinating character, or of a dull aching variety. Generally it appears in twinges of short duration, though of great intensity. Though principally following the course of the nerves, neuralgic pain pervades adjacent structures. Heat as well as cold generally increases it, as well as a light touch. Firm pressure sometimes relieves. In many cases painful points, generally corresponding to the places of exit of nerves from a bony structure, are found by testing with pressure. Numbness may accompany the pain, as well as muscular spasm in rare cases. The pain of neuralgia is usually increased at night. It may return at regular intervals during the day, especially if dependent upon neuritis.

The treatment of neuralgia includes the use of rest, catharsis, the analgesics, hypodermic exhibition of morphia, the use of cocaine by the galvanic cathode, as well as the local use of menthol, camphor, mustard, chloride of ethyl, chloroform, etc. Excision of a part of the affected nerve or removal of a ganglion of the sympathetic may effect a cure. In all cases hygiene, diet, regimen, and tissue-building are necessary, as well as the discovery and removal of any peripheral irritant, thereby stopping all nerve leaks. See NEURITIS.

NEURASTHE′NIA (Neo-Lat., from Gk. *νεῦρον, neuron*, nerve + *ἀσθένεια, asthencia*, weakness), nerve weakness. Perhaps the most frequent of the acquired neuroses. The symptom group making up this clinical entity was first familiarized by Beard of New York in 1869, and it is sometimes called the American disease, though now recognized as a world-wide malady. As a rule all forms of nervous energy are reduced and fatigue quickly appears upon the exercise of any motor, mental, or organic activity. It is essentially a disorder of the productive period of life, but does occur in neurotic children and in nervous adults of advanced years. The sexes are about equally affected. Hebrews, Scandinavians, and Slavs show a special susceptibility, and those of neuropathic heredity and the offspring of the physically defective are prone to develop it.

High altitudes, extremes of climatic conditions, wasting diseases, vicious habits, physical illness, injury, shock, and fright, or protracted anxiety, grief, worry, and excitement are competent causes. Excesses of all varieties, and finally and most important of all, overwork, must be added to the list. The only essential element in the causation of neurasthenia is overstrain, and this is a quantity relative to the inherent capacities of the individual and often correlated with hereditary tendencies or defects.

The major symptoms of the disorder are headache, backache, gastro-intestinal disturbances, neuro-muscular weakness, mental depression, irritability, and insomnia. To these in varying number and of inconstant appearance are added tremor, twitchings, startings, sensations of general fatigue, pressure headaches, drawing feelings in the back of the neck and spine, tenderness at various points along the spine, particularly at its two extremities and at the waist, neuralgic pains, and various paræsthesiæ described as prickling, tightness, burning, numbness, stiffness, heat, cold, heaviness, soreness, and vague discomforts referred to the body viscera. Use of the eyes commonly intensifies the headache, and causes prompt fatigue with increase in all the subjective complaints. Sometimes patients shun the light continuously. Nervous indigestion, gaseous fermentation, alternating diarrhœa and constipation, cardiac palpitation, feebleness of the circulation, and vascular storms are commonly presented. The activity of the functions of the genito-urinary tract is reduced. On the mental side there is loss of concentration and consequently memory is enfeebled. Continuous application is impossible. Courage fails, introspection becomes habitual, and many apprehensions and distinct phobias of a hypochondriacal cast add to the patient's misery. The natural affections are diminished and depressed emotions are continuous. The sleep, disturbed by troubled dreams, is broken and unrefreshing. The early morning hours are particularly gloomy. The patient's general bodily condition is unsatisfactory. Anæmia and loss of flesh are commonly encountered, though exceptionally the general nutrition is excellent. The great majority of these symptoms it will be noticed are subjective, not demonstrable physically and capable of misrepresentation. For this reason such patients are misunderstood by their friends, who either foster the condition by misguided solicitude or give it scant sympathy. A careful examination proves that the nerve force is actually diminished and strength exhausted with undue ease. This is demonstrated by the contraction of the visual fields under appropriate tests, the initial exaggeration and progressive reduction of the tendon reflexes, the inability to maintain dynamographic records, the tendency to rapid heart, the digestive inadequacy, etc. Any one or even very many of the enumerated symptoms may be found in other ailments, but it is their systematic grouping and the exclusion of other competent morbid states that enables a diagnosis of neurasthenia to be made.

When the brain functions are principally disordered the term cerebral neurasthenia is sometimes employed. In the same way spinal and sexual neurasthenia are mentioned, but in neurasthenia no function escapes, though there may be a varying preponderance of certain classes of symptoms. All functions are marked by an irritable weakness. Often this nervous disorder is associated with hysteria, particularly in the traumatic cases. Not seldom it is secondary to an initial bodily disease, which may or may not be present at the same time.

Neurasthenia is essentially chronic. Its causation is commonly of long standing, its onset insidious, its course protracted, its recession halting and marked by relapses, its tendency to recurrence pronounced. It is often associated with organic and inorganic diseases, and is encountered as an initial stage in the development of hypochondriasis, melancholia, mania, and general paresis. When uncomplicated by organic diseases its prognosis is usually fairly good, provided the causal conditions can be removed and sufficient adequate rest and upbuilding secured. As it often arises out of the necessities of human existence and social conditions, its proper treatment is frequently impossible. The keynote is rest, and in proportion as this can be made complete both mentally and physically success results. The full rest cure plan of Mitchell, especially with women, often secures brilliant results. In a modified form in mild cases it is also efficient. It implies the expenditure of much time and money. When this is not possible, change of scene, of occupation, of preëxisting influences must otherwise be obtained. The burden of work, the fretting, and carking cares must be minimized, and the physical health and stamina raised to the highest possible level. If such patients can be fattened success is almost assured. Drugs play an entirely secondary part in the treatment of neurasthenia, merely meeting incidental physical requirements. Any underlying physical disease of which neurasthenia may be the superficial manifestation must of course receive major care. To the mental perturbation, however, constant attention must be directed. The patient's fears must be allayed, his hopefulness encouraged, his introspection diverted, and refreshing sleep secured. In proportion as the physician grasps the mental side of the disease, secures the patient's confidence, and meets the requirements of his biased views, in that ratio is he successful and helpful in managing the neurosis.

A number of more or less speculative theories regarding the essence of neurasthenia are current. Hodge and others have proven by interesting laboratory experiments that under conditions of ordinary use the protoplasm of the motor cells is morphologically modified and probably more or less exhausted functionally; that during rest and repose it regains its former appearance and potential force. Some conceive that in neurasthenia the rest periods have been so inadequate that the recuperative powers are belittled, and there is reason to suppose that in some instances this may reach an irreparable degenerative degree. Certain alleged peculiarities of the blood and the general disturbance of assimilation are looked upon by others as arguing a general toxic state which gives rise to the neurasthenic manifestations. These findings are as likely to be effect as cause, but doubtless might operate in a vicious circle to protract the nervous disorder.

NEUREUTHER, noi′roi-tẽr, EUGEN NAPOLEON (1806-82). A German painter, etcher, and illustrator, born in Munich, son of the painter Ludwig Neureuther (1775-1830), by whom he was first instructed at Bamberg, before studying at the Munich Academy under Wilhelm von Kobell. His talent developed, however, chiefly under the influence of Cornelius, who employed him on the frescoes in the Glyptothek and in the Arcades of the Royal Garden. His success in this work of ornamental character suggested to him the idea of illustrating Goethe's romances and ballads with marginal drawings. Published in 1829-39, the drawings were universally admired and made the artist's reputation. In 1830 Neureuther visited Paris, where his illustrations of the scenes of the July Revolution appeared under the title "Souvenir du 27, 28, 29, Juillet" (1831). After his return, he published "Marginal Drawings to German Poets" (1832-35), and in 1838 completed his illustrations to Herder's *Cid.* From a visit to Rome in the same year he returned with a rich collection of studies, utilized subsequently in various works. In 1835 he had first tried his hand at etching, in which line he produced his most pleasing and valuable compositions, notably the large plate of "Dornröschen" (1839), his best effort with the needle. As a painter he may be judged by the fine specimens in the Schack Gallery at Munich, which contains "Cornelius Among His Pupils and Fellow Artists," "The Dying Nun," and others.

NEUREUTHER, GOTTFRIED VON (1811-87). A German architect, born at Mannheim, brother of Eugen Neureuther. First instructed by his father, he studied afterwards in Munich at the university and academy, and extended his knowledge by traveling through Germany, France, Italy (which he visited four times), Greece, and Turkey. He became most widely known through the Polytechnicum (1866-70) and the new Academy of Arts (1873-85) in Munich, handsome edifices in the Italian Renaissance style, of which he was a prominent exponent.

NEURI′TIS (Neo-Lat., from Gk. νεῦρον, *neuron*, nerve). A disease of a nerve or of nerves, accompanied by inflammation. Neuritis is either single or multiple; interstitial or diffuse; toxic or infective. It is caused by injury to the nerve involved, or infection such as from typhoid fever, or tuberculosis or leprosy; or by toxic action of alcohol, arsenic, lead, etc.

The symptoms of localized neuritis are severe pain, somewhat relieved when the part is at rest and kept warm, some numbness, reduction of the sense of touch, loss of power in the muscles, and eventual atrophy. There may be some contracting of the muscles, with rosy color of the skin, and a peculiar glossiness.

Multiple neuritis is very frequent. It is caused by the toxins of several infectious diseases, as diphtheria, typhoid fever, smallpox, and scarlet fever, as well as those of alcohol, mercury, lead, gout, diabetes, cancer, and tuberculosis. In this form of neuritis the invasion is usually acute, with fever, pain in head, back, and legs, loss of power in arms and legs so that the patient can scarcely climb the stairs, drop-wrist and drop-foot, muscular wasting, tenderness in the muscles, tremor, and sensory disturbances. Fever is rare, and the invasion of the disease is slow. When alcohol is the cause, delirium and convulsions may occur, with hallucinations, somewhat resembling *delirium tremens.* Multiple neuritis is very frequent in other countries, under various names. It is called *beri-beri* or *kakké* in Japan, China, New Zealand, India, Brazil, and the West Indies, in which countries it is endemic. Its course is similar to that of alcoholic multiple neuritis. Its mortality varies from 3 to 50 per cent. The mortality of alcoholic neuritis is not much smaller. Of those who continue the use of alcohol, 50 per cent. die of alcoholism, pneumonia, or tuberculosis. The treatment of multiple neuritis consists of elimination of the cause, rest in bed, phenacetin, sodium salicylate, strychnia, nitrate of silver, and chloride of ammonium under a physician's directions.

NEUROL′OGY (from Gk. νεῦρον, *neuron*, nerve + -λογία, *-logia*, account, from λέγειν, *legein*, to say). The branch of science concerned with the anatomy, physiology, disorders, and diseases of the nervous system. Brain functions associated with mentality are somewhat arbitrarily placed in the field of psychology, and their disorders furnish the topics grouped under the head of psychiatry. Neurological conditions are also studied in the lower animals, giving a subdivision of the subject, comparative neurology, which with embryology furnishes important facts which aid in understanding the human nervous apparatus. In the more limited medical sense, neurology embraces a study of the human nervous system, its diseases (except insanities) and their treatment.

Nervous diseases are: first, morbid manifestations of demonstrably disturbed nerve elements, and, second, so-called functional disorders in which actual changes in the physical properties of the nervous system have not yet been discovered. The latter are commonly called neuroses and are steadily tending to enter the former category under improved methods of research. In many nervous diseases heredity is a marked feature and in the acquired diseases of the nervous system heredity may play a predisposing part.

There is a general and probably well-founded belief that nervous diseases are increasing in frequency. Absolute statements, however, are impossible, as many causative conditions are changing and other newly recognized nervous diseases are being added to the known list. For instance, the infectious diseases, such as smallpox, typhoid, diphtheria, and malaria, are all capable of producing organic and functional nervous diseases. Their control by preventive medicine and hygiene correspondingly reduces that liability. Civilization, on the other hand, by conserving the unfit and prolonging the life of the feeble and neurotic, entails additional nervous disturbances and susceptibilities. There can be no doubt that modern urban conditions favor the development of nervous instability and at the same time bring to bear the additional highly competent noxious influences of vice, particularly through alcoholic and drug habits and venereal diseases. The monotony and hardships of farm life, however, are also a factor of morbidity and are particularly active among the women so situated. Some occupations bear either a direct or predisposing relation to nervous ailments. Writer's cramp and the entire group of occupation neuroses of which it is a type show this feature. Workers in metal, especially lead, phosphorus, mercury, arsenic, those subjected to inhalation of various gases, and those whose occupation tempts them to indulge in liquors, are liable to nervous disorders. Work entailing exposure to cold or wet or increased atmospheric pressure, and that attended by great mental strain or monotony, furnishes predisposing factors.

The question of heredity in relation to nervous diseases is one of decided importance. The neurologist is not content to trace the identical nervous disorder in successive generations, or to note its appearance in blood relations. He properly concerns himself with all the facts which tend to furnish a neuropathic liability. This is indicated with more or less force by the occurrence of any sort of nervous and mental disease in the antecedents of a given individual. An hysterical mother may have an epileptic child and an idiotic grandchild. Even a very highly wrought nervous organization in mother and father may eventuate in unstable children. The transmission of nervous disease may be direct, the identical malady reappearing, or, what is more common, the defect may show itself by transformation into some allied malady. Atavistic tendencies, through which an intermediate generation escapes, are also frequently noted. Tuberculosis, rheumatism, gout, diabetes, and Bright's disease are so commonly found in neurotic families that the association is morbidly significant. All debilitating diseases and exhausting conditions in parents may be reflected in nervously unstable offspring. Consanguinity in the parents does not operate detrimentally as far as nervous diseases are concerned, unless, as is often the case, it brings together individuals of neurotic tendencies, which are naturally intensified in the children.

NEUROP'TERA (Neo-Lat. nom. pl., from Gk. νεῦρον, *neuron*, nerve + πτερόν, *pteron*, wing). A Linnæan order of insects which has recently been restricted by separating out the orders Mecoptera, Corrodentia, Isoptera, Odonata, Ephemerida, Plecoptera, and Trichoptera, which together for a time were known as the Pseudoneuroptera. At present the Neuroptera includes those forms belonging to the old group of net-winged insects which possess a complete metamorphosis. The mouth-parts are formed for biting; the wings are four in number, membranous, and furnished with numerous veins, usually with many cross veins. Practically all forms are carnivorous, and feed upon other insects. Some of them are aquatic, but the majority live on land and wherever their prey abounds. The order is divided into seven large families:

(1) The Sialidæ, including the dobson or hellgrammite fly (see CORYDALIS), the alder-flies (Sialis), and the fish-flies (Chauliodes).

(2) The Raphidiidæ, or snake-flies (q.v.).

(3) The Mantispidæ, including the false rearhorses, or mantis-like Neuroptera. These insects, rare in the United States, have a long neck and grasping front legs, and are predatory in habits; their transformations are especially interesting.

(4) The Conropterygidæ, including the dustywings, which are the smallest of the Neuroptera and have wings covered with whitish powder. They are very few in number, and prey, in the larval stage, upon scale insects, plant-lice, and red spiders.

(5) The Myrmeleonidæ, or ant-lions (q.v.).

(6) The Hemerobiidæ, or aphis-lions (q.v.).

(7) The Chrysopidæ, or golden-eyed lace-winged flies. See LACE-WINGED FLY.

Nearly all the families of Neuropteran insects are represented by fossil remains in the Tertiary rocks; and some, such as the dragon-flies, caddice-flies, May-flies, and white ants, appear in the still earlier Mesozoic formations.

Consult: Comstock, *Manual for the Study of Insects* (Ithaca, 1895); Sharp, *Cambridge Natural History*, vol. v. (London, 1895); Howard, *The Insect Book* (New York, 1902).

NEUROP'TERIS (Neo-Lat., from Gk. νεῦρον, *neuron*, nerve + πτερίς, *pteris*, fern). An important genus of fossil ferns common in the coal measure shales and sandstones of Carboniferous age in North America and Europe. See FERN; and CARBONIFEROUS SYSTEM.

NEURO'SIS (Neo-Lat., from Gk. νεῦρον, *neuron*, nerve). A morbid nervous state, either functional (due to reflex disturbance from a lesion or a condition in another part of the body) or organic (due to local conditions). Neuroses are classed as *kinesio-neuroses*, or disorders of motion; *æsthesio-neuroses*, or sensory disorders; *tropho-neuroses*, or disorders of nutrition; *thermo-neuroses*, or disorders of heat perception; *vasomotor neuroses* or *angio-neuroses*, or disorders of circulation; *secretory neuroses;* and *mixed neuroses*. Among the latter are the *aero-neuroses*, certain disorders affecting the extremities, such as acro-paræsthesia and erythromelalgia; *sexual neuroses*, affecting the functions of the sexual organs; and *psycho-neuroses*, in which there is a combination of mental and physical symptoms due to a complex condition. Dana classifies conveniently the functional nervous diseases that are termed neuroses as follows: (1) Degenerative neuroses, including epilepsy, hysteria, the spasmodic tics, paramyoclonus, Thomsen's disease, paramyotonia, and akinesia algera. (2) Acquired neuroses, including chorea, tetanus, tetany, neurasthenia, sexual neuroses, traumatic neuroses, exophthalmic goitre, and the occupation neuroses. (3) Late degenerative neuroses, including paralysis agitans. (4) Trophic and vasomotor neuroses, including facial hemiatrophy, acromegaly, and angioneurotic œdema. Many of these functional neuroses are considered under their proper titles.

The occupation neuroses are functional disorders consisting of numbness, tingling, partial loss of muscular power, involuntary contractions or spasms, tremor and disability, which combine to prevent the use of certain groups of muscles which have been used habitually by the patient in his occupation or professional labors. An occupation neurosis is really a condition of muscle-fatigue occurring in a neurasthenic, with subsequent neuritis in a few cases. The most common neurosis of this class is *writers' cramp*, or scriveners' palsy. This disease has been known since about 1820, when the steel pen superseded the quill. Men, aged about twenty-five to forty years, are the most numerous victims. Worry, intemperance, and other undermining influences are predisposing causes, as well as preëxisting neurasthenia, as already noted. Excessive writing, under mental pressure, is the exciting cause, especially if the writing is done with the hand in a cramped position. It is a chronic disease. Many sufferers learn to write with the left hand, but this also soon becomes affected. The use of gold pens has brought some relief, and has controlled the increase of the affection among writers. But the great refuge and preventive is the typewriter. All who use the pen to a great extent should use large cork penholders and gold pens. Writing under cerebral strain should be avoided.

Telegraphers' cramp is frequent among the manipulators of the Morse instrument. About one in 200 operators suffer from 'loss of the grip.' The symptoms are much the same as in writers' cramp. Among the other occupation neuroses are *musicians' cramp*, among pianists, violinists, flutists, and others; *sewing spasm*, among tailors, seamstresses, and shoemakers; *milkers' spasm*, which is very rare; *ballet-dancers' cramp*, and many others.

In the treatment of occupation neuroses, rest or change of occupation, massage of nerve and muscle, electricity, douches, and the cautery have proved useful. Drugs are generally useless, except such as relieve the neurasthenia of the patient. Consult Dana, *Text-Book of Nervous Diseases* (New York, 1892).

NEUROT'IC (Neo-Lat. nom. pl., from *neurosis*). A word formerly used in medicine to specify such a drug as tends to affect principally and specifically the brain centres that govern intellect, sensibility, and motor activity. Alcohol, ether, chloral, opium, potassium bromide, amyl-nitrite, strychnine, quinine, aconite, and digitalis are examples of drugs to which this name may be applied.

The term neurotics is more often used to denote individuals who suffer from nervous disease, such as neurasthenia or hysteria, or who are of pronounced nervous temperament.

NEURUPPIN, noi'ru̇p-pēn'. A town of the Province of Brandenburg, Prussia, on the small lake of Ruppin, connected with the Elbe, 38 miles northwest of Berlin (Map: Prussia, E 2). It has a gymnasium and a seminary for teachers. Its industries are brewing, spinning, and the manufacture of linen and woolen cloths, starch, brushes, machinery, and trimmed lumber. There is also considerable trade in cattle and cereals. Neuruppin became a town in 1256. Population, in 1890, 14,584; in 1900, 17,100.

NEUSALZ, noi'zälts. A town in the Province of Silesia, Prussia, on the Oder, 75 miles northwest of Breslau (Map: Prussia, F 3). The principal industries are flax-spinning, ironworking, shipbuilding, and the manufacture of linen thread, cartridges, and enamel. Population, in 1900, 12,586.

NEU-SANDEC, noi-zän'děts. A town of the Crownland of Galicia, Austria, situated on the Dunajec, about 45 miles southeast of Cracow (Map: Austria, G 2). It has a Roman Catholic church of the fifteenth century, an Evangelical church of the seventeenth century, an old castle, a gymnasium, a Jesuit college, and a hospital. The chief industrial establishments are the extensive railway shops, and in the vicinity of the town are petroleum wells. Population, in 1890, 12,722; in 1900, 15,724, mostly Poles and Jews.

NEUSATZ, noi'zäts (Hung. *Újvidék*). A royal free town of Hungary, situated on the left bank of the Danube opposite the town of Peterwardein and at the mouth of the Franz-Josefs Canal (Map: Hungary, F 4). It is a town of recent origin, having been practically rebuilt since its destruction in 1849. It is the seat of the Greek Oriental Bishop of Bács, and has a higher gymnasium and a commercial school. Its products are chiefly agricultural, and the river trade is important. Neusatz is the seat of the *Matica Srpska*, the chief literary and scientific organization of the Serbs in Southern Hungary. Population, in 1900, 29,296, mostly Serbs and Magyars.

NEUSE, nūs. A river of North Carolina, rising in Person County in the northern part of the State, and flowing southeast into Pamlico Sound (Map: North Carolina, F 3). It is about 300 miles long, and navigable by steamers for over 100 miles. At New Berne, 30 miles from its mouth, it widens into a broad estuary.

NEUSIEDLER SEE, noi'zēd-lẽr zā (Hung. *Fertö-Tava*). A lake in Northwestern Hungary, 30 miles southeast of Vienna (Map: Hungary, E 3). It is about 23 miles long, from 4 to 9 miles wide, and covers an area of 126 square miles. On the eastern shore is the large swamp of Hanság, but the land on the west shore consists of vine-clad hills, with several thriving towns. The water is salty, and unfit to drink. The lake has dried up on several occasions, notably in 1865, when farms were laid out in its bed; but in 1870 it filled up again, destroying all improvements. It is now connected with the Rabnitz River by a canal which, in case of a flood, drains off the surplus water.

NEUSOHL, noi'zōl (Hung. *Beszterczebanya*). The capital of the Province of Sohl, Hungary, at the confluence of the Gran and Bistritz, 13½ miles by rail north of Altsohl (Map: Austria-Hungary, F 2). It has a cathedral noted for its fine fourteenth-century altar, besides other interesting ecclesiastical structures. The old castle is used as a garrison station. There are manufactures of hardware, firearms, and a silver foundry. Four and a half miles to the north are the Herrengrund silver and copper mines. Population, in 1900, 9264.

NEUSS, nois. A town in the Rhine Province, Prussia, near the Rhine, with which it is connected by a canal, 4 miles west of Düsseldorf (Map: Prussia, B 3). The Catholic Church of Saint Quirinus, a beautiful edifice, and a noble specimen of the transition from the round to the pointed style, was begun in 1209. The late Gothic Rathaus is interesting for its collection of paintings by Janssen. Neuss produces a large amount of rape oil. There are manufactures of paper, machinery, ironware, leather, and woolens; there is a trade in grain, cattle, and coal. Population, in 1890, 22,635; in 1900, 28,484. The town is supposed to be the *Novesium* of the Romans. It came under the Archbishop of Cologne in 1074. In 1474 it suffered a long siege by Charles the Bold, and a century later was almost totally destroyed by Alexander of Parma.

NEUSTADT, noi'stät. A city in Upper Silesia, Prussia, 29 miles southwest of Oppeln (Map: Prussia, C 3). It has two monasteries, a gymnasium, and several trade schools. There are manufactures of woolen and linen fabrics, carpets, shoes, dyes, and yeast. Population, in 1890, 17,577; in 1900, 20,139.

NEUSTADT, WIENER. A town of Austria. See WIENER-NEUSTADT.

NEUSTADT-ON-THE-HARDT, härt. A town in the Rhine-Palatinate, Bavaria, situated in the Hardt Mountains, about 15 miles west-northwest of Speyer (Map: Bavaria, C 4). The abbey church (1356) contains a number of tombs of the Counts Palatine. The educational institutions include a gymnasium, a *Realschule,* and a Latin school founded in 1579. Neustadt manufactures cloth, paper, tobacco, etc. In the vicinity are extensive vineyards. Population, in 1890, 15,016; in 1900, 17,800, chiefly Protestants.

NEUSTETTIN, noi′stĕt-tēn′. The capital of a circle in the Province of Pomerania, Prussia, 92 miles southwest of Danzig (Map: Prussia, G 2). There are manufactures of machinery, ironware, and dyes. Population, in 1900, 10,026.

NEUSTRELITZ, noi-strā′lĭts. The capital of the Grand Duchy of Mecklenburg-Strelitz, Germany, situated 62 miles by rail north by west of Berlin (Map: Germany, E 2). It is laid out with remarkable regularity, its wide, straight streets radiating in eight directions from the market-place, which is adorned with a statue of the Grand Duke George. The principal buildings are the grand ducal palace, situated in a beautiful park and containing a fine library of 80,000 volumes and collections, the theatre, and the Rathaus. There are also a gymnasium, a *Realschule,* and a fine hospital. The principal manufactures are machinery, woolens, trimmed lumber, cloth, vinegar, flour, etc. The trade is mostly in agricultural products and flour. Neustrelitz was built in 1726 on the site of an old fortress. Population, in 1900, 11,344.

NEUSTRIA, nūs′trĭ-ȧ (Lat. *Francia occidentalis,* West France). The name given in the times of the Merovingians to the western portion of the Frankish Empire, in contrast to Austrasia (q.v.). Later it was used for various territorial divisions; in the eleventh century, and later, it was often used as synonymous with Normandy. Consult Longnon, *Atlas historique de la France* (Paris, 1889). See FRANKS.

NEUTITSCHEIN, noi′tĭt-shīn′. A town in the Crownland of Moravia, Austria, on the Titsch, 70 miles northeast of Brünn (Map: Austria, F 2). It has a Byzantine church and an old castle, a higher *Realschule,* and schools of agriculture and forestry. There are manufactures of tobacco, carriages, hats, and cloth. Population, in 1900, 11,891, chiefly of German descent.

NEUTRAL AXIS (Lat *neutralis,* from *neuter,* neuter, from *ne-,* not + *uter,* either). An imaginary line of a body which is subjected to a transverse strain, and is so situated as to separate the forces of extension from those of compression. If the ratio of the resistance to extension and compression were the same for all substances, and depended merely upon the form of the body, then in all bodies of the same shape the neutral axis would have a definite geometric position. But this ratio has a separate value for every substance. In a rectangular wooden beam supported at both ends, the neutral axis passes longitudinally through the centre of the beam, while in cast iron, in which the resistance to compression is greater than that to extension, it is a little above the centre, and in wrought iron, in which the contrary is the case, it is a little below the centre.

NEUTRALITY (in International Law). The complete abstention of a State from giving material aid or encouragement to either belligerent in an existing war. Legally a neutral State is a friend to both belligerents and endeavors to maintain peaceful relations with each. The doctrine of neutrality as now understood is of comparatively recent growth, it having had almost no place in the rules of ancient warfare. As a result of the imperfect notions of neutral duty, several grades of neutrality were formerly recognized. Thus, the obligation of neutrality might be *qualified* by a previous agreement with one of the belligerents by which the neutral stipulated to furnish troops or ships of war or other material upon the outbreak of hostilities. Such a position would be regarded as an act of war according to modern international law, which recognizes only *strict* neutrality—that is, total abstinence from participation in the war either by assistance or countenance. The status of *permanent neutrality* may be created by the agreement of a State to observe perpetual neutrality toward certain other States in consideration of having its own neutrality respected, or the neutrality of a State may be guaranteed by the collective action of other nations. Such is the position of Switzerland and Belgium. The status of *armed neutrality* arises from the alliance of several neutral powers for the purpose of maintaining certain views of neutral duty or for preventing the armed aggression of a belligerent upon neutral commerce. Such were the armed neutralities of the Baltic Powers formed in 1780 (see ARMED NEUTRALITY, THE) and 1800 for enforcing the doctrine that "free ships make free goods" which the Powers concerned had adopted by treaties among themselves. It is the usual custom upon the outbreak of war for neutral governments to issue proclamations of neutrality, announcing the course which they purpose to follow in their intercourse with belligerents during the continuance of hostilities, sometimes giving notice to belligerents of what will be permitted and what forbidden in neutral waters, and formally notifying their own subjects or citizens of the existence of war and warning them of the penalties imposed for the violation of its neutrality laws. As the doctrine of neutrality is now understood it is the duty of neutrals to treat both belligerents as friends, neither granting nor withholding any privilege from one which is not granted or withheld equally from the other. Any deviation from this rule which results in an injury to one of the belligerents is a clear violation of neutral obligations and may be a justification for reprisal on the part of the injured belligerent. Among the positive obligations of a neutral may be mentioned the duty of treating the soldiers of each belligerent humanely, as where a ship of war in distress seeks to enter a neutral port or fugitive troops ask for asylum from the pursuit of a victorious army. Among the obligations of a negative character resting upon neutrals may be mentioned the duty of abstaining from furnishing money, ships, troops, or munitions to either belligerent. However, it is legitimate for neutrals in their own country to sell to belligerents whatever they may wish to buy so long as both are treated equally. So, too, they may transport any article of commerce, except contraband of war, to belligerent ports for the purpose of sale unless with the intention of violating a blockade. But it is forbidden to neutrals to allow their ports or territorial waters to be used by either belligerent as a base of hostile operations against the other.

Not only are neutrals subject to certain duties, but international law clothes them with certain rights and immunities which belligerents are bound to respect. Thus a neutral State has a right to insist that its territory shall be inviolable from acts of war committed by either belligerent. An armed vessel, therefore, has no right to pursue an enemy into neutral waters or to effect a capture there. Nor has a belligerent any right to move troops through the territory of a neutral State or commit acts of belligerency therein. These are violations of the sovereignty of the neutral and may be resisted by force. The act of a public vessel, however, in passing through the territorial waters of a neutral State is not a violation of its neutrality.

As a means of enforcing the obligations of neutrality it is customary for States to pass statutes defining the duty of their subjects in relation to other nations at war and imposing penalties for their violation. These statutes are popularly known as *neutrality laws*. They do not affect the international responsibility of the State, however, and their inefficiency cannot be pleaded in extenuation of a failure to fulfill neutral obligations.

The neutrality laws of the United States are contained chiefly in the acts of 1794, 1818, and 1838. They declare it to be a misdemeanor for any citizen to accept or exercise a commission for the purpose of serving a foreign Power in war with a State at peace with the United States, or to enlist or induce another person to enlist or engage him to go abroad to enlist in the foreign service of such a State; or to fix out, arm, equip, or augment the force of any armed vessel with the intent that it shall be employed in the service of a Power at war with a friendly State; or to institute within the territory of the United States any military expedition against any such Power. The President of the United States is empowered to compel any foreign vessel which ought not to remain in the territorial waters of the United States to depart therefrom and to enforce the observance of the neutrality laws in general. One of the chief purposes of this legislation is to prevent organized efforts to secure the enlistment of troops by belligerents in neutral territory. Neutral governments, however, cannot be held responsible for the unorganized and unauthorized departure of individual citizens for the purpose of enlisting in a foreign army. The manufacture and sale of contraband of war except in the case of ships fitted for warfare is not expressly prohibited by the neutrality laws of either Great Britain or the United States. See International Law, and the authorities there cited; also Alabama Claims; Contraband of War; Declaration of Paris; War, Laws of.

NEUTRAL NATION. An Iroquoian tribe formerly holding the territory along the north shore of Lake Erie in the Province of Ontario, and extending eastward as far as the Genesee River in New York. Their proper name is unknown. They were known to the Huron (see Wyandot) as *Atiwendaron*, implying a people speaking a language slightly different (from Huron), and to the Seneca as *Gagwage-ono*. The French called them the 'Neutral Nation,' on account of their taking a neutral stand during the long wars between the Iroquois and the Huron. This did not save them, however, for on the final conquest and dispersion of the Huron people the Iroquois invaded the Neutral country with the result that in 1651 the tribe was utterly destroyed, the remnant being incorporated with the conquerors or dispersed in small parties among the Western or Southern tribes. The war was carried on chiefly by the Seneca, according to whose tradition the immediate cause of dispute was a ball-play contest in which the Seneca were the victors. The final battle occurred at a fortified Neutral town about six miles south of the present Buffalo. The majority of the captives were incorporated by the Seneca, who also took possession of the conquered territory as far west as Lake Erie.

NEUVILLE, nē′vēl′, Alphonse de (1836-85). A French military painter and illustrator. He was born at Saint-Omer (Pas-de-Calais), May 31, 1836. His father, who was wealthy, wished his son to prepare for an official position, but the boy preferred a military life and attended the naval school at Lorient, where he spent much time sketching. To please his family, he studied law for three years, but then determined to become a painter. He took a studio of his own, studying a short time with Picot, but was more influenced by the art and advice of Delacroix. His first exhibited picture, "Batterie Gervais, Malakoff," an episode from the Crimean War, achieved some success. Not being equally successful with later works, as a means of livelihood, De Neuville designed a large number of illustrations for periodicals and books. His great success came after the Franco-Prussian war of 1870-71, in which he served as an officer of engineers. He became the most popular painter of that war, his pictures being greeted with great applause. From a purely artistic point of view they are open to criticism. His colors are often dull, and sometimes ill-chosen, wherefore his drawings in black and white are considered better than his paintings. He excels in portraying vividly and vigorously an intensely dramatic incident, and depicts soldiers in the thick of the fight with accuracy and sentiment that make the pictures national in spirit.

His early paintings include: "Capture of Naples by Garibaldi" (1860); "Chasseurs of the Guard" (1861); and "Attack in the Streets at Magenta" (1864)—all in the Saint-Omer Museum; "Chasseurs Crossing the Tchernaia" (1868), Lille Museum. Among his later and more famous pictures, many of which are in the United States, are: "Bivouac Before Bourget" (1872), Dijon Museum; "The Last Cartridge" (1873); "Defense of Le Bourget" (1879), and "Surprise in Environs of Metz in 1870" (1877), in the W. H. Vanderbilt collection, New York; "The Adieu," John Jacob Astor, New York; "Attack at Dawn," John G. Johnson, Philadelphia, Pa.; "The Destruction of the Telegraph Line" (1884), David C. Lyall, New York. In 1881 he, in company with Detaille, painted the celebrated circular panorama, "The Battle of Champigny." He died in Paris, May 20, 1885. Consult De Lostalot, in *Gazette de Beaux-Arts*, xxiv. (1885).

NEUVILLE, Jean Guillaume, Baron Hyde de (1776-1857). A French statesman, born at

La Charité-sur-Loire. He displayed great loyalty to Louis XVI. and Marie Antoinette, was one of the most active agents in the 'emigration' from France, took part in the Royalist uprising of 1796, and after the 18th Brumaire attempted to persuade Bonaparte to recall the Bourbons. Being accused of having taken a part in the plot of the 'infernal machine,' he fled to Switzerland, and later went to the United States. Upon the restoration of the Bourbons, he returned to France, was Minister to the United States from 1816 to 1821, and was then Minister to Portugal. He was a member of the Chamber of Deputies from 1822 to 1830, and held the portfolio of the Marine in the Ministry of Martignac. After the Revolution of July, 1830, he withdrew into private life. His *Mémoires* were published in 1888.

NEUWIED, noi′vēt. The capital of a circle in the Rhine Province, Prussia, on the Rhine, seven miles northwest of Coblenz (Map: Prussia, B 3). The castle, residence of the Prince of Wied, stands in a beautiful park, and has collections of Roman antiquities. The town has many educational institutions, including a gymnasium and two seminaries for teachers. Wool and cotton goods, soap, tobacco, starch, chicory, and ironware are manufactured. Population, in 1900, 11,003. Neuwied was founded in 1653 by the Prince of Wied, as a refuge for religious exiles, and many religious denominations are represented by its present inhabitants.

NEVA, nē′vȧ, *Russ. pron.* nyĕ-vä′. The outlet of Lake Ladoga (q.v.) in Northwestern Russia (Map: Russia, D 2). It leaves the lake at its southwestern end and flows westward for 45 miles, emptying through several mouths into the Gulf of Finland. The city of Saint Petersburg is built on the islands of its delta. It is the last link in the great waterway which through the Volga River and the Ladoga Canal system connects the Caspian Sea with the Baltic. Though the volume of water flowing through the Neva is very great, and the river is in places more than half a mile wide, its navigation has been made possible only by extensive engineering works, and an artificial channel, running through the shallow Bay of Neva, connects its mouth with the harbor of Kronstadt. During continued west winds the waters of the bay are piled up in the delta of the river, causing destructive inundations.

NEVADA, nē-vä′dȧ, popularly the 'Sagebrush State.' A Western State of the United States. The 42d parallel of north latitude separates it from Oregon and Idaho on the north, the 114th meridian west of Greenwich from Utah and Arizona on the east, the Arizona boundary being continued on the southeast by the Colorado River as far as the 35th parallel, while a straight line running from the latter point northwest to Lake Tahoe in latitude 39° N., and thence along the 120th meridian, separates Nevada from California on the southwest and west. Nevada ranks fourth in size among the States of the Union. It has an extreme length from north to south of 483 miles, and an extreme breadth of 320 miles. Its area is 110,700 square miles, of which 960 square miles consist of water.

Topography. The greater part of Nevada lies in the Great American Basin included between the Sierra Nevada on the west and the Wahsatch Mountains on the east, and bounded by cross ranges on the southwest and, less definitely, on the north. Neither of the main boundary ranges comes within this State, the crest of the Sierra lying wholly in California, and the Wahsatch running through the centre of Utah. This great basin forms a plateau whose floor lies 4000 to 6000 feet above the sea, though in the extreme southwest it is somewhat lower. From this floor rise a uniform series of parallel ranges from 10 to 25 miles apart, and running north and south through the length of the State, but broken here and there by passes and branch valleys. In the southwestern portion they are almost worn away, leaving isolated knobs scattered over the plain. Some of these ranges rise above 9000 feet, while most of them are over 7000 feet high. The highest point in the State is Wheeler Peak, near the centre of the eastern boundary, with an altitude of 13,058 feet.

Hydrography. Since the surface of Nevada is a basin surrounded by mountains, a very small part of it drains into the ocean. In the extreme north rises the Owyhee, a tributary of the Columbia River system, and the extreme southeastern portion drains into the Colorado, which flows on the southeastern boundary. A large part of the State, especially the south-central and southwestern portion, is without any rivers at all, the small streams running down the mountain slopes during the wet season being lost in the plains where the water evaporates. The principal river is the Humboldt, which rises in the northeastern corner and flows across the State to Humboldt Lake or Sink. Several rivers rise in the Sierra Nevada and flow into lakes and sinks in the west-central part of the State. Among these are Walker River, flowing into Walker Lake, Carson River, disappearing in Carson Sink, and the Truckee River, flowing from Lake Tahoe into Pyramid Lake. The last is the largest lake in the State and measures 35 miles in length by 10 miles in width. Lake Tahoe lies on the western boundary at an altitude of over 6000 feet. It is 21 miles long and 11 miles wide and of great depth. In the rainy season some of the level plains are covered for hundreds of square miles with water from a few inches to two feet deep, leaving in the dry season hardened mud flats sometimes covered with a coating of alkaline salts.

Climate. The climate is very dry and in general pleasant and healthful. The winters are not severe, and snow is confined chiefly to the mountains, where in some places it remains throughout the year. The mean temperature for January is 28°, and for July 71°. The maximum may rise above 110° and the minimum is about 30° below zero, though in the valleys it seldom falls more than 16° below. The winters are generally calm; violent winds are rare at any season. The average annual rainfall is about ten inches. This is very unevenly distributed both in regard to season and locality. Five-sixths of the total precipitation falls from December to May, and the greater part of it falls in high altitudes, the mountainous parts of Washoe County receiving 23 inches, while some valley districts are absolutely rainless.

For Flora and Fauna, see paragraphs on these topics under Rocky Mountains and United States.

Geology. The mountains of Nevada are originally due to extensive foldings and faultings of the strata during the Jurassic Age, which brought to the surface rocks ranging from the Jurassic down to the Archæan system. Some are composed of granite, syenite, porphyry, and slate, while in others limestone and calcareous spar predominate. Although some recent uplifts in the northwest are still almost unmodified, the topography of the majority of the ranges is probably due more to erosion than to the original fractures and folds. The valleys are filled with deep layers of Quaternary detritus. Volcanic rocks occur as intrusions in various places, and in the northwestern part of the State there are extensive lava fields, while other evidences of volcanic action, such as hot springs and sulphur deposits, also exist.

Besides silver and gold (see paragraph *Mining*) the minerals found within the State include antimony, lead, copper, mercury, and nickel, as well as sulphur, gypsum, and extensive deposits of salt and borax, the last found on the alkali flats and in beds of dry lakes.

Mining. Nevada owed her early development to mining. Immensely rich lodes of silver and gold were discovered, one of which—the Comstock lode (q.v.)—produced as high as $38,000,000 worth of bullion in one year. With the apparent exhaustion of the Comstock lode, the industry decreased considerably. The output of silver continued to decrease until 1899, when the product was valued at $1,090,457. Gold, however, revived during the last decade, the output for 1899 being valued at $2,219,000—more than double that of 1893. Copper, lead, and iron ore are also mined. No coal has been mined since 1894. The rich mineral resources of the State afford a valuable field for future development.

Agriculture. Agriculture is less developed in Nevada than in any other State. It is the most arid of the States and at the same time contains the most meagre sources for an artificial water supply. The lack of transportation facilities and of local markets retards the development of such possibilities as exist. In 1899, 504,168 acres, or 88 per cent. of the total improved area, were irrigated. The most extensive irrigated areas are along the Humboldt River and in the west-central part of the State. There are altogether 2,565,647 acres, or 3.7 per cent. of the State's area, included in farms. The industry centres about stock-grazing, the tilling of the soil being a mere adjunct to it. The animal products, together with the hay and forage and other products fed to live stock, comprise 80.6 per cent. of the total value of farm products. During the last decade of the century there was a large increase in all varieties of domestic animals. Cattle and sheep are of the greatest importance. Stock-raising being so prominent, hay and forage are naturally the most important of the crops grown. In 1899 there were 292,134 acres devoted to them, or 71.6 per cent. of the total crop area. Alfalfa constituted about one-third of this acreage. In the same year there were 18,537 acres devoted to wheat, 7043 to barley, 4786 to oats, and 2235 to potatoes. The wheat area increased five fold during the decade.

The soil is of great fertility and produces abundantly when sufficiently watered. The following table shows the relative importance and increase of the different varieties of domestic animals for the decade 1890-1900:

	1900	1890
Dairy cows	13,606	9,273
Neat cattle	371,586	201,627
Horses	80,295	56,788
Mules and asses	3,048	1,723
Sheep	568,251	273,469
Swine	15,174	7,373

Manufacturing. The manufacturing establishments are chiefly of a domestic nature, producing and repairing articles for local consumption. Car repair shops and flour and grist milling employ the greatest capital. The total capital of all manufacturing industries is less than $1,500,000.

Transportation. There has been little inducement to railroad construction in Nevada. For several years the mileage has been about 920 miles. In proportion to the area of the State the mileage is less than that of any other State. The principal line is the Southern Pacific, running from east to west through the State. There are no navigable streams.

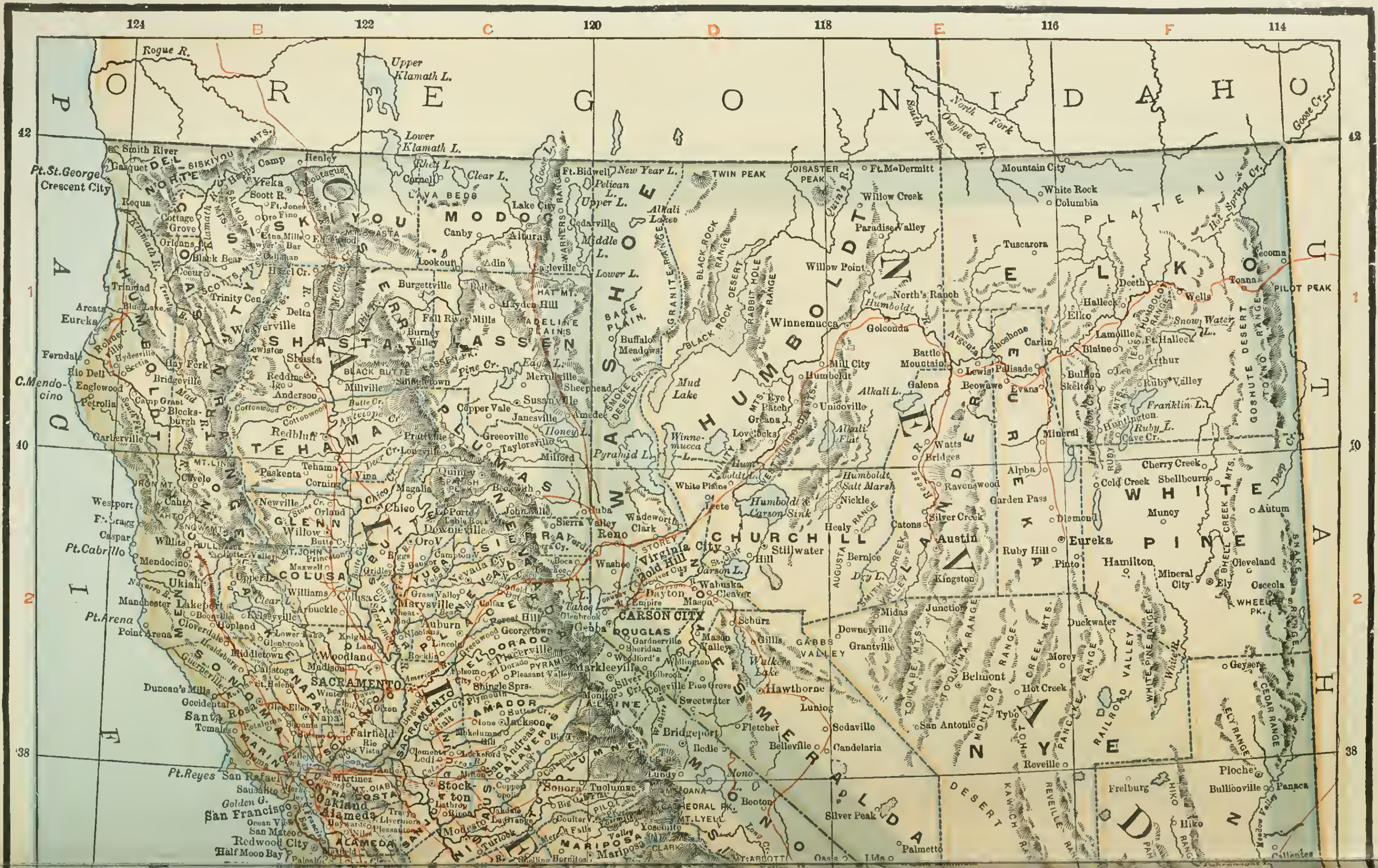
Banks. A national bank was organized in 1866, but soon closed. The First National Bank of Winnemuca, organized in 1886, is the only national bank in the State at present. In 1902 its capital was $82,000; surplus, $10,000; deposits aggregated $511,000 and loans $378,000. In 1902 there were two State banks. The State banking law of 1891 is very lax. The two State banks had a capital of $300,000; surplus, $100,000; cash, $127,000; deposits, $1,579,000; and loans, $1,007,000. Most of the banking is done by agencies of California banks.

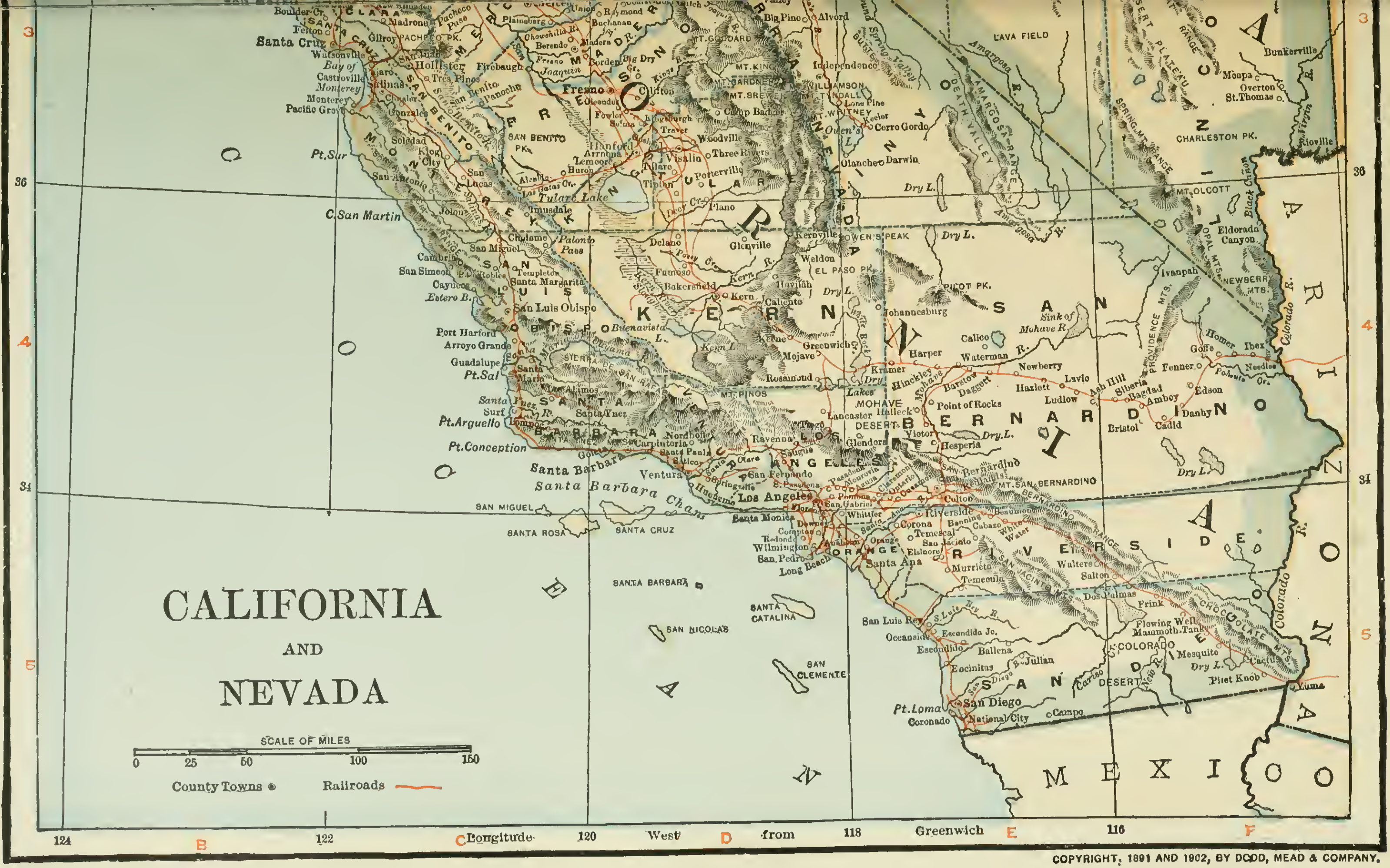
Finances. On admission to Statehood, in 1864, Nevada had a public debt of $400,000, which in the following decade grew to $738,528. This debt was in 9 and even 10 per cent. bonds, and was caused by the extravagant salaries paid to officials. The income of the State was derived partly from a tax on property, partly from a special tax on the proceeds of the silver mines. The income from this special tax grew rapidly with the output of the mines; in 1874 it amounted to 28 per cent. of the total receipts of the State treasury, and in 1878 to 50 per cent., or about $250,000. The output of the mines rapidly declined in the eighties, and with it the income of the treasury. The total debt in 1900 was $676,709, out of which $380,000 are irredeemable, and only the payment of interest obligatory. The State held in trust for the educational funds $1,529,652, which cannot be applied to payment of debts. The receipts in 1900 were $510,608, half of which came from a general property tax, and 30 per cent. from payments on land and interest on land payment. The expenditures were $533,402, 25 per cent. of which was for school purposes, and 25 per cent. for purchase of bonds for the school fund.

Population. The falling off in the mining industry of the State, and failure to develop in other directions, have resulted in a diminution of the population. It now has the fewest inhabitants of any State, and is the only one in which a decrease is taking place. The following are the figures by decades: 1860, 6857; 1870, 42,491; 1880, 62,266; 1890, 45,761; 1900, 42,335. The largest towns are: Reno, population, in 1891, 3563; in 1901, 4500; Virginia City, population, in 1891, 8571; in 1901, 2695; Carson City, the capital, population, in 1891, 3950; in 1901, 2100.

AREA AND POPULATION OF CALIFORNIA BY COUNTIES.

County.	Map Index.	County Seat.	Area in square miles.	Population.	
				1890.	1900.
Alameda	C 3	Oakland	764	93,861	130,197
Alpine	D 2	Markleeville	710	667	509
Amador	C 2	Jackson	632	10.320	11,116
Butte	C 2	Oroville	1.660	17.939	17.117
Calaveras	C 2	San Andreas	1,080	8.882	11,200
Colusa	B 2	Colusa	1,088	14.640	7.364
Contra Costa	B 3	Martinez	728	13.515	18,046
Del Norte	B 1	Crescent City	992	2,592	2,408
Eldorado	C 2	Placerville	1,796	9.232	8,986
Fresno	C 3	Fresno	6.152	32,026	37,862
Glenn	B 2	Willow	1,270	......	5.150
Humboldt	B 1	Eureka	3.496	23,469	27,104
Inyo	E 3	Independence	10.294	3,544	4,377
Kern	D 4	Bakersfield	8.050	9,808	16.480
Kings	D 3	Hanford	984	......	9,871
Lake	B 2	Lakeport	1.328	7,101	6,017
Lassen	C 1	Susanville	4,520	4,239	4.511
Dos Angeles	D 4	Los Angeles	4.202	101,454	170.298
Madera	D 3	Madera	2,062	......	6.364
Marin	B 2	San Rafael	549	13,072	15,702
Mariposa	C 3	Mariposa	1,510	3,787	4,720
Mendocino	B 2	Ukiah	3.626	17,612	20.465
Merced	C 3	Merced	1.932	8,085	9,215
Modoc	C 1	Alturas	3.741	4.986	5.076
Mono	D 3	Bridgeport	3.020	2.002	2,167
Monterey	C 3	Salinas	3.340	18,637	19,380
Napa	B 2	Napa	780	16,411	16.451
Nevada	C 2	Nevada City	972	17,369	17,789
Orange	D 5	Santo Ana	750	13.589	19.696
Placer	C 2	Auburn	1.365	15.101	15.786
Plamas	C 1	Quincy	2.694	4.933	4,657
Riverside	E 5	Riverside	7,323	......	17,897
Sacramento	B 2	Sacramento	1,000	40.339	45,915
San Benito	C 3	Hollister	1.388	6,412	6,633
San Bernadino	E 4	San Bernadino	19,947	25,497	27,929
San Diego	F 5	San Diego	8.478	34.987	35.090
San Francisco	B 3	San Francisco	47	298.997	342,782
San Joaquin	C 3	Stockton	1,396	28,629	35,452
San Luis Obispo	C 4	San Luis Obispo	3.310	16.072	16,637
San Mateo	B 3	Redwood City	434	10,087	12.094
Santa Barbara	C 4	Santa Barbara	2.632	15,754	18.934
Santa Clara	C 3	San Jose	1,286	48,005	60.216
Santa Cruz	B 3	Santa Cruz	424	19.270	21,512
Shasta	B 1	Redding	3.876	12.133	17,318
Sierra	C 1	Downieville	960	5.051	4,017
Siskiyou	B 1	Yreka	5,991	12.163	16,962
Solano	C 2	Fairfield	900	20,946	24.143
Sonoma	B 2	Santa Rosa	1,620	22.721	38.480
Stanislaus	C 3	Modesto	1,456	10,040	9.550
Sutter	C 2	Yuba City	622	5,469	5,886
Tehama	B 1	Redbluff	3.008	9.916	10.996
Trinity	B 1	Weaverville	3.282	3.719	4,383
Tulare	D 3	Visalia	4,952	24,574	18,375
Tuolumne	C 2	Sonora	2.208	6,082	11,166
Ventura	D 4	Ventura	1.721	10,071	14.367
Yolo	C 2	Woodland	996	12,684	13,618
Yuba	C 2	Marysville	636	9.636	8,620


124
B
122
C
120
D
118
E
116
F
114
42
40
38
1
2
OREGON
IDAHO
UTAH
NEVADA
PACIFIC
CALIFORNIA
Rogue R.
Upper Klamath L.
Lower Klamath L.
Goose L.
North Fork
Owyhee R.
South Fork
Goose Cr.
PLATEAU
Smith River
Pt.St.George
Crescent City
DEL NORTE
SISKIYOU MTS.
Yreka
MODOC
LAVA BEDS
Alturas
Ft.Bidwell
TWIN PEAK
DISASTER PEAK
Ft.McDermitt
Willow Creek
Mountain City
White Rock
Columbia
Tuscarora
PILOT PEAK
Toana
Wells
Deeth
Halleck
Elko
ELKO
GOSHUTE DESERT
HUMBOLDT
Winnemucca
Golconda
Battle Mountain
Paradise Valley
Willow Point
North's Ranch
Humboldt R.
Mill City
Unionville
Lovelocks
WASHOE
Mud Lake
Pyramid L.
Winnemucca L.
Reno
Wadsworth
Virginia City
Gold Hill
Carson City
CARSON CITY
DOUGLAS
Genoa
Dayton
Tahoe
Humboldt & Carson Sink
CHURCHILL
Stillwater
Carson L.
Wabuska
Walker Lake
Hawthorne
ESMERALDA
Aurora
Bridgeport
Bodie
Mono
Sodaville
Candelaria
Belleville
Silver Peak
Palmetto
LANDER
Austin
Kingston
Galena
Beowawe
Carlin
Palisade
EUREKA
Eureka
Ruby Hill
Pinto
Mineral
Diamond
WHITE PINE
Hamilton
Cherry Creek
Shellbourne
Ely
Osceola
Cleveland
Mineral City
NYE
Belmont
Tybo
Hot Creek
Reveille
San Antonio
Ione
Junction
Ploche
Bullionville
Panaca
Hiko
Freiburg
LINCOLN
RAILROAD VALLEY
SNAKE RANGE
CEDAR RANGE
ELY RANGE
WHITE PINE RANGE
MONITOR RANGE
TOIYABE MTS.
SHOSHONE MTS.
REVEILLE RANGE
KAWICH RANGE
DESERT
HUMBOLDT
SHASTA
Redding
Shasta
Mt. Shasta
TRINITY
Weaverville
Eureka
Arcata
Ferndale
HUMBOLDT
C.Mendocino
TEHAMA
Red Bluff
Tehama
LASSEN
Susanville
PLUMAS
Quincy
SIERRA
Downieville
BUTTE
Chico
Oroville
GLENN
Willows
COLUSA
Colusa
MENDOCINO
Ukiah
LAKE
Lakeport
SONOMA
Santa Rosa
NAPA
Napa
YOLO
Woodland
SACRAMENTO
Sacramento
PLACER
Auburn
NEVADA
Nevada City
Grass Valley
YUBA
Marysville
SUTTER
EL DORADO
Placerville
AMADOR
Jackson
CALAVERAS
San Andreas
ALPINE
Markleeville
TUOLUMNE
Sonora
MARIPOSA
Mariposa
STANISLAUS
Modesto
SAN JOAQUIN
Stockton
SOLANO
Fairfield
CONTRA COSTA
Martinez
ALAMEDA
Oakland
Alameda
MARIN
San Rafael
San Francisco
San Mateo
Redwood City
Half Moon Bay
Pt.Reyes
Pt.Arena
Pt.Cabrillo
Yosemite
MT. LYELL
CATHEDRAL PK.
Mono L.



CALIFORNIA
AND
NEVADA

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AREA AND POPULATION OF NEVADA BY COUNTIES.

County.	Map Index.	County Seat.	Area in square miles.	Population.	
				1890.	1900.
Churchill	D 2	Stillwater	4,816	703	830
Douglas	D 2	Genoa	878	1.551	1,534
Elko	F 1	Elko	16,939	4.794	5.688
Esmeralda	D 2	Hawthorne	8,776	2.148	1.972
Eureka	F 7	Eureka	4,111	3.275	1,954
Humboldt	D 1	Winnemucca	16.126	3.434	4,463
Lander	E 2	Austin	5,307	2,266	1.534
Lincoln	F 3	Pioche	19.437	2.466	3.284
Lyon	D 2	Dayton	1.267	1.987	2.268
Nye	F 2	Belmont	17.376	1.290	1.140
Ormsby	D 2	Carson City	120	4.883	2.893
Storey	D 2	Virginia City	263	8,806	3,673
Washoe	D 1	Reno	5,612	6,437	9.141
White Pine	F 2	Ely	8.712	1,721	1.961

The State has one representative in the National House of Representatives.

Religion. The churches do not show a strong numerical representation in Nevada. The Catholics, with a membership of about 4000, outnumber all the other churches combined. The Protestant Episcopal, Mormon, Methodist Episcopal, and Presbyterian churches are represented.

Education. The State expends a large per capita sum for educational purposes, and maintains a school term of more than seven months in length. The total expenditure for 1900 was $224,622. The number of children of school age (five to eighteen years) was 9260; number enrolled, 6676; average daily attendance, 4698. Education is compulsory, but the law is not strictly enforced. There are about 400 pupils in the high schools of the State and over 300 in the State University—a coeducational institution located at Reno, in connection with which the Federal Government has established an agricultural experiment station. There are no normal schools. The national Government maintains a boarding school for Indian children.

Charitable and Penal. The State supports an orphan's home, at Carson; a hospital for mental diseases, at Reno; and a State prison at Carson.

Government. Nevada has had but one constitution, which was adopted by popular vote in 1864. A proposed amendment may originate in either House and must receive the approval of a majority of the members elected to each House at two consecutively elected legislatures, after which it must receive a majority vote of the people. A constitutional convention may be called if approved by two-thirds of the members elected to each House and a majority of the popular vote. Suffrage is restricted to sane male citizens, twenty-one years of age, who have resided in the State six months and the district or county thirty days; the Legislature, however, has the power to make the payment of a poll tax a conditional right for voting. Carson City is the capital.

Legislative. The aggregate number of members of both branches of the Legislature cannot exceed 75, and the Senators must not number less than one-third or more than one-half the Assemblymen. Assemblymen serve two years and Senators four years. Both are elected on the Tuesday after the first Monday in November of even years, and the sessions of the Legislature convene on the third Monday of January of odd years and cannot exceed 60 days in length.

Executive. The Governor, Lieutenant-Governor, Secretary, Treasurer, Controller, Surveyor-General, and Attorney-General are elected at the same time as are the members of the Legislature, and serve for four years.

Judicial. There are a supreme court, district courts, and justices of the peace and such city and town courts as the Legislature may establish.

Local Government. A uniform system of county and township government is established by the Legislature, which system must provide for a board of county commissioners in each county.

Militia. The militia numbers 138 men.

History. The territory from which Nevada was formed was acquired from Mexico by the Treaty of Guadalupe Hidalgo, February 2, 1848, and later formed part of Utah Territory. The first European known certainly to have entered the region was Francisco Garcés, a Franciscan friar, on his way to California from Sonora in 1775. Other friars followed him, but no settlements were made. In 1825 Peter S. Ogden, in the employ of the Hudson's Bay Company, worked inland with a small party and came upon the Humboldt River, sometimes called the Ogden River after himself, or the Mary River, after his Indian wife. Other trappers came within the next five years, though they suffered from the attacks of the Blackfeet and Shoshone Indians. In 1826 Jedediah S. Smith crossed the entire breadth of the present State from west to east. Frémont passed through in 1843-45, and possibly occasional emigrants bound for Oregon or California settled here and there. In 1849 the Mormons founded a trading post in the valley of the Carson River, near the present town of Genoa, to supply gold-seekers on their way to California. When Utah Territory was formed, September 9, 1850, the western boundary was fixed as the summit of the Sierra Nevada Mountains and so included much of the present State, but the Territorial organization did not extend at once to the extreme west, and the inhabitants organized a government of their own. In 1853, and again in 1856, the inhabitants of the Carson Valley petitioned to be annexed to California, claiming that the Government of Utah did not protect them, and had even withdrawn the county government, so tardily given. A petition for Territorial government was sent to Congress in August, 1857, and in 1858 a provisional government was formed at Carson City with Isaac Roop as Governor. In 1860 another petition was sent to Congress and the Territorial Delegate applied for admission. Meanwhile the Comstock Lode had been discovered in June, 1859, and miners flocked thither from every direction. The new Territory was separated from Utah, March 2, 1861, being bounded on the east, however, by the 116th meridian. Another degree was cut from Utah, July 14, 1862, and on May 5, 1866, the eastern boundary was extended to the 114th meridian and that part of the State lying below 37° was taken from Arizona. In September, 1863, an election was held for delegates to form a State constitution, but the instrument submitted was defeated in January, 1864. However, the political situation made two additional Republican votes in the United States Senate exceedingly desirable, and Congress in March, 1864, again passed an enabling act; in July the Constitution was accepted, and the State was admitted October 31st. Politically the State is swayed largely by local interests. It was Republican in national elections until 1892, when it was carried by the People's Party. In 1896 and 1900 it voted for the free-silver candidate, William Jennings Bryan.

The Governors of Nevada have been as follows:

TERRITORIAL

James W. Nye		1861-64

STATE

Henry G. Blasdell	Republican	1864-70
Louis R. Bradley	Democrat	1870-79
John H. Kinkead	Republican	1879-83
Jewett W. Adams	Democrat	1883-87
Christopher C. Stevenson	Republican	1887-90
Frank Bell	"	1890-91
Roswell K. Colcord	"	1891-95
John E. Jones	Silver	1895-96
Reinhold Sadler	"	1896-1903
John Sparks	Silver-Democrat	1903 —

Consult: Angel, *History of Nevada* (Oakland, 1881); Bancroft, *Nevada, Colorado, and Wyoming* (San Francisco, 1890); *Nevada and Her Resources* (Carson City, 1894).

NEVADA. A city and the county-seat of Story County, Iowa, 32 miles north by east of Des Moines; on the Chicago and Northwestern and other railroads (Map: Iowa, D 3). It is the centre of a farming and cattle-raising district, and has a large cold storage plant for butter and eggs, and some manufactures, the chief products being tile and flour. There is a public library of 5000 volumes. Population, in 1890, 1662; in 1900, 2472.

NEVADA. A city and the county-seat of Vernon County, Mo., 100 miles south of Kansas City; on the Missouri Pacific and the Missouri, Kansas and Texas railroads (Map: Missouri, B 4). It has a Roman Catholic convent school, and is the seat of a State lunatic asylum and of Cottey College for Young Ladies (Methodist Episcopal, South), opened in 1884. A prominent feature of the city is Lake Park, named from a beautiful lake within the municipal limits. Nevada controls considerable trade in the products of the agricultural and stock-raising district of which it is the centre, and has large zinc smelters, a foundry and iron works, and saw, planing, flour, and feed mills. Nevada became the county-seat in 1858, and was incorporated in 1870. It is governed, under a charter of 1880, by a mayor, elected every two years, and a unicameral council. Population, in 1890, 7262; in 1900, 7461.

NEVADA, Emma (Emma Wixom) (1861—). An American dramatic soprano, born in Austin, Nev. She studied under Marchesi in Vienna and afterwards in Italy. She first appeared in opera in London (1880) with Marie Van Zandt and subsequently sustained leading parts in Triest, Pesth, Prague, Milan, Rome, Naples, and Paris, making her first professional tour of the United States in 1884-85. She had a wide repertoire, but perhaps her most successful rôle was Mignon, which part she sang for an entire year in Paris.

NEVADA CITY. A town and the county-sea of Nevada County, Cal., 166 miles northeast of San Francisco; the terminus of the Nevada County Narrow Gauge Railroad (Map: California, C 2). It is a popular health and summer resort, being esteemed for its equable climate and for its fine site, at an elevation of 2500 feet in a mountainous region. There are valuable gold mines near by, which supply the city's quartz mills. The leading occupations are mining, the cultivation of fruit and vines, and wine-making. Under a charter of 1885, the government is vested in a president and board of trustees elected on a general ticket. The town owns and operates the water-works. Nevada City was first settled in 1849, and in 1850-51 was the most important mining town in the State. It was incorporated in 1875. Disastrous fires occurred in 1851, 1856, 1858, and 1863. Population, in 1890, 2524; in 1900, 3250.

NEVADA STATE UNIVERSITY. The head of the educational system of the State of Nevada and the only institution of collegiate grade within the State. It was founded at Elko in 1873 and was removed to Reno in 1885 and formally reopened in 1886. The university comprises the college of agriculture, including departments of dairying and domestic arts and sciences, the college of arts and science, the college of applied science, with departments of mining and metallurgy and mechanical and civil engineering, the State Normal School, and the University High School. Military instruction forms part of the curriculum and a uniform is worn by the students. The degrees conferred are those of B.A., B.S., M.A., M.S., and mining, mechanical, and civil engineer. In 1902 the faculty numbered 18 and the attendance was 310, including 90 preparatory students. The library contained 4000 volumes. The university campus covers about 40 acres and with its buildings was valued at $200,000. The value of the college property was $225,000, and the income $62,000.

NÉVÉ, nā′vā′. See Glacier.

NEVERS, ne-vâr′. The capital of the Department of Nièvre, France, and formerly of the Province of Nivernais, situated on a hill in the midst of fertile plains at the confluence of the Loire and the Nièvre, 140 miles southeast of Paris (Map: France, K 5). It is an important railway junction. The old portion of the town is ill-built, with narrow, crooked streets, but the modern portion has wide streets and a fine park. A gateway containing a Gallo-Roman museum, and two towers, are preserved remains of the mediæval fortifications. The feudal ducal castle is utilized for the Palace of Justice and also contains a museum. The chief ecclesiastical buildings are the Romanesque eleventh century Church of Saint Etienne, and the recently restored Cathedral of Saint Cyr, built in the thirteenth century on the site of a prior church, the west portion of which is incorporated in the present building; the cathedral is noted for its double apse and fine sculptures and paintings. The town possesses a public library, and numerous educational, scientific, and benevolent institutions. It has manufactures of iron and copper ware, chemicals, porcelain and cloth, an engine-fitting factory, formerly a famous naval cannon foundry, and oil mills. Nevers is the ancient Noviodunum, an important town of the Ædui. It has been an episcopal see since the sixth century, when it was called Nivernum. The town became the seat of the counts of Nevers in the tenth century and was created a dukedom by Francis I. in 1538. The dukedom of Nevers passed by marriage to a member of the family of Gonzaga, the ducal house of Mantua. On the extinction of the Gonzaga line in Mantua in 1627, Charles, Duke of Nevers, claimed the duchy. He was supported by France, and opposed by Spain and Austria. The War of the Mantuan Succession which ensued ended in the recognition of the claim of Charles of Nevers in 1630. The population of Nevers in 1900 was 27,673.

NEVERSINK HIGHLANDS, A range of hills in New Jersey. See Navesink Highlands.

NEVIANSKII-ZAVOD, nĕv-yän′skê zȧ-vŏd′. A mining settlement in the Government of Perm, Russia, situated on the Neiva, in the Ural Mountains, 62 miles north of Yekaterinburg (Map: Russia, K 3). It is the centre of an important mining district and contains extensive iron works, steel mills, and gold washeries. The settlement was founded in 1699. Population, in 1897, 16,066.

NEV′ILLE, Richard, Earl of Warwick. An English political leader known as the 'king-maker.' See Warwick, Richard Neville, Earl of.

NEVILLE'S CROSS, Battle of. A battle between the Scotch and the English, fought on October 17, 1346. During the Hundred Years' War (q.v.) the Scotch were the firm allies of the French, and when Edward III. invaded France, King David II. of Scotland prepared to harass England. He was met, however, at Neville's Cross, near Durham, by the English under Henry Percy and Ralph Neville. The English, owing to their archers, were completely victorious, and David himself was captured. See Bruce, David.

NEV′IN, Ethelbert (1862-1901). An American composer, born at Edgeworth, Pa. After thorough preparation under local music teachers, he went to Berlin (1884) and became a pupil of Von Bülow and Karl Klindworth, the former of whom particularly encouraged his natural gift for composition. He returned to Boston in 1887 and settled there, devoting himself largely to composition, but after 1893 he spent much of his time in Europe, mostly in Paris, the south of France, Italy, and Algiers. He returned to America in 1900, and became associated with H. N. Parker in the department of music at Yale University. Of his compositions, which are almost entirely in the smaller forms, *Narcissus*, a piano number, published in a group entitled *Water Sketches*, and the song *The Rosary*, were perhaps the most popular. He was the composer of many songs, instrumental pieces and waltzes, almost all of which are marked by the delicate daintiness and originality which was characteristic of his work. He died at New Haven, Conn.

NEVIN, John Williamson (1803-86). An American clergyman. He was born in Franklin County, Pa., graduated from Union College in 1821, studied theology at Princeton, and taught Hebrew there from 1826 to 1828. From 1829 to 1840 he was professor of Hebrew and biblical literature in the Western Theological Seminary at Allegheny, Pa. From here he went to the theological seminary of the Reformed (German) Church at Mercersburg, where he taught theology until 1851. He was president of Marshall College, Mercersburg, from 1841 to 1853. After this institution had united with Franklin College at Lancaster under the name of Franklin and Marshall, he served as president from 1866 to 1876. He was one of the founders of the 'Mercersburg theology' (q.v.). He was the editor of and principal contributor to *The Mercersburg Review* from 1849 to 1853. He published: *Biblical Antiquities* (2 vols., 1828; revised ed. 1849); *The Anxious Bench* (1842); *The Mystical Presence* (1846); *History and Genius of the Heidelberg Catechism* (1847); *Anti-Christ; or, the Spirit of Sect and Schism* (1848). Consult his biography by Appel (Philadelphia, 1889).

NEVIS, nĕv′ĭs. One of the Leeward Islands in the West Indies, belonging to Great Britain. It lies two miles southeast of Saint Christopher, with which it is administratively connected (Map: West Indies, Q 6). Area, 50 square miles. It consists largely of an extinct volcano, 3596 feet high and wooded at the summit. The lower slopes are fertile and well cultivated, producing sugar-cane and some limes and oranges. The population in 1891 was 13,087, and in 1901, 12,774. The chief town is Charlestown, with a good roadstead and a population (1901) of 1383. The island was discovered by Columbus in 1498. It was colonized by the English in 1628. In 1899 it suffered from a disastrous hurricane.

NEVIS, Ben. A mountain of Scotland. See Ben Nevis.

NEVOME, ne-vō′mȧ. See Pima.

NEVSKI (nyĕf′skē) **PROSPEKT′.** The chief street of Saint Petersburg, extending for about three miles in a straight line, and faced by some of the finest shops and public buildings of the city. It is 150 feet in width, and in winter presents a scene of great animation.

NEW, John Chalfant (1831—). An American politician, born at Vernon, Ind. He graduated at Bethany College, (West) Virginia, in 1851, and settled in Indianapolis, where he was admitted to the bar in 1852. In 1861 he was appointed quartermaster-general of Indiana, a post which he held throughout the Civil War. In 1862 he was a member of the Indiana State Senate. After the war he engaged for several years in banking, and in 1875 was appointed by President Grant, Treasurer of the United States. In 1882 President Arthur appointed him Assistant Secretary of the Treasury. He was active in securing the nomination and election of Benjamin Harrison in 1888 to the Presidency, and as a reward for his services was appointed United States Consul-General at London, England, which position he held until 1892.

NEW ACADEMY. A school of Greek philosophers, the successors and expositors of Plato. The various schools classed under the name of the Academy are differently divided by modern historians. The third school, headed by Carneades (q.v.), is sometimes referred to as the New Academy, though it is perhaps more often classed, with the second, under the name of Middle, the New beginning a little later with Philo of Larissa, who founded the fourth school.

NEW ALBANY. A city and the county-seat of Floyd County, Ind.; on the north bank of the Ohio River, two miles below the falls, and opposite Louisville, Ky., with which it is connected by a long railroad bridge, and on the Louisville, Evansville and Saint Louis, the Louisville, New Albany and Chicago, the Baltimore and Ohio Southwestern, and the Pittsburg, Cincinnati, Chicago and Saint Louis railroads (Map: Indiana, D 4). It has a fine city hall and court house, post office and custom house, large fair grounds, De Pauw College for women, and a public library. In the suburbs there is a national cemetery which contains 2908 graves, 676 of unknown dead. The city controls large commercial interests, and is an important manufacturing centre, having tanneries, woolen mills, furniture factories, engine and boiler works, rolling, planing, and flour mills, iron foundries, plate glass works, and pork-packing establishments. New Albany was laid out in 1813 and incorporated as a city in 1839, the charter of that year being still in operation and providing for a mayor, chosen every four years, and a unicameral council, which elects subordinate municipal officers. Population, in 1890, 21,059; in 1900, 20,628.

NEW AMSTERDAM. The name of New York City (q.v.) under the Dutch.

NEW ARCHAN′GEL. The former name of Sitka (q.v.).

NEWARK, or **NEWARK-UPON-TRENT.** A municipal borough and market-town of Nottinghamshire, England, on a navigable branch of the Trent, 16 miles southwest of Lincoln (Map: England, F 3). Newark is one of the most important malting towns in England, and has flour mills, breweries, manufactures of agricultural implements and boilers, gypsum and limestone quarries, and a trade in corn, malt, and flour. The corn market is one of the largest in the kingdom. The parish church, a large and elegant edifice, though often rebuilt, still shows traces of its original Norman character. The grammar and song school was founded in 1529. Newark was incorporated in the reign of Edward VI. and received further charters from Charles I. and Charles II. The town owns the water-works and markets, and maintains a free library and public baths. It dates from the Roman occupation. The castle, now in ruins, was built early in the twelfth century. King John died in it in 1216. From its position and great strength it was called 'the Key of the North,' and during the Civil War sustained three sieges for Charles I., finally surrendering at his request to the Scots in 1646. Population, in 1891, 14,450; in 1901, 15,000. Consult Cornelius Brown, *Annals of Newark-upon-Trent* (London, 1879).

NEWARK, nū′ẽrk. A town in Newcastle County, Del., 12 miles west by south of Wilmington; on the Baltimore and Ohio and the Philadelphia, Baltimore and Washington railroads (Map: Delaware, O 2). It is the seat of Delaware (State) College (q.v.), and of Newark Academy. There are extensive paper manufactures, also wall-paper mills, fibre works, machine shops, etc. The water-works and electric light plant are owned and operated by the municipality. Population, in 1890, 1191; in 1900, 1213.

NEWARK. The largest city of New Jersey, a port of entry, and the county-seat of Essex County, eight miles west of New York; on the west bank of the Passaic River, which empties into Newark Bay three miles below the city proper, and on the Pennsylvania, the Lehigh Valley, the Lackawanna, the Erie, and the Central of New Jersey railroads (Map: New Jersey, D 2).

The city occupies an area of about 18½ square miles on a generally level plain. Toward the west, however, the ground rises, affording the beautiful sites of a popular residential district. Though Newark contains the homes of many business men of New York, it has distinct individuality as a manufacturing city, and many members of its industrial and commercial community find homes in the beautiful surrounding suburbs of the Oranges, Montclair, Caldwell, Irvington, and other places with which the city is connected by a network of electric railways. The streets are regularly laid out, and the main avenues are broad and well paved with granite or asphalt, 137 miles of the total street mileage (231) being paved. Broad Street, the principal thoroughfare and business street, having a width which justifies its name, presents a handsome appearance, enhanced by the stately elm-trees in the parks that border it for a considerable distance. There are many public parks—Branch Brook, Military (formerly the old training ground), Washington, Lincoln, East Side, and West Side; and statues of General Philip Kearny, Frederick T. Frelinghuysen, and Seth Boyden, the inventor, a bronze bust of Abraham Coles, and a bronze Indian group. The finest edifices include the Federal building, accommodating the custom house and post office; the Public Library, which cost $350,000; the Prudential Life Insurance building, the high school, and the Peddie Memorial Church. The City Hospital, the German, Saint Michael's, Saint Barnabas, and Saint James hospitals, and the Essex County Hospital for the Insane are among the more prominent charitable institutions. There are in the city nine public hospitals, fourteen public homes, and four orphan asylums. Newark has the Newark Academy, a well-known classical school of long standing, Saint Benedict's College, and the Newark Technical School, a city institution. The Public Library contains 80,000 volumes. Other libraries are the Board of Trade, Young Men's Catholic Association, County Law, High School, and State Historical Society. The last-named institution has also an interesting collection of relics.

Newark is essentially an industrial centre, having long been noted for the extent and variety of its products, which, according to the census of 1900, were valued at $126,954,000. The more important manufactures include leather, machinery, foundry and machine-shop products, jewelry, saddlery, hardware, celluloid, spool cotton, boots and shoes, carriages, hats and caps, clothing, trunks, paper, varnish, chemicals, rubber, beer, and ale. The water frontage of the city extends along the Passaic River and Newark Bay for a distance of 10½ miles, and there is a large trade by river, as well as by rail.

The government is vested in a mayor, elected every two years, a unicameral council, and subordinate administrative officials appointed or elected as follows: By the mayor—city counsel, attorney and assistant, excise and assessment commissioners, trustees of the public library, and police justices; by the mayor with the consent of the council—police, fire, and health commissioners, city comptroller, auditor, and tax commisioners; by the council—treasurer, tax receiver, city clerk, and building inspector, and assistants; by popular vote—board of education, and board of street and water commissioners. The annual expenditures for maintenance and operation are about $4,875,000, the principal items being $900,000 for schools, $425,000 for the police department (including amounts for police courts, jails, reformatories, etc.), $410,000 for interest on debt, $340,000 for the water-works, $300,000 for the fire department, $215,000 for municipal lighting, $205,000 for charitable institutions, and $125,000 for street expenditures. The water-works, built at a cost of $6,000,000, are owned and operated by the municipality, the entire system now comprising about 300 miles of mains. There are nearly 180 miles of sewers. Newark has (1902) a bonded debt of $17,585,000, and an assessed property valuation (real and personal) of about $160,000,000.

Population, in 1810, 8008; 1830, 10,953; 1850, 38,894; 1860, 71,941; 1870, 105,059; 1880, 136,508; 1890, 181,830; 1900, 246,070, including 71,400 persons of foreign birth and 6700 of negro descent.

Newark was settled in 1666 by a party of thirty from Milford, Conn., led by Robert Treat. In 1667 a company from Guilford and Branford, dissatisfied with the union of New Haven and

Connecticut, came here under the leadership of Abraham Pierson. The settlement was strictly religious, the rights of full citizenship being restricted to members of the Congregational Church. At first called Milford, it was renamed in 1667 after Pierson's English home, Newark-upon-Trent. It originally included a large part of the present Essex County, in which the towns of Belleville, Bloomfield, Clinton, Montclair, and the Oranges later grew up. In 1745-46 the English grantees of East Jersey attempted to invalidate the Indian titles of the settlers, claiming that they alone could grant land. Riots ensued which were repressed with difficulty. Newark was chartered as a town in 1712; in 1777 it was occupied first by Washington, and then, along with all that section of New Jersey, by the British, who plundered the inhabitants and destroyed much property. The College of New Jersey, later Princeton University (q.v.), was located here from 1748 to 1756. In 1798 Newark received a second town charter, and in 1836 was incorporated as a city. In 1836 occurred the most destructive fire in the city's history, and in 1837 the wide-spread business panic caused much distress. Consult: Atkinson, *The History of Newark, N. J.* (Newark, 1878); and *Records of the Town of Newark, 1666-1836* (Newark, 1864).

NEW′ARK. A village in Wayne County, N. Y., 32 miles east by south of Rochester; on the Erie Canal, and on the New York Central, the West Shore, and the Northern Central railroads (Map: New York, C 2). It has a public library of 3000 volumes and is the seat of the State Custodial Asylum for Feeble-Minded Women. The surrounding country is a productive agricultural section: and the chief industries of the village include the distillation of peppermint oil, fruit-preserving, the growing of roses and nursery stock, and the manufacture of cut glass, tinware, boxes, flour, foundry products, etc. Population, in 1890, 3698; in 1900, 4578.

NEWARK. A city and the county-seat of Licking County, Ohio, 33 miles east of the State capital, Columbus; at the junction of the forks of the Licking River, and on the Pennsylvania and the Baltimore and Ohio railroads (Map: Ohio, F 5). It has also good interurban electric railway service. Situated in a plain surrounded by hills, Newark is attractively laid out, twelve miles of its streets being paved with vitrified brick. The Auditorium, a memorial to the soldiers and sailors who died in the Civil War, is one of the finest theatres in the State. Two of the most extensive earthworks of the mound-builders are here, comprising a circular embankment, one mile in circumference, and a larger series of fortifications, called the Octagon Fort. Tributary to the city are fertile agricultural sections, and areas of natural gas, coal, and sandstone. The manufacturing interests are very important, the establishments including electric car works, table glassware and bottle works, locomotive shops of the Baltimore and Ohio, stove foundries, bent-wood works, rope-halter factory, hardwood sawmill, cigar factory, engine and machine works, and iron foundry, agricultural implement works, flouring mills, carriage factory, chemical laboratory, etc. Newark was settled in 1801, and was laid out as a town in the following year. Population, in 1890, 14,270; in 1900, 18,157.

NEWARK SERIES. The name given to the Triassic system in the eastern part of North America. Along the Atlantic coast from Nova Scotia to South Carolina there are many isolated areas of thick bedded red sandstones, conglomerates, and breccias, which throughout their extent exhibit marked uniformity of characteristics. The sedimentary rocks are accompanied by dikes and sheets of basalt indicating intense volcanic activity at the time of their formation. Fossils are rare and mostly of fresh-water or land types, the commonest being land plants and foot-prints of animals. The micaceous and feldspathic nature of the sandstone shows that it was derived from the waste of crystalline rocks. In North Carolina and Virginia the series contains workable coal seams; it also yields a good quality of building stone—the brown sandstone of Connecticut and New Jersey. See TRIASSIC SYSTEM.

NEW ATLAN′TIS, THE. The name given by Lord Bacon, in his allegory bearing the same title, to an island supposed to lie in the Southern Atlantic, on which the author is shipwrecked. There he finds an organized association for natural science and the arts. See ATLANTIS.

NEWAYGO, nē-wā′gō. A village and the county-seat of Newaygo County, Mich., 37 miles north of Grand Rapids; on the Muskegon River, and on the Pere Marquette Railroad (Map: Michigan, H 5). It is situated in a region that has attained considerable popularity as a place of resort, being noted particularly for its hunting and fishing. The village, especially known for its cement works, is engaged in manufacturing also furniture, flour, and lumber products. Population, in 1890, 1330; in 1900, 1172.

NEW BED′FORD. A port of entry and one of the county seats of Bristol County, Mass., 56 miles south of Boston; the terminus of a division of the New York, New Haven and Hartford Railroad (Map: Massachusetts, F 4). It is situated near the mouth of the Acushnet River, which expands into a fine, spacious harbor leading into Buzzard's Bay. Fort Rodman, on Clark Point, with a garrison of 120 men, defends the harbor's entrance. A drive, over four miles in length, extends around the point and to the city, commanding splendid marine views. New Bedford, in area about 19⅓ square miles, is regularly laid out, and its streets are paved chiefly with gravel and macadam. Among the prominent structures are the city hall, the county court house, the post office, the Public Library, Masonic and Odd Fellows' buildings, Saint Luke's and Saint Joseph's hospitals, Saint Mary's Home, the Textile School, and the Merchants' National Bank. A State armory is (1903) in course of construction. The Public Library (73,000 volumes) is one of the oldest free public libraries in the United States, having been opened in 1853. The library was founded, however, some fifty years before it became a municipal institution. The corner-stone of the present building was laid in 1856. The public parks, aggregating 255 acres, are: the Common, Brooklawn, Buttonwood, Hazelwood, and Grove. The New Bedford and Fairhaven bridge, which spans the harbor, cost $1,500,000, and is one of the features of the city.

New Bedford, once noted for its extensive whaling interests, is now distinctively a manufacturing centre, known particularly for the production of fine cotton goods and cotton yarns. According to the census of 1900, capital to the amount of $29,073,000 was invested in the various industries, which had an annual output valued at $25,682,000, $16,749,000 representing the value of cotton goods alone. The cotton mills in 1900 contained 1,369,380 spindles; the cotton cloth mills had 23,351 looms. There are also foundries and machine shops, oil manufactories, cordage works, carriage and wagon shops, paint works, lumber mills, etc. The trade of the city is considerable, the leading commodities being coal, of which 560,000 tons are received annually, cotton, lumber, fish, and general merchandise.

Under the revised charter of 1896, the government is vested in a mayor, chosen annually; a bicameral council, the aldermen being elected on a general ticket; and administrative officers chosen as follows: Board of health, license commission, and park commission, appointed by the mayor and confirmed by the board of aldermen; water board, fire department, and overseers of the poor, elected by the city council; school committee, chosen by popular vote. The waterworks are owned and operated by the municipality. The system, which cost about $3,100,000, comprises two sources of supply, the first works having been built in 1865-69 and the new works in 1895-99. The original supply is held wholly for emergency purposes. There are now ninety-nine miles of mains. New Bedford spends annually in maintenance and operation over $1,000,000, the principal expenditures being: for schools, $235,000; for interest on debt, $155,000; for the police department, $115,000; for the fire department, $80,000; for streets, $70,000; for hospitals, asylums, and other charitable institutions, $70,000; for lighting, $50,000. The assessed valuation of property (real and personal) was (1902) $65,000,000; the bonded debt, $3,903,000. Population, 1790, 3313; 1850, 16,443; 1880, 26,845; 1890, 40,733; 1900, 62,442, including 25,529 persons of foreign birth and 1685 of negro descent.

New Bedford formed part of Dartmouth until 1787 and was not incorporated as a city until 1847. For many years, and especially between 1818 and 1857, it was a centre of the American whale-fishing industry. During the Revolution New Bedford sent out many privateers, and, from its convenient location, became the storehouse of captured prizes. On September 5, 1778, an English fleet of thirty-two vessels and an army under General Gray attacked the town, captured it, and reduced the greater part of it to ashes, the damage amounting to about $450,000. Consult: Ricketson, *History of New Bedford* (New Bedford, 1858); *Centennial in New Bedford* (New Bedford, 1876).

NEWBȨRN. A city, port of entry of the Pamlico district, and the county-seat of Craven County, N. C., 107 miles southeast of Raleigh; on the Neuse River at its confluence with the Trent, and on the Atlantic and North Carolina and the Atlantic Coast Line railroads (Map: North Carolina, E 2). It is connected by steamships with New York, Baltimore, and Norfolk, passing through inland water routes, and exports fish, cotton, lumber, and vegetables. It has hosiery and knitting mills, cottonseed oil and lumber mills, machine shops, canning, barrel, carriage, fertilizer, and cigar factories, and extensive fish and oyster and truck-gardening interests. The most prominent architectural features of the city are the Government building, the county court house, and two bridges over the Neuse and Trent rivers, both affording fine views of river scenery. The government, under a charter of 1899, is administered by a mayor, elected every two years, and a unicameral council. The water-works and electric light plant are owned and operated by the municipality. Newbern was settled by Swiss in 1710, was for a time the capital of the Province of North Carolina, and for many years was its most important seaport. It was strongly fortified during the Civil War, but was captured by General Burnside, March 14, 1862, after a severe engagement three miles from the city, the Union loss being about 100 killed and 500 wounded. Population, in 1890, 7843; in 1900, 9090.

NEW′BERRY. A town and the county-seat of Newberry County, S. C., 43 miles west-northwest of Columbia; on the Southern and the Atlantic Coast Line railroads (Map: South Carolina, C 2). It has a fine city hall and court house, and Newberry College (Lutheran), which was opened in 1858. The centre of a productive cotton-growing section, Newberry carries on a considerable trade, and manufactures cotton goods, cottonseed oil, fertilizers, coffins, etc. The government is administered, under a charter of 1894, by an annually elected mayor and a unicameral council. The water-works and electric light plant are owned and operated by the municipality. Population, in 1890, 3020; in 1900, 4607.

NEWBERRY, John Strong (1822-92). An American geologist, born in Windsor, Conn. He spent most of his early life in the Western Reserve of Ohio, and received his college education at the Western Reserve University, at Hudson, Ohio, from which he graduated in 1846, and then entered the Cleveland Medical School, where he received the degree of M.D. in 1848. Going to Europe, he spent two years in Paris in postgraduate work in medicine and paleontology. On his return to the United States, in 1851, he took up the practice of medicine in Cleveland, but in 1855 he joined an exploring expedition under Lieutenant Williamson, sent out by the War Department to examine the country between San Francisco and the Columbia River. His geological investigations were published as a separate volume of the *Reports of Explorations and Surveys to Ascertain the Most Practical and Economic Route for a Railroad from the Mississippi River to the Pacific Coast, Made in 1855-56* (Washington, 1857). In 1857-58 he acted as geologist to an expedition headed by Lieutenant Ives, sent out to explore the Colorado River. Newberry's paper relating to the geology, physiography, and Indian tribes, undoubtedly forms the most valuable and interesting part of the *Report on the Colorado River of the West, Explored in 1857-58* (Washington, 1861). The next year Newberry again went into the field, this time as naturalist of an expedition under Captain Macombe, which explored southwestern Colorado and adjacent parts of Utah, Arizona, and New Mexico. The results of this appeared in 1876 under the title of *Reports of the Exploring Expedition from Santa Fé to the Junction of the Grande and Green Rivers* (Washington, 1876.)

During the Civil War he performed the duties of secretary to the Sanitary Commission for the Mississippi Valley, and after the administration of this work he became attached to the Smithsonian Institution, at the same time holding a professorship in the Columbian University at Washington, to which he had been called in 1857. In 1866 he was offered the chair of geology and paleontology in the School of Mines, Columbia College, which he accepted, and held for twenty-four years. In 1869, when the Ohio Geological Survey was established he was made director and personally did much of the work described in several of the reports. He did much work for the Illinois Geological Survey, and also described the extensive collections of fossil plants gathered by Hayden's survey of the West. In 1867 he was elected president of the American Association for the Advancement of Science, and in the same year he was chosen president of the New York Academy of Sciences, which position he held for twenty-four years. He was also president of the Torrey Botanical Club from 1880 to 1890, and assisted in the organization of the Geological Society of America at Cleveland in 1888, and served as a member of the commission to organize an international geological congress, of which he subsequently became president. During the latter part of his life he resided in New Haven, Conn.

In addition to the works above mentioned, Dr. Newberry also wrote the following: *The Rock Oils of Ohio* (1859); *Iron Resources of the United States* (1874); *The Structure and Relations of Dinichthys* (1875); *Report on the Fossil Fishes Collected on the Illinois Geological Survey* (1886); *Fossil Fishes and Fossil Plants of the Triassic Rocks of New Jersey and the Connecticut Valley* (1888); *Paleozoic Fishes of North America* (1889); and *Later Extinct Floras* (1898).

NEWBERY, John (1713-67). A famous English bookseller and publisher, the son of a poor farmer of Waltham Saint Lawrence, in Berkshire. He attended the village school, but he educated himself mainly by reading. In 1730, he went to Reading, where he entered the service of William Carnan, editor of the *Mercury*. After the death of his employer, in 1737, he married his widow. Somewhat later, he opened in London a bookshop and publishing house in Saint Paul's Churchyard (1745). He started several newspapers. In *The Universal Chronicle and Weekly Gazette* (founded 1758), appeared Johnson's *Idlers;* and in *The Public Ledger* (founded 1760) appeared Goldsmith's *Citizen of the World*. Newbery was the first publisher to issue books especially for the young. His *Juvenile Library* was made up of dainty volumes bound in flowered and gilt Dutch paper. Among them were *Goody Two Shoes* (reprinted with introduction by C. Welsh, London, 1881) and *Tommy Trip and His Dog Growler*.

NEW'BOLT, Henry John (1862—). An English writer, born June 6, 1862, at Bilston, Staffordshire, where his father was vicar of Saint Mary's Church. He was educated at Clifton College, Bristol, and at Corpus Christi, Oxford, where he took first honors in the classics. Called to the bar at Lincoln's Inn (1887), he practiced his profession till 1899. In 1900 he established the London *Monthly Review*. He is best known for his martial poems in *Admirals All* (1897) and *The Island Race* (1898, largely a reprint). Among his other publications are a novel entitled *Taken from the Enemy* (1892); *Mordred*, a tragedy; *Stories from Froissart* (1899); and *Froissart in Britain*, with illustrations taken from originals in the British Museum (1900).

NEW BRAUNFELS, broun'fĕlz. A city and the county-seat of Comal County, Texas, 32 miles northeast of San Antonio; at the confluence of the Guadaloupe and Comal rivers, and on the International and Great Northern and the Missouri, Kansas and Texas railroads (Map: Texas, E 5). The Comal River, though short, is of considerable volume, having its source in large artesian springs. The city is the distributing point for an extensive farming and cattle-raising district, and is industrially important because of its good water power, some of the largest flouring mills in the State being located here. The principal manufactured products include flour, cottonseed oil, leather, bricks, and wagons. Population, in 1890, 1608; in 1900, 2097 (mostly of German descent).

NEW BRIGHTON, brī'ton. A borough in Beaver County, Pa., 29 miles northwest of Pittsburg; on the Beaver River, and on the Pittsburg, Fort Wayne and Chicago, the Pittsburg and Lake Erie, and other railroads (Map: Pennsylvania, A 3). It has a public art gallery, Beaver Valley General Hospital, Y. M. C. A. and public high school libraries, and a public park. The river furnishes extensive water power, and there are deposits of coal and clay in the vicinity. New Brighton is an important industrial centre, its manufactures including pottery, bricks, sewer pipe, glass, flour, twine, lead kegs, coffee mills, nails, rivets, wire, etc. Population, in 1890, 5616; in 1900, 6820.

NEW BRIT'AIN. The former name of the Bismarck Archipelago (q.v.); also applied to the largest island of the archipelago, now called New Pomerania (q.v.).

NEW BRITAIN. A city in Hartford County, Conn., 10 miles southwest of Hartford, on the New York, New Haven and Hartford Railroad (Map: Connecticut, D 3). It has a State Normal School, a Roman Catholic cathedral, New Britain Institute, and a fine public park of about 75 acres, besides several smaller areas. New Britain is noted for its extensive manufactures, which, according to the census of 1900, represented an invested capital of $14,116,000, and had a production valued at $12,261,000. The most important manufactures are hardware, foundry and machine-shop products, cutlery and edge tools, hosiery and knit goods, stamped ware, saddlery, hardware, etc. The government is administered, under a revised charter of 1896, by a mayor, chosen every two years, and a unicameral council which controls elections of the majority of subordinate municipal officers. The city clerk and assistant, treasurer, collector, auditor, and sheriff are, however, chosen by popular vote. The school board is independently elected by the town. There are municipal waterworks. Population, in 1890, 16,519; in 1900, 25,998. New Britain was settled in 1687, and was incorporated as a parish under the name 'New Britain Society' in 1754. It was separated from Berlin and incorporated as a township in 1850, and in 1871 was chartered as a city. It was the birthplace and home of Elihu Burritt (q.v.). Consult Camp, *History of New Britain* (New Britain, 1889).

NEW BRUNSWICK, brŭnz′wĭk. A province of the Dominion of Canada. It lies between latitudes 44° 30′ and 48° 6′ N. and longitudes 63° province from the southwestern to the north- by Quebec and the Bay of Chaleur, on the east by the Gulf of Saint Lawrence and Northumberland Strait, on the south by Nova Scotia and the Bay of Fundy, and on the west by the State of Maine and Quebec. It has an area of 28,200 square miles, including 100 square miles of water area.

Topography. The coast on the Gulf of Saint Lawrence is low and sandy, with numerous spits and lagoons; that on the Bay of Fundy is bold and rocky. The latter is protected from the scouring action of the phenomenally high tides by a ridge of hard Cambrian rock with small areas of Silurian and Devonian as well as of the older Huronian and Laurentian systems. Another ridge, composed of granite, traverses the province from the southwestern to the northeastern corner. It forms the main divide between the eastern and western rivers, and has an average height of 1000 to 1500 feet, with a number of detached monadnocks from 2000 to 2500 feet high. These ridges are regarded as outlying branches of the Appalachian system. They inclose between them a large, triangular tract of low, undulating plain, occupying the eastern half of the province, and underlain by the Carboniferous system. West of the dividing range is a Silurian plateau much eroded and trenched by the valley of the Saint John River. The geology of the province is somewhat confused, and not yet definitely understood; but it is probably in many respects similar to that of Nova Scotia (q.v.).

Nearly all the western half of New Brunswick is drained by the River Saint John, which, after forming for a long distance the boundary with Maine, flows through the province in a southerly direction as far as the 46th parallel, then turns to the east, and discharges into the Bay of Fundy, through an estuary extending north and south for about fifty miles. The northeastern part of the province is drained into the Gulf of Saint Lawrence through a large number of small streams. There are numerous lakes. Grand Lake, in the south central portion, is the only one of considerable size. The coast line is 500 miles in extent, and is indented by spacious bays, inlets, and harbors. The chief are: Fundy, Chignecto, and Cumberland bays, the last two being merely extensions of the first; Passamaquoddy Bay in the south; Verte, Shediac, Cocaigne, Richibucto, and Miramichi bays on the east; and the Bay of Chaleur, 90 miles long by 12 to 25 broad, in the northeast.

Climate. New Brunswick is subject to extremes of heat and cold. At inland points the extremes are greatest, the temperature sometimes falling to 30° below zero in the winter and rising to 95° in the summer. The atmosphere, however, is drier than on the coast, and the extremes do not occasion great discomfort. Spring opens later and summer lingers longer than in the provinces farther west. The rainfall for the province averages above forty inches.

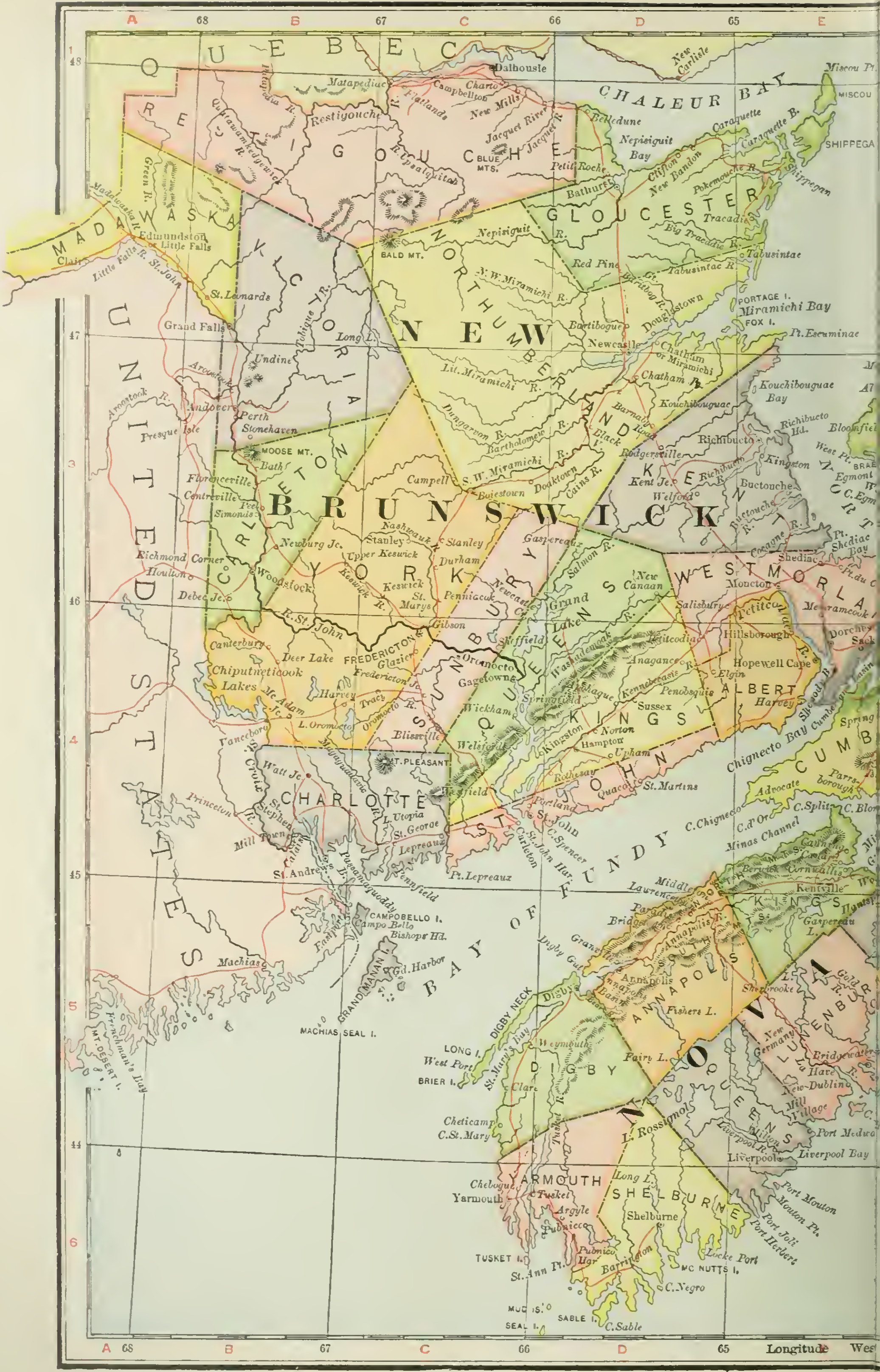
Mining. Although a large part of the province is occupied by Carboniferous strata, the mineral coal is for the most part impure or in thin seams, and is but little worked. The coal-like mineral 'albertite,' formerly mined with great profit in Albert County, has long since been exhausted. Salt springs are numerous. Nickel and iron ore are found, as are also antimony and manganese. Gypsum, plumbago, grindstone, and limestone are very abundant, and the freestone of the province, unsurpassed for beauty and durability, commands a high price in the States.

Fisheries. From an early period fishing has been one of the leading industries. The waters on both coasts rank among the best fishing grounds of the world. For a decade and a half the annual earnings from fisheries have been about $4,000,000, Nova Scotia alone, among the Maritime Provinces, exceeding that amount. New Brunswick thus nearly ranks with Massachusetts, which is the leading sea-fishing State of the United States. The herring, smelt, sardine, and lobster fisheries are of greatest importance, and in the first three New Brunswick leads all the other provinces.

Agriculture. The kind and quality of soil vary greatly with the underlying geological formation, but it is generally fertile, though much of the surface is too hilly to admit of profitable cultivation. In most of the valleys, and in the diked districts, for instance at the head of the Bay of Fundy, the fertility is of a high grade. Originally, the whole area was covered with forests, of which about one-half has been removed. The nature of the forests is not uniform, but they usually consist of both hard and soft woods. On the Bay of Fundy the species are largely confined to spruces and firs, as a consequence of the cold winds of that region. Spruce, fir, and tamarack also prevail in the western part of the province. But farther eastward the hard-wood varieties, such as maple, beech, ash, and birch, prevail, interspersed with spruce and pine. The elm abounds in the river valleys, and with it are found the birch and red maple. In 1902 a law was passed for the establishment of a large national park and game preserve at the sources of the Tobique, Nipisiguit, and Miramichi rivers. The destruction of the forests in New Brunswick, as in the other Maritime Provinces, seems to have had a climatic effect quite different from that which usually follows, namely, the rainfall increases, resulting in the growth of the soft woods—balsam, spruce, and tamarack—in the region where the hard woods were removed.

Agriculture is the leading occupation, but it has not reached extensive proportions. The natural growth of marsh hay in the valleys supplies an abundant and valuable hay product. About 180,000 acres are devoted to oats. Buckwheat, potatoes, and wheat are next in importance in the order named. The conditions especially favor the growth of turnips and other root crops. On the other hand, the climate is rather too severe for the large fruits, except in certain regions like the valley of the Saint John, where the hardier varieties are successfully grown. The smaller fruits, however, are abundant, and, ripening late, are put on the New England market at monopoly prices. The situation of the province on the seaboard gives it a marked advantage in marketing produce.

Considerable attention is given to the raising of sheep, and more especially cattle, and in very recent years there has been a decided growth in the dairy industry.



A
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QUEBEC
CHALEUR BAY
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Dalhousie
Campbellton
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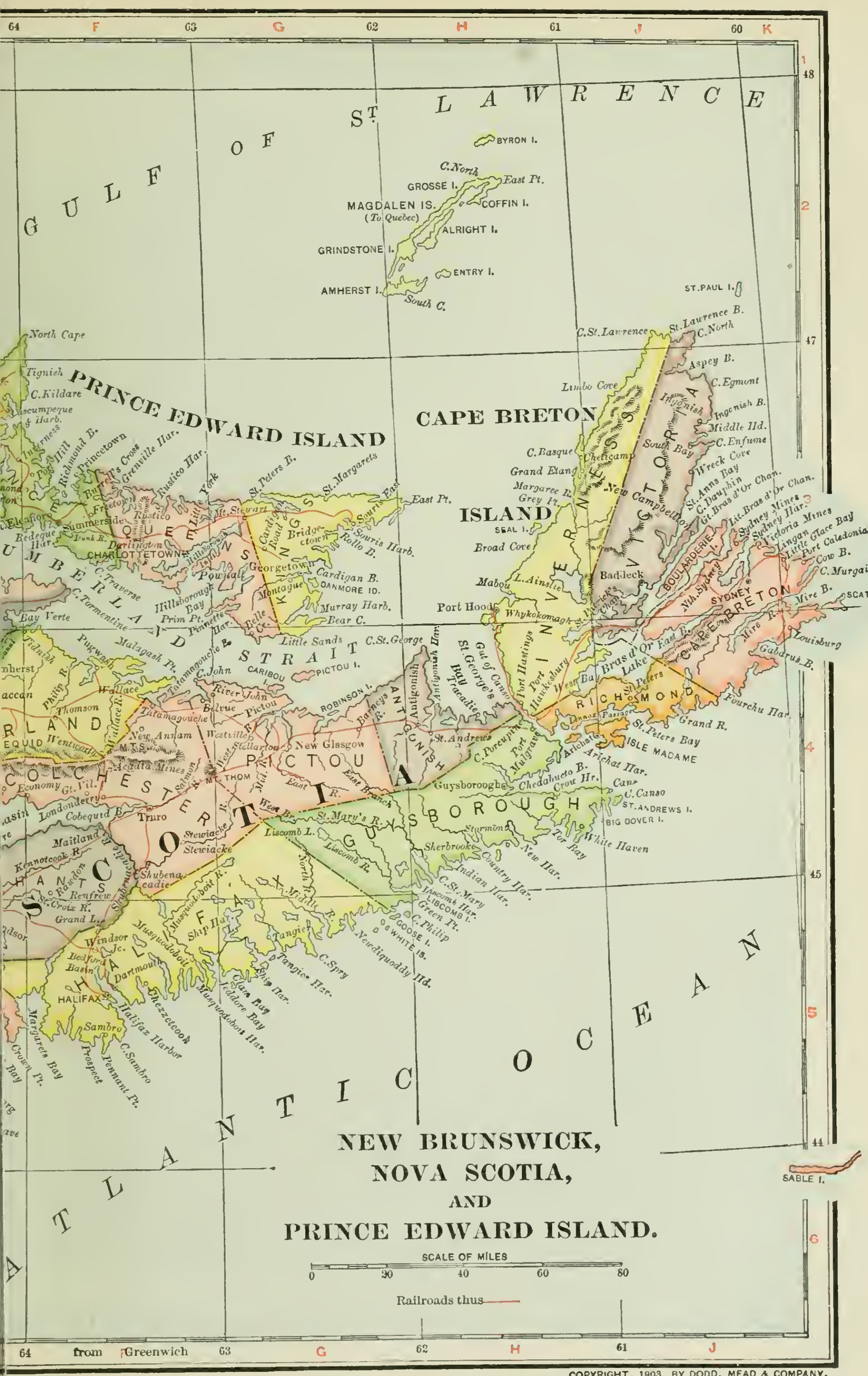
Restigouche
Charlo
New Mills
Jacquet River
Belledune
Nepisiguit Bay
BLUE MTS.
Petit Roche
Bathurst
GLOUCESTER
Caraquette
Caraquette B.
New Bandon
Clifton
Pokemouche R.
Shippegan
SHIPPEGAN
MISCOU
Miscou Pt.
Tracadie
Big Tracadie R.
Tabusintac R.
Tabusintac
MADAWASKA
Edmundston or Little Falls
Clair
Little Falls
St. John R.
Green R.
Madawaska R.
St. Leonards
Grand Falls
VICTORIA
Tobique R.
Long L.
Undine
Perth
Stonehaven
Andover
Aroostook
Aroostook R.
Presque Isle
BALD MT.
NORTHUMBERLAND
Nepisiguit R.
N.W. Miramichi R.
Red Pine
Bartibog R.
Bartibogue
Newcastle
Douglastown
Chatham or Miramichi
Chatham Jc.
PORTAGE I.
Miramichi Bay
FOX I.
Pt. Escuminac
Lit. Miramichi R.
Dungarvon R.
Bartholomew R.
Barnaby R.
Black R.
S.W. Miramichi R.
Doaktown
Cains R.
Boiestown
NEW BRUNSWICK
KENT
Kouchibouguac
Kouchibouguac Bay
Rodgersville
Richibucto
Richibucto Hd.
Richibucto R.
Kingston
Kent Jc.
Welford
Buctouche
Buctouche R.
Cocagne
Shediac
CARLETON
MOOSE MT.
Bath
Florenceville
Centreville
Peel
Simonds
Newburg Jc.
Stanley
Nashwaak R.
Upper Keswick
Keswick R.
Keswick
St. Marys
YORK
Durham
Penniacook
Woodstock
Richmond Corner
Houlton
Debec Jc.
Canterbury
Chiputneticook Lakes
Deer Lake
Mc Adam Jc.
Harvey
Tracy
Oromocto R.
L. Oromocto
FREDERICTON
Glazier
Fredericton Jc.
Gibson
Campell
SUNBURY
Newcastle Cr.
Gaspereau R.
Salmon R.
Oromocto
Gagetown
Sheffield
Blissville
QUEENS
Grand Lake
Wickham
Welsford
Springfield
Washademoak L.
KINGS
Kingston
Hampton
Norton
Sussex
Anagance
Kennebecasis R.
Penobsquis
Upham
Rothesay
WESTMORLAND
New Canaan
Moncton
Salisbury
Petitcodiac
Petitcodiac R.
Hillsborough
Hopewell Cape
ALBERT
Elgin
Harvey
Shepody B.
Dorchester
Sackville
Chignecto Bay
CHARLOTTE
Vanceboro
St. Croix R.
Watt Jc.
Magaguadavic R.
ST. PLEASANT
Princeton
St. Stephen
Mill Town
Calais
L. Utopia
St. George
Lepreau
Pennfield
St. Andrews
Passamaquoddy B.
Eastport
CAMPOBELLO I.
Campo Bello
Bishops Hd.
GRAND MANAN I.
Gd. Harbor
MACHIAS SEAL I.
Machias
UNITED STATES
Frenchman's Bay
MT. DESERT I.
ST. JOHN
Westfield
Quaco
St. Martins
Portland
St. John
Carleton
C. Spencer
St. John Har.
Pt. Lepreaux
C. Chignecto
BAY OF FUNDY
Minas Channel
C. d'Or
C. Split
Advocate
Parrsborough
CUMB
Spring
Middleton
Lawrencetown
Paradise
Bridgetown
Granville
Annapolis R.
Annapolis
Annapolis Basin
Digby
Digby Gut
DIGBY NECK
ANNAPOLIS
SOUTH MTS.
KINGS
Kentville
Berwick
Cornwallis
Gaspereau L.
Fishers L.
Fairy L.
Sherbrooke
New Germany
LUNENBURG
Bridgewater
La Have R.
New Dublin
Mill Village
Gold R.
LONG I.
West Port
BRIER I.
St. Mary's Bay
Weymouth
DIGBY
Clare
Tusket R.
Cheticamp
C. St. Mary
NOVA
L. Rossignol
QUEENS
Milton
Liverpool R.
Liverpool
Liverpool Bay
Port Medway
YARMOUTH
Chebogue
Yarmouth
Tusket
Argyle
Pubnico
Pubnico Har.
Long L.
SHELBURNE
Shelburne
Barrington
Locke Port
C. Negro
MC NUTTS I.
Port Mouton
Mouton Pt.
Port Joli
Port Herbert
TUSKET I.
St. Ann Pt.
MUD IS.
SEAL I.
SABLE I.
C. Sable
Kouchibouguac Bay
Bloomfield
West Pt.
Egmont
C. Egmont
Pt. du Chene
Memramcook
Longitude West



NEW BRUNSWICK, NOVA SCOTIA, AND PRINCE EDWARD ISLAND.

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Manufacturing and Commerce. Dominion, provincial, and municipal aid has greatly facilitated the construction of railways; the mileage for all lines aggregated 1438 miles in 1900. The Canadian Pacific connects the province with the railroad systems west by running west from Saint John and crossing the State of Maine. The Intercolonial enters the province from Quebec on the north and traverses the east side of the province, one branch connecting with Saint John. The position of New Brunswick on the Atlantic coast, and the large number of excellent harbors, greatly favor its commercial advantage. The foreign trade of the province passes through the port of Saint John. Regular ship lines connect this port with Atlantic coast points to the south, and with European countries. In 1900 the merchant marine consisted of 122 steamers and 805 sailing vessels, the total net tonnage being 78,700. Lumber is the chief article of export. The manufacture of lumber and of lumber products lead the manufacturing industries. Shipbuilding, which was formerly important, has been all but discontinued. The manufacture of wood-pulp, on the other hand, is assuming large proportions, and the future of the industry is assured, because the supply of spruce—the wood used for this purpose—is practically inexhaustible. In 1900 the creameries in the province numbered 33 and the cheese factories 54.

In 1900 there were 43 savings banks, with 7062 depositors and an average deposit of $353.46. In the same year there were five Government savings banks, having 15,887 depositors, with an average deposit of $396.20.

Government and Finance. The administration of the Government is in the hands of a Lieutenant-Governor and his council of six paid members and from one to four honorary members. The legislative body is called the House of Assembly, its forty-six members being elected for a term of four years. The legislative council was abolished in 1892. In striking contrast to some other Canadian provinces, there are no local municipal councils, the municipal affairs being managed by a county council. In this council each parish has two representatives, who serve without emolument (except in the County of Carleton), the term of office being one year. The various parish officers receive their appointments from the county council. The net debt of the province in 1900 was $2,751,000, or $8.56 per head of the population. The expenditures for the same year amounted to $794,000, and the receipts to $758,000. Over half the receipts came from the Dominion subsidy, the timber licenses being next in importance. Taxes are levied by the province upon telegraph, telephone, and insurance companies and banks. There is also a succession duty upon estates. Local expenditures are met by taxes collected upon real and personal property, income, and polls. Property is rated at its full value. The capital of New Brunswick is Fredericton.

Population. There is a high birth-rate in the province, but also a rather large emigration. The censuses for 1891 and for 1901 gave, respectively, 321,200 and 331,000. There is a small French element. The great bulk of the population is of British origin, the Irish especially being well represented. Saint John has a population of 40,700 (1901), and Moncton 9000.

Religion. The Catholics number a little over one-third of the total religious membership of New Brunswick. Among the Protestants the Baptists are strongest, followed by the Anglicans, Presbyterians, and Methodists, in the order named.

Education and Charities. Educational affairs are in the hands of a superintendent of education and an educational council. Unlike Quebec and Ontario, the province does not provide for separate denominational schools. There is uniformity of methods, text-books, etc., throughout the province. One in every 5.22 of the population is enrolled in the public schools, the proportion between the grammar and the elementary enrollment being one to sixty. The province also maintains normal schools and provides for higher education at the University of Fredericton. The different religious sects maintain seminaries and universities, of which Mount Allison University (Methodist) is the largest. The expenditure per capita of the total population shows a steady increase from $1.26 in 1888 to $1.88 in 1900. Of this amount, 67.94 per cent. is raised by local assessment.

Of the charitable institutions, the asylums for the insane constitute the greatest item of expenditure. The province supports also, in whole or part, a general hospital (at Saint John), a boys' industrial home, and deaf and dumb institutions. Private and sectarian interests are well represented in charitable work. Convicts sentenced to penal life are sent to the Dominion penitentiary at Dorchester.

History. The first European settlement was made on the Bay of Chaleurs by Frenchmen in 1639, and in 1672 further settlements were made on the Miramichi River and along the coast. With Nova Scotia, New Brunswick formed the original French colony of Acadia or New France, which was taken by the English in 1654, restored to France in 1667, but re-ceded to the English in 1713 by the Treaty of Utrecht, although disputes as to the boundaries lasted until the Treaty of Paris in 1763 finally settled the question in favor of the British. The first British settlements were made by Scotch agriculturists and laborers along the Miramichi in 1764. In 1783 over 5000 United Empire Loyalists from the United States settled in the colony. In 1784 Nova Scotia and New Brunswick separated to form distinct colonies, and in January, 1786, the first legislative assembly of New Brunswick met at Saint John. In 1867 New Brunswick united with Ontario, Quebec, and Nova Scotia and thus became one of the original provinces of the Dominion of Canada.

Bibliography. Selwyn and Dawson, *Descriptive Sketch of the Physical Geography and Geology of the Dominion of Canada* (Montreal, 1884); Bailey and Jack, *Woods and Minerals of New Brunswick* (Fredericton, 1876); Willmott, *The Mineral Wealth of Canada* (London, 1898); Cooney, *History of New Brunswick* (Halifax, 1832); Kingsford, *History of Canada* (London, 1887-98); Perley, *On the Early History of New Brunswick* (Saint Johns, 1891).

NEW BRUNSWICK. A city and the county-seat of Middlesex County, N. J., 23 miles southwest of Newark; at the head of navigation on the Raritan River, about 15 miles from its mouth, and on the Pennsylvania and the Raritan River railroads (Map: New Jersey, D 3). It is the terminus of the Delaware and Raritan Canal. A magnificent new railway bridge over the river is in course of construction. The city has a public library with over 17,300 volumes and the Gardner A. Sage Library of 44,500 volumes, and is the seat of Rutgers College (q.v.), connected with which is the Theological Seminary of the Dutch Reformed Church, and of the State Agricultural and Mechanical College with the State model farms. New Brunswick is extensively engaged in manufacturing hosiery, wall paper, rubber boots and shoes, bicycle tires, chemicals, fruit jars, boilers, cigars, foundry products, knitting needles, sash and blinds, shoes, etc. Under a charter of 1863, the government is vested in a mayor, elected biennially, a unicameral council, and in administrative boards. The boards of library trustees and of health are appointed by the mayor; the board of water commissioners is elected by the council; the board of education is chosen by popular vote. The waterworks are owned and operated by the municipality. Population, in 1890, 18,603; in 1900, 20,-006. The first settlement here was made in 1681. The place was first called 'Prigmore's Swamp' (1681-97), then 'Inion's Ferry' (1691-1714), and finally New Brunswick, in honor of the House of Brunswick. New Brunswick was incorporated as a town in 1736, and was chartered as a city in 1784. It suffered much during the Revolution, and during the winter of 1776-77 was occupied by the British.

NEW'BURGH. A city in Orange County, N. Y., 60 miles north of New York City; on the Hudson River, about five miles above the picturesque Highlands, and on the Erie and the West Shore railroads (Map: New York, F 4). It is built on a steep, terraced slope, rising about 300 feet above the river to an extended plateau. The city has a public library, a public park, Saint Luke's Home and Hospital, Home for the Friendless, and Home for Children. The river here expands into Newburgh Bay, giving the city a deep water front and exceptional facilities for traffic by water. There is a trade in agricultural and dairy products, and large quantities of coal from Pennsylvania are here transferred to barges and coasting vessels. Newburgh is of considerable importance as an industrial centre, having manufactories of cottons, woolens, silks, paper, powder, flour, felt hats, and carpet: shipyards; foundries and machine shops; tanneries and leatherette works; and plaster works. The government, as provided by the charter of 1898, is vested in a mayor, elected biennially; a common council; and administrative officials, the majority of whom are appointed by the executive, either absolutely or with the consent of the council. The city clerk, however, is elected by the council, and the water commissioners, board of education, and almshouse commissioners are chosen by popular vote. The water-works are owned and operated by the municipality. Population, in 1890, 23,087; in 1900, 24,943. The first settlement at Newburgh was made in 1709 by German Lutherans from the Rhenish Palatinate, who named it the 'Palatine Parish by Quassaic.' By 1750 most of the Germans had been replaced by people of English and Scotch descent, who in 1752 changed the name to the 'Parish of Newburgh' (after Newburgh, Scotland). Newburgh was the headquarters of the American Army from March, 1782, until the latter part of 1783, and it was here that the Newburgh Addresses were circulated, that the army was disbanded, and that Washington received the famous Nicola letter, proposing that he become King. The 'Hasbrouck House,' then occupied by Washington, is now owned by the State and used as a museum for Revolutionary relics. On the grounds is the 'Tower of Victory,' an imposing stone structure erected by the United States and State governments to commemorate the close of the war. Newburgh was incorporated as a village in 1800 and was chartered as a city in 1865. Consult: Ruttenber, *History of the Town of Newburgh* (Newburgh, 1859); Powell (editor), *Historic Towns of the Middle States* (New York, 1899); Nutt (comp.), *Newburgh* (Newburgh, 1891).

NEWBURGH ADDRESSES. Two anonymous letters that appeared in 1783, after the close of the Revolutionary War. They urged some organized action to redress the wrongs of American soldiers, especially the withholding of their pay, and were later found to have been written by General John Armstrong.

NEW'BURN. A town in Northumberland, England, on the Tyne, 5½ miles west of Newcastle. Population, in 1891, 8000; in 1901, 12,-500.

NEW'BURY. A municipal borough and market town in Berkshire, England, on the Kennet, 17 miles southwest of Reading (Map: England, E 5). Trade in agricultural produce and malting are the principal industries, and an annual wool market is held. The chief buildings are the church, built in the reign of Henry VII., and the Corn Exchange. The town owns real estate, markets, and the gas works. It dates from the Roman period, and was a gift of the Conqueror to Ernulf de Hesdin. Newbury is best known for two hard-fought but indecisive battles between the Royalists and Parliamentarian forces in September, 1643, and in October, 1644. On the battlefield is a handsome memorial to Lords Falkland, Sutherland, and Carnarvon, Royalists, who fell in 1643. Population, in 1901, 11,061. Consult Money, *History of Newbury* (Oxford, 1887).

NEW'BURYPORT. A city, including several villages, a port of entry, and one of the county-seats of Essex County, Mass., 37 miles northeast of Boston; on the Merrimac River and on the Boston and Maine Railroad (Map: Massachusetts, F 2). Among the city's noteworthy buildings and objects of interest are the public library of 40,000 volumes, Marine Museum, Putnam Free School, Anna Jaques Hospital, Old Ladies' Home, Home for Destitute Children, the Old South Church, containing the remains of George Whitefield, the house in which William Lloyd Garrison was born, the Dexter House, a statue of Washington, Washington Park, and a chain suspension bridge. The harbor, opening into the Atlantic Ocean, is safe and spacious. The principal manufactured products include boots and shoes, cotton cloths, celluloid collars and cuffs, silverware, electric car works, machinery, hats, and combs; and there is some shipbuilding, formerly a very extensive and important industry. Newburyport is also a distributing centre for coal. Under the original charter of incorporation of 1851, the government is administered by a mayor, annually elected, and a bicameral council, of which the Upper House is elected on a general ticket and the Lower by wards. The municipality owns and operates the water-works. Population, in 1890, 13,947; in 1900, 14,478.

Newburyport was settled about 1635, was a part of Newbury until 1764, when it was separately established and incorporated as a town, and was chartered as a city in 1851. It was the home of Theophilus Parsons and the birthplace of Francis C. Lowell, who introduced cotton manufacturing on a large scale into the United States. Consult: Smith, *History of Newburyport, Mass.* (Boston, 1854); and Hurd, *History of Essex County, Mass.* (Philadelphia, 1888).

NEW CALEDONIA, kăl′ê-dō′nĭ-å. An island in the Pacific, belonging to France, the southernmost of the Melanesian Islands. It is situated 1200 miles southeast of New Guinea, 850 miles from the coast of Queensland, and about the same distance from New Zealand (Map: Australasia, J 5). It is elongated in shape, extending from northwest to southeast, with a length of 240 miles, an average width of 30 miles, and an area of 6584 square miles. It is almost entirely surrounded by a coral reef, which is five to fifteen miles from the shores, and affords a belt of well-protected navigable water inside. The coast itself is indented with numerous bays, forming, especially on the southwestern side, many excellent harbors. The interior is very mountainous. There are two parallel ranges running the entire length of the island and inclosing a longitudinal valley between them. They are of nearly uniform height, except in the south, where they are broken by marshy lowlands. The highest point is an unnamed peak near the northwest coast, with an altitude of 5570 feet. Mount Humboldt in the southeast is 5360 feet high. The rocks are composed chiefly of serpentine, gneiss, schists, and limestone. There are no active volcanoes, but some evidences of ancient volcanic activity, including thermal springs. The rivers are all short, only one being navigable (25 miles).

The proverbially healthful climate is both drier and cooler than that of the other Melanesian Islands. Perpetual spring reigns. The rainfall (70 inches) is sufficient to sustain a very rich flora, although large areas are semi-arid pine barrens in which the *Araucaria Cookii* is prominent. True forests appear chiefly in the northern part, and contain much valuable timber, though sandal-wood has now practically disappeared. The fauna, like that of all other Oceanic islands, is very poor in varieties, a single species of bat being probably the only indigenous mammal, while reptiles are also few. The avifauna is the richest, and is related to that of the Australian continent rather than to that of New Zealand. The natives of New Caledonia, whom the French style Canaques ('Kanakas'), are Melanesians, probably of mixed (Papuan-Polynesian) type. The coast tribes seem to be better shaped and more regularly featured than the rest. They are above the average in stature, with dolichocephalic head form. The absence of large animals on the island has made them practically vegetarians, but it may account in part for the cannibalism which once prevailed in this part of the world. One of their most interesting institutions is the pilu-pilu, or yam-harvest dance, with its mock fight. Something like the 'duk-duk' society of New Britain exists among them. Among other things worthy of note are their beehive huts, grotesque carvings of heads, and sling-stones. The bow seems to be little employed, the spear and club being preferred. Traces of ancient aqueducts are reported to have been discovered in some parts of the island. Numerous petroglyphs and rock-carvings exist, some of which are considered pre-Kanaka. Since New Caledonia has been made a French penal colony, some admixture between the Europeans and the native women has taken place. Some of the tribes of the interior are still little known. The Webias of Central New Caledonia, who still live in a state of independence, and have not yet been seriously influenced by the whites, are said to be good-natured people and skillful fishermen.

The natives are the best agriculturists of all the Oceanic tribes, and irrigate the soil by means of aqueducts. They have even succeeded better than the white farmers, as the latter have been embarrassed for lack of labor, though they have imported Chinese and New Hebrides islanders. The natives live on reservations from which whites are excluded, but they are rapidly decreasing in number—50 per cent. in the last fifty years. The chief agricultural products are coffee, maize, tobacco, sugar, grapes, and pineapples. Wheat and cotton have also been introduced. The mineral wealth is considerable, including gold, silver, lead, copper, nickel, cobalt, chromate of iron, and coal. The last six are mined, and the nickel output is the most valuable, amounting in 1899 to 74,614 tons of ore, valued at about $800,000. The commerce is considerable, amounting in 1899 to about $4,000,000, including imports and exports. Of the latter the principal are minerals, canned meats, and coffee. A railroad is under construction from Nouméa, the capital, to Bourail (90 miles).

The island with its dependencies, the Isles of Pine, Wallis, Futuna, and Alafi, and the Huon and Loyalty Islands, is administered by a military governor, who is assisted in civil matters by a privy council. The colony is chiefly used as a penal settlement, and convicts constitute the majority of the white inhabitants. In 1898 the total population was 52,756, of whom 5585 were free colonists, 1762 officials, 1714 soldiers, 7477 convicts under sentence, 2515 liberated convicts, 1829 Asiatics, and 31,874 natives.

The island was discovered by Cook in 1774. In 1843 the French flag was raised, but the act was disavowed, owing to protests from England. Ten years later, however, the French took formal possession in order to put a stop to the cannibalism and excesses committed by the natives. In 1864 the penal settlement was founded, and after the Franco-Prussian War thousands of Communists were deported hither, most of whom have now returned to France. The natives have always been suspicious of the whites, and in 1878 rose in revolt, massacring many of the colonists.

Consult: Garnier, *La Nouvelle-Calédonie* (3d ed., Paris, 1876); Anderson, *Fiji and New Caledonia* (London, 1880); Cordeil, *Origines et progrès de la Nouvelle-Calédonie* (Numea, 1885); Griffith, *In an Unknown Prison Land: An Account of Convicts and Colonists in New Caledonia* (ib., 1901.)

NEW CASTILE, kăs-tēl′. The southern part of Castile (q.v.).

NEW'CASTLE. A city of New South Wales, situated at the mouth of the Hunter River, 102 miles north-northeast of Sydney, with which it is connected by rail and by steamers (Map: New South Wales, F 3). It is a well-built town with paved streets and fine public buildings. It is the principal port for the northern part of New South Wales, and is the greatest coaling port in the Southern Hemisphere. There are twenty-five collieries in the district, employing about 7000 persons. The wool trade is also large. Newcastle has some five miles of wharves, at which vessels of the largest tonnage may load and discharge. The area of the harbor, which is protected by two forts and two breakwaters, is 540 acres. The width of the channel at the entrance of the harbor is 1200 feet, and the depth of water on the bar 25½ feet, and of the harbor 27 feet at high and 23 feet at low water. The industries of Newcastle include a steam biscuit factory, copper-smelting works, a brewery, shipbuilding yards, foundries, carriage factories, and a boot factory. It is the seat of a United States consul, and owns its gas and electric lighting plants and water-works. Population, in 1891, 13,000; in 1901, 14,250.

NEW CASTLE. A city in New Castle County, Del., six miles south of Wilmington; on the Delaware River, at the head of Delaware Bay, and on the Philadelphia and Reading and the Philadelphia, Baltimore and Washington railroads (Map: Delaware, P 2). It has a good harbor and regular steamship connection with Philadelphia and Baltimore, is the centre of an agricultural and fruit-growing region, has large shad-fishing interests, and manufactures iron pipe, woolen and cotton goods, shirts, flour, and bricks. The city possesses several buildings of historic interest, a public library of 6000 volumes, and two parks. Under the charter of 1875, the government is administered by a mayor, chosen every three years, and a unicameral council, elected at large. Settled by Swedes in 1640, New Castle was held successively by the Swedes, Dutch, and English, and was the landing place of William Penn in 1682. It was incorporated first in 1875. Population, in 1890, 4010; in 1900, 3380.

NEW CASTLE. A town and the county-seat of Henry County, Ind., 41 miles east-northeast of Indianapolis; on the Blue River, and on the Lake Erie and Western, the Cleveland, Cincinnati, Chicago and Saint Louis, and the Pittsburg, Cincinnati, Chicago and Saint Louis railroads (Map: Indiana, D 3). The town is surrounded by a farming district and has a supply of natural gas, and is an industrial centre of importance. The leading manufactures include tin, sheet iron and steel, bridge works, iron and brass beds, pianos, agricultural machines, furniture, handles, shovels, carriages, bricks, paper boxes, flour, etc. The water-works and street lighting plant are owned by the municipality. Population, in 1890, 2697; in 1900, 3406.

NEW CASTLE. A city and the county-seat of Lawrence County, Pa., 50 miles northwest of Pittsburg; at the junction of the Shenango and Neshannock rivers, and on the Erie, the Pennsylvania, the Pittsburg and Lake Erie, the Pittsburg and Western, and the Western New York and Pennsylvania railroads (Map: Pennsylvania, A 3). It is the commercial centre of a fertile agricultural region, which has also rich deposits of bituminous coal, limestone and sandstone, fire clay, and iron ore, and is noted for its extensive manufactures of iron, glass, fire brick, steel wire nails, boilers, machinery, tin plate, stoves, plows, lumber products, flour, paper, etc. The Y. M. C. A. maintains a library; and the city has a beautiful place of resort in Cascade Park, owned by the traction company. Settled in 1812, New Castle was chartered as a city in 1869. The government, under a charter of 1889, is vested in a mayor, chosen every three years, and a bicameral council, of which the Upper House (Select Council) confirms the executive's appointments of the heads of administrative departments. Population, in 1890, 11,600; in 1900, 28,339.

NEWCASTLE, Henry Pelham Fiennes Pelham Clinton, Fifth Duke of (1811-64). An English statesman. He was educated at Christ Church, Oxford, and represented South Notts in Parliament from 1832 to 1846, when he was ousted by the influence of his father, the fourth Duke, for supporting Sir Robert Peel in his free-trade measures. In the brief Conservative Administration of 1834-35 he had been a Lord of the Treasury, and First Commissioner of Woods and Forests in the Peel Administration, from 1841 to 1846. He was then made Chief Secretary to the Lord Lieutenant of Ireland, but went out of office with his chief a few months afterwards. He succeeded to the dukedom in 1851, and returned to office in 1852, filling the post of Secretary of State for the Colonies (which formerly included the Department of War) in the Aberdeen Government. The war with Russia broke out, and in June, 1854, it was found necessary to create a Secretary of State for War, and the new office was assigned to Newcastle. The sufferings of the British army before Sebastopol in the winter of 1854 raised a storm of popular discontent, and when the House of Commons determined to inquire into the conduct of the war, the Duke resigned, though the system, not the Minister, was to blame. Newcastle was reappointed Secretary of State for the Colonies in the second Administration of Lord Palmerston, 1859. In 1860 he accompanied the Prince of Wales during a tour in Canada and a portion of the United States, and on his return received the Order of the Garter from the Queen. Though his administration was meeting with general approval, failing health compelled him to resign, and he died a few months later on October 18, 1864.

NEWCASTLE, Margaret, Duchess of. See Cavendish, Margaret.

NEWCASTLE, Thomas Pelham-Holles, First Duke of (1693-1768). An English statesman. He was educated at Westminster School, and for a short time attended the University of Cambridge. He gave considerable aid to the House of Brunswick on the death of Queen Anne, and as a result various honors were conferred on him, and in 1715 he was created Duke of Newcastle. In 1724 he became Secretary of State for the southern department in Walpole's coalition Administration, and by aiding now one party and then another, as it best suited his interests, he remained in office almost continuously for thirty-eight years. In 1754 Newcastle became Prime Minister. He was in power at the beginning of the hostilities of the Seven Years' War (q.v.), but affairs were mismanaged completely, and in November, 1756, Newcastle resigned. Pitt now took charge of the war and foreign affairs. In 1757 a Newcastle-Pitt Ministry was formed, Pitt being the virtual head. In 1762 Newcastle was forced out of office by Lord Bute, and thereafter was of little importance, though during the short Rockingham Administration, formed in 1765, he filled the office of Privy Seal. He died November 17, 1768. Newcastle seems to have had much of the absurd and grotesque in his character. Consult: Coxe, *Pelham Administration* (London, 1829); Cobbett, *Parliamentary History* (London. 1806-20); Carlyle, *Frederick the Great* (London, 1888); Stanhope, *History of England from the Treaty of Utrecht to the Treaty of Versailles, 1713-83* (London, 1851-54); Lecky, *History of England in the Eighteenth Century* (London, 1878-90).

NEWCASTLE, William Cavendish, Duke of. An English statesman. See Cavendish, William, Duke of Newcastle.

NEWCASTLE-UNDER-LYME, līm. A Parliamentary and municipal borough in Staffordshire, England, 15 miles northwest of Stafford (Map: England, D 3). Its chief buildings are the town hall and high school, with which is incorporated the free grammar school, founded in 1602. The quaint red sandstone tower of the restored parish church dates from the twelfth century. The town has greatly improved in modern times; it owns remunerative real estate, gas, markets, and free library, and provides technical instruction, and maintains a sewage farm, cemetery, and isolation hospital. Hats were formerly the principal branch of manufacture, but the making of army clothing is now the chief industry. Newcastle-under-Lyme is surrounded by famous potteries, and coal-mines are worked in the vicinity. Of Saxon origin, the town was named after a castle built by Henry I. near the great forest of Lyme. The town received its first charter from Henry II. in 1175. Population, in 1891, 18,450; in 1901, 19,914.

NEWCASTLE-UPON-TYNE, tīn. An episcopal city and municipal county of England, capital of Northumberland, on the left bank of the Tyne, eight miles from its mouth (Map: England, E 1). The town stands partly upon an elevated plateau and partly upon the north bank of the river. The river is crossed by three bridges, which connect Newcastle with Gateshead (q.v.)—the High Level Bridge, the Redheugh Bridge, and a swing bridge (completed in 1874 at a cost of nearly £500,000). The High Level Bridge is one of the engineering triumphs of Robert Stephenson. The length of the viaduct is 1337 feet, and the height of the railway above high-water mark, 112 feet. It has a broad carriageway, by which the ordinary traffic avoids the precipitous streets on both sides of the river, with passenger paths on each side, and the railway above.

The Church of Saint Nicholas is a noble edifice, chiefly in the Decorated style. In the Guildhall, an old and somewhat inconvenient building, situated beside the river, the town assizes are opened and the quarter sessions held. Under the Guildhall proper there is an exchange for the merchants, ship-owners, and brokers of the quayside. In the Moot Hall, a modern, handsome Grecian building overlooking the swing-bridge, the town and county assizes are held. The spacious town hall, a modern building, stands on a block of ground facing Saint Nicholas Church; associated with it are a corn market and offices for the transaction of the town business. The market for the sale of meat and vegetables is one of the most spacious and commodious in the kingdom. All the railways entering the town terminate in a large station near its centre. The jail, a heavy and costly building, occupies a low and confined situation. The postal and telegraph office is one of the largest and finest of the public buildings in the town. There are two theatres—the Royal (the ornament of Grey Street, the handsomest street in the town), and the Tyne Theatre in Westgate Street. Among the educational institutions are a natural history museum, a public library, a literary and philosophical society, society of antiquaries, a natural history society, mechanics' institute, and an institute of mining engineers. The colleges of medicine and science are both connected with the University of Durham. A column surmounted by a statue of Earl Grey, to commemorate the passing of the Reform Bill, and a bronze statue to George Stephenson are the principal monuments in the city.

Of benevolent institutions there are an infirmary, a dispensary, asylums for the blind, the deaf and dumb, and two orphanages. The municipal property is valued at $15,000,000, and consists of real estate, markets, street railways, and quays. The municipality maintains baths, wash houses, free libraries, cemeteries, and dust destructors, and indirectly contributes to technical education; important domestic utilities such as gas, water, etc., are provisionally monopolized by companies. Extensive improvements have modernized the older portions of the town, and the streets generally are wide, well paved and well lighted. The trade of Newcastle consists chiefly in coal from the Northumberland and Durham regions, of which it is the great centre. Large quantities of lead, the produce of the mines of Alston Moor and Weardale, are brought to Newcastle for manufacture, and a large quantity of unrefined lead is also imported from Spain.

At Newcastle the railway system had its origin, and its locomotive and engineering works are among the largest in England. The ordnance works of Sir William Armstrong at Elswick, the western part of Newcastle, are well known. Iron shipbuilding and various branches of engineering are extensively carried on, and since 1882 several men-of-war have been constructed on the Tyne. Newcastle occupies an important position in the manufacture of soda, bleaching-powder, vitriol, salt, and other chemical products. Earthenware is largely manufactured, and glass-staining has reached great perfection. The firebrick trade has attained large proportions, and there are important manufactures of gas-retorts and sanitary pipes, which are sent all over the world. Immense numbers of grindstones are exported. Portland and other cements are manufactured in vast quantities.

The river Tyne from the sea to Newcastle forms a natural dock for the accommodation of shipping, and for ten miles both banks are lined with quays, docks, and factories. It has four natural docks, the largest nearly a mile long, and including two piers at its mouth; £3,250,000 have been spent on the improvement of the Tyne. The entrance and many parts of the river have been deepened by dredging, and, though eight miles from the mouth of the Tyne, the tidal river is as much a port for Newcastle as the Thames is for London. An average of 15,000 vessels annually enter and clear at the Tyne ports, which comprise Newcastle and North and South Shields, with a gross tonnage of 16,000,000. The value of exports, consisting chiefly of iron, copper, lead, alkali, and machinery, averages $60,000,000 annually; and imports, including fruits, grain, butter, sugar, metals, and petroleum, average $50,000,000. The total exports from Newcastle to the United States amount to about $20,000,000. It is the seat of a United States consul.

Newcastle dates from the Roman Pons Ælii—one of the chain of forts by which the wall of Hadrian was fortified. On the withdrawal of the Romans, the deserted camp became the residence of a colony of monks, and the town was called Monkchester. Robert, eldest son of William the Conqueror, commenced to built a castle here in 1079 or 1080. Hence the modern name of New Castle. William Rufus finished his brother's castle, surrounded the town with a wall, and gave the inhabitants peculiar privileges. The present castle, which displays better than any other in England the genius of Norman military architecture, was erected by Henry II. between the years 1172 and 1177. Newcastle being made the rendezvous of the vast armaments which the first three Edwards led into Scotland, it was in their time surrounded with new walls of unusual strength and magnitude; portions of them yet remain. During the Civil War it declared for the King, and sustained a ten months' siege by the Scots. The coal trade dates from the reign of Henry III. In 1615, 400 colliers cleared the port, one-half to supply London. Lords Stowel, Eldon, and Collingwood, Mark Akenside, and Hutton, the mathematician, were natives of Newcastle. Intimately connected with it, though not born in it, were Thomas Bewick, the engraver; Robert Morrison, the Chinese scholar; and George and Robert Stephenson. Population, in 1801, 28,400; in 1851, 87,800; in 1891, 186,300; in 1901, 214,803. Consult Rendel, *Newcastle-on-Tyne: Its Municipal Origin and Growth* (London, 1898).

NEW CHURCH. See SWEDENBORGIANS.

NEW COLLEGE. A college at Oxford, England, originally known as the College of Saint Mary of Winchester. It was founded by William of Wykeham, Bishop of Winchester, and sometime Lord Chancellor of England, in 1379 for a warden, 70 fellows and scholars, 10 chaplains, 3 clerks, and 16 choristers. The college was but a part of Wykeham's plan, which included also the establishment of the famous school at Winchester, the first of the English public schools, from whose numbers the scholars of New College were to be chosen. To this new feature in English education was added also the beginning of a tutorial system in the college, by which the ordinary university instruction was supplemented by the work of the fellows of the college with the younger scholars. In the buildings of his college, Wykeham founded the school of English college architecture, and the buildings remain to-day the finest of the early colleges. In every way, this foundation was the most splendid of its time, but, owing chiefly to certain curious exemptions from university supervision in examinations (cf. King's College, Cambridge), it did not play the part that might have been expected of it during most of its history. Here Vitelli taught Grocyn Greek, and thus gave the college a very real connection with the new awakening. It is to-day, in scholarship and athletics, one of the leading colleges in Oxford. The establishment, as fixed by statutes of 1855 and 1881-82, consists of a warden, 22 fellows, 3 chaplains, 40 scholars, college officers, a choir, and, in all, some 275 undergraduates. The connection with Winchester School is still maintained very closely. The buildings are of great beauty, particularly the hall and the chapel, with windows designed by Sir Joshua Reynolds, and an imposing tower. The gardens, which include in their limits part of the old city wall of Oxford, are among the most attractive in Oxford. The college presents to 40 livings. Among the worthies of New College have been Archbishop Chichele, founder of All Souls' College, Bishop Waynflete, founder of Magdalen College, Bishops Ken and Lowth, and Sydney Smith. See KING'S COLLEGE, CAMBRIDGE; WINCHESTER; OXFORD UNIVERSITY; WYKEHAM, WILLIAM.

NEWCOMB, nū'kom, SIMON (1835—). An American astronomer and mathematician, born in Wallace, Nova Scotia. He was educated in his father's school and came to the United States in 1853. A year afterwards he began teaching in Maryland, and in 1857 was appointed computer on the *Nautical Almanac* at Cambridge. In 1858 he graduated at the Lawrence Scientific School, and in 1861 was appointed professor of mathematics in the United States Navy. He negotiated the contract for and supervised the construction of the 26-inch equatorial telescope at the Naval Observatory. He was secretary of the Transit of Venus Commission in 1871-74, observed the transit of Venus at the Cape of Good Hope in 1882, and directed several eclipse expeditions, beginning in 1860. In 1877 he became senior professor and director of the *Nautical Almanac*, a position which he held till he was retired on account of age in 1897. He was professor of mathematics in Johns Hopkins University in 1894-1901 and editor of the *American Journal of Mathematics*. Newcomb became a member of nearly all the Imperial and Royal Societies of Europe and of the various scientific associations of this country. He was also made an associate of the Institute of France, and an officer of the Legion of Honor, being the first American since Franklin to be so honored. He was president of the American Association for the Advancement of Science in 1877, of the Society for Psychical Research in 1885-1886, of the Political Society of America in 1887, of the American Mathematical Society in 1897-1898, and of the Astronomical and Astrophysical Society of America, from its foundation in 1899; vice-president of the National Academy of Sciences in 1883-89, and was chosen president of the Saint Louis Congress of Arts and Sciences. He was awarded the Copley (1874), the Huygens (1878), the Royal Society (1890), and the Bruce medal (1898); and numerous other prizes and honorary degrees from societies and universities in this country and Europe. In addition to scientific attainments he wrote on finance and political economy, and delivered a course of lectures at Harvard University on kindred topics.

NEWCOMBE (nū′kom) **MEMORIAL COLLEGE.** See Tulane University.

NEWCOMEN, nů-kŏm′en. Thomas (1663-1729). An English blacksmith, inventor of the atmospheric steam engine. a prototype of the modern machine. He was born at Dartmouth, and, it would seem, had addressed himself to the task of devising a practical engine before 1698, when Savery took out his patent. Possibly Newcomen had forged the larger parts of Savery's engine—they lived only fifteen miles apart. But it is certain that Savery shared in the patent taken out by Newcomen about 1710. The part played by John Calley is uncertain; probably he was only a grazier who advanced Newcomen money. Newcomen's engine is described and pictured in a copper engraving dated 1719; it was a combination of preceding machines and an improvement on all of them, in that it was a complete change of type, the various elements of boiler, condenser, and engine pump being divided among so many separate parts, which, with the exception of the condenser (the present form of which is due to Watt), are essentially the same as those of the modern engine. Newcomen's was the first practical machine, and it was successfully and commonly used for pumping.

NEWCOMES, nū′kōmz, The. A novel by W. M. Thackeray (1854-55). The character of Colonel Newcome is one of the finest delineations of a simple-minded, pure-hearted gentleman in fiction, and is said to have been drawn from the author's stepfather, Colonel Smyth.

NEW CONNECTION METHODISTS. See Methodism.

NEW CONNECTION OF GENERAL BAPTISTS. See Baptists.

NEW CUM′BERLAND. A town and the county-seat of Hancock County, W. Va., 33 miles north of Wheeling; on the Ohio River, and on the Pittsburg, Cincinnati, Chicago and Saint Louis Railroad (Map: West Virginia, D 1). It is chiefly engaged in the manufacture of pottery (semi-porcelain), fire and paving brick, sewer pipe, and tiling, the adjacent region having valuable clay deposits. There are also coal mines, a foundry, and mills for the pulverization of fire clay for use in iron works. Population, in 1890, 2305; in 1900, 2198.

NEW DECATUR, dė-kā′tŭr. A city in Morgan County, Ala., 25 miles west by south of Huntsville; on the Tennessee River, just above Decatur, and on the Louisville and Nashville and the Memphis and Charleston railroads (Map: Alabama, B 1). It is developing rapidly as an industrial centre, being noteworthy for iron manufactures. According to the census of 1900, capital to the amount of $1,349,000 was invested in the various industries, which had a production valued at $2,977,000. New Decatur was settled in 1887, and was incorporated in 1889. Under a revised charter of 1899 the government is vested in a mayor, elected every two years, and a unicameral council. Population, in 1890, 3565; in 1900, 4457.

NEW DONGOLA, dŏṉ′gō̇-lȧ. A town of the Egyptian Sudan. See El-Ordeh.

NEWELL, nū′el, Peter (1862—). An American illustrator, born near Bushnell, McDonough County, Ill. He worked for a time as photographer and maker of crayon portraits in Jacksonville, Ill., and later studied at the Art Students' League in New York City. Afterwards he settled at Leonia, N. J., and contributed constantly to various current publications. His work in flat tones was a later development of his original talent, and became very popular through the ingenious *Topsys and Turveys* (1893-94); *A Shadow Shown* (1896); and *Peter Newell's Pictures and Rhymes* (1899); volumes for which he furnished the text himself. He also produced the clever and grotesque illustrations for John Kendrick Bangs's *House-Boat on the Styx*, *Pursuit of the House-Boat*, and *Mr. Munchausen;* Lee's *Tommy Toddles;* Stockton's *The Great Stone of Sardis;* Mark Twain's *Innocents Abroad;* and Carroll's *Alice in Wonderland* and *Alice Through the Looking Glass.*

NEWELL, Robert Henry (1836-1901). An American humorist, born in New York, December 13, 1836. His reputation was made during the Civil War by newspaper sketches and letters over the name 'Orpheus C. Kerr' (Office Seeker). These letters were collected in four volumes (1862-68). Newell also wrote romances and several volumes of verse. His humor lightened the toil of Lincoln, and it was genuine though not excellent.

NEW ENGLAND. The collective name of the States of Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut. It has an area of 67,384 square miles, and had a population, in 1900, of 5,592,017.

Leif Ericson is believed by many to have sailed along the coast of New England as early as 1000 A.D., and it is in New England that the mythical city, Norumbega (q.v.), is generally supposed to have been located. The coast seems to have been visited by Verrazano in 1524, and was to a considerable extent explored by Sir Humphrey Gilbert in 1583, by Gosnold in 1602, by Sir Martin Pring in 1603, and by George Weymouth in 1605. By the charter of 1606 the Plymouth Company was empowered to make settlements in what was then called 'North Virginia:' but an attempt (1607), by a company under George Popham, to found a settlement on what is now the Maine coast, failed. In 1614 Capt. John Smith sailed along the coast, and also went for some distance inland up several of the rivers. He prepared a description of his voyage and a rough map of the coast, and suggested the name 'New England' for the region. Beginning with 1620, when the Plymouth colony was established in the present Massachusetts, settlers gradually came into New England, and in 1643 the colonies of Connecticut, New Haven, Massachusetts Bay, and Plymouth united to form a confederacy known as the United Colonies of New England, the first attempt at federation made in America. Each colony was to choose two commissioners, and the eight commissioners thus chosen were to hold annual sessions at Boston, Hartford, New Haven, and Plymouth, and were to take action with reference to various matters of common interest to the four colonies. In 1663 the meetings became triennial. Meetings were held as late as 1684, though in the last years little was accomplished. Of the present New England States Connecticut resulted from the union of the colonies of Connecticut and New Haven, and Massachusetts from the union of the colonies of Massachusetts Bay and Plymouth, while both New Hampshire and Maine were originally under the jurisdiction of Massachusetts, Maine not receiving a separate organization until 1820. See articles on the various States and the historical section of the article United States.

NEW ENGLAND HISTORIC AND GENEALOGICAL SOCIETY, The. An association incorporated in 1845 in Boston, Mass., for historical research in regard to the family histories of the early settlers in New England, and the collection of old records. The society began the collection of a library which now contains 30,000 volumes and as many pamphlets, chiefly upon the subject of New England history and biography, and has also a collection of relics and curios, manuscripts, and many old portraits and oil paintings. It now has a membership of a thousand, and holds monthly meetings. In 1847 the society began the publication of a quarterly magazine, *The New England Historical and Genealogical Register,* and also publishes the *Bibliopolist,* for circulation among its members, giving the proceedings and necrology of the society.

NEW ENGLAND PRIMER, The. One of the most famous school-books in the history of education. Yet it is uncertain when it first appeared, and of the 2,000,000 copies that it is reasonable to suppose were printed and sold in the eighteenth century, less than 50 survive, representing, however, some forty editions. Much has been done to clear up the bibliography of the work by Paul Leicester Ford in *The New England Primer: A History of Its Origin and Development, with a Reprint of the Unique Copy of the Earliest Known Edition, and Many Facsimile Illustrations and Reproductions* (New York, 1897). The compiler of the work was shown by Ford to have been Benjamin Harris, an English printer and rhymester, who during the Catholicizing reign of James II. came to Boston and set up a book, coffee, tea, and chocolate shop 'by the Town Pump near the 'Change.' Here some time before 1690 he first issued the *Primer,* an abridgment of another compilation, *The Protestant Tutor.* A fragment of this first edition, or of a second, soon after, was found used as waste in the binding of a book printed in 1688, and is known as "The Bradford Fragment." The *Primer* was changed from time to time to suit not only religious, but political feeling, though in general through the eighteenth century the tendency was strongly religious. The most familiar quotation from the *New England Primer* is doubtless the nursery prayer, "Now I Lay Me Down to Sleep," but many couplets from the rhymed alphabet are still remembered. The composition of the different editions varies greatly. The earliest is thus made up: (1) Title; (2) Godly Admonitions; (3) Alphabet and Syllabary; (4) Rhymed Alphabet; (5) The Dutiful Child's Promises; (6) An Alphabet of Lessons, Texts of Scripture; (7) Choice Sentences; (8) The Lord's Prayer, Creed, and Ten Commandments; (9) The Duty of Children, Texts; (10) Hortatory Verses; (11) Names in Order of Biblical Books; (12) Roman and Arabic Numerals, from 1 to 100; (13) John Rogers's Exhortation to His Children; (14) The Shorter Catechism. The more noteworthy features of other editions are: John Cotton's "Spiritual Milk for American Babes," a still shorter catechism, and a "Dialogue Between Christ, Youth, and the Devil."

NEW ENGLAND THEOLOGY. The name given to a distinct school of Calvinistic theology, originating in New England, and characterized by modifications of the older theology in respect to the nature of God; the freedom, ability, and responsibility of man; the nature of moral action; and the constitutive principle of virtue. The originator of the school was Jonathan Edwards (q.v.). With Edwards and his immediate successors the general aim was to combat Arminianism. In 1770 John Murray (q.v.) arrived in New England and began to preach Universalism, and thus introduced a new element into theological thought and controversy. (See Universalism.) The early decades of the nineteenth century were occupied with the Unitarian controversy and with discussion of the teachings of Dr. Taylor of New Haven, particularly concerning sin, depravity, and regeneration. The outcome was the adoption of the principles which have since been known as the New England theology, and which may be stated in the propositions that all sin is voluntary; that through the connection with Adam there is in man a sinful propensity which renders it certain that every man will sin from the beginning of moral action; that, though man has complete freedom of will, as a fact, he never turns to God without the previous regenerating operation of the Holy Spirit, which persuasively turns him to repentance and holiness; that holiness is disinterested love; that election is the choice, for reasons lying in the knowledge of God alone, of certain persons, without regard to their own merits, as the recipients of such gracious influence as shall certainly secure their repentance. During the past half century theological thought in New England, as elsewhere, has been profoundly influenced by German philosophy and historical criticism and by the theory of evolution. As a consequence the New England theology as a distinct school has become a thing of the past, and the unmodified doctrines of the older leaders are no longer taught in the Congregational seminaries. Among those prominent in developing and defending the teachings of the school, after Edwards (1703-58), may be mentioned: Joseph Bellamy (1719-90); Samuel Hopkins (1721-1803); Jonathan Edwards, the Younger (1745-1801); Stephen West (1735-1819); Samuel West (1730-1807); Nathaniel Emmons (1745-1801); Timothy Dwight (1752-1817); Nathaniel W. Taylor (1786-1858); Leonard Woods (1774-1854); Moses Stuart (1780-1852); Edwards A. Park (1808-1900); Henry B. Smith (1815-76); Horace Bushnell (1802-76); Samuel Harris (1814-99). Consult: Fisher, *History of Christian Doctrine* (New York, 1896); Walker, *History of the Congregational Churches in the United States* (New York, 1894); Boardman, *New England Theology* (New York, 1899). See also Congregationalism; and the biographical notices of the leaders.

NEW FOREST. A forest region in the southwestern part of Hampshire, England, with an area of 92,000 acres (144 square miles) (Map: England, E 6). The name dates from the Norman Conquest, when the district was afforested and protected by severe laws by William the Conqueror. It is a Crown possession managed by the Court of Verderers as a public pleasure ground.

NEWFOUNDLAND, nū′fŭnd-lănd′. A British colony in North America, comprising the island of Newfoundland and its dependency, Labrador. The island lies across the entrance to the Gulf of Saint Lawrence between latitudes 46° 35′ and 51° 40′ N., and between longitudes 52° 35′ and 59° 25′ W. It is separated from the eastern extremity of Labrador in the north by the Strait of Belle Isle, 10 miles wide, while Cabot Strait separates it from Cape Breton Island, 65 miles to the southwest. Newfoundland is that part of North America which lies nearest to Europe, its distance from Valentia in Ireland being 1640 miles. It is roughly triangular in shape, measuring 317 miles from Cape Ray, its southwestern, to Cape Norman, its northernmost point, while the distance from Cape Anguille in the extreme west to Cape Spear in the east is 316 miles. The total area of the island is 42,200 square miles. The coastline is extremely irregular, being indented with numerous large bays studded with countless islands, and ramifying into narrow fiords which run far into the interior. In the southeast the Bay of Placentia and Trinity Bay run in from opposite sides of the island, cutting off the Avalon Peninsula, which is connected with the mainland by a very narrow isthmus. In the northwest there is a corresponding peninsula, though less detached, known as Le Petit Nord, at the head of which the coast is deeply indented by White Bay. Many of the bays form commodious and well-sheltered harbors with deep water close to shore.

Topography. The coasts are nearly everywhere bold and rugged, presenting a line of rocky cliffs from 200 to 400 feet high, broken by the fissures which form the entrances to the fiords. In the Bay of Islands on the west coast, the small rocky islets are 1000 feet high, while the shores of the bay rise in Blomidon Cliff to a sheer height of 2125 feet from the water's edge. The interior is an undulating plateau of moderate elevation traversed by a number of ridges which terminate in the headlands, and which, like all the chief physical features, river valleys, headlands, and geological formations, run diagonally across the island from southwest to northeast. The principal ridge is the Long Range, which runs along the entire western coast, and has numerous peaks from 1500 to 2000 feet high. Avalon Peninsula is rugged and hilly, and scattered over the interior plateau are a number of isolated peaks known as 'tolts.'

Hydrography. Newfoundland has an abundance of lakes, ponds, and streams. The principal rivers flow toward the northeast coast, except the Humber, which breaks through the Long Range and enters the Bay of Islands. The largest stream is the Exploits River, which flows through a chain of long lakes stretching almost across the island, its length being 200 miles. The rivers, however, cannot be used as means of communication except as canoe routes for hunters. The largest lake is Grand Pond, 56 miles long, with an area of 192 square miles, and there are several others almost equaling this in size.

Climate. The winters are not as cold, nor are the summers as warm as in Canada, the annual extremes of temperature being 7° and 83°. The Arctic current, which skirts the eastern coast, and the east winds, which drive the floating ice into the bays along that coast, prolong the winter and spring, and render the climate here raw and chilly in winter and cool in summer. The moisture-laden east winds, moreover, bring frequent fogs.

Geology and Minerals. The bulk of the island consists of Archæan rocks, among which the Huronian system predominates in the southeastern third, and the Laurentian in the remainder of the island. There are, however, beds of Paleozoic and Lower Mesozoic, reaching as far as the Lower Carboniferous system. These are found chiefly in the troughs forming the river valleys, the valley of the Exploits following a bed of Upper Silurian rocks, 20 miles wide. The chief mineral is copper, while some lead and silver and a little gold have been found. There are large beds of gypsum on the western coast, and a small coal field exists near Saint George's Bay.

Soil and Flora. Large portions of the interior consist of marshes, and there are barren areas of rock covered with lichens and low shrubs of pine and larch. Some parts, however, are heavily timbered, especially at the heads of the bays, and along the river valleys. The latter also afford large tracts of good arable land. The principal trees are white and yellow pine, white, black, and red spruce, fir, tamarack, birch, and red maple. Among the wild animals are the black bear, wolf, and several species of fox.

Agriculture and Mining. Although there are probably 5,000,000 acres of land on the island suitable for agriculture, only 64,494 acres had been improved in 1891. Since that time the Government has offered a bonus for cleared land, and the area under cultivation now amounts to about 100,000 acres, located almost wholly along the southeast coast. The principal crops are potatoes and turnips; hay and oats are also raised. The most important mineral exploited is copper, the output of which has increased considerably in recent years. The value of the exports of copper ore in 1900 was $616,170. Pyrites and iron ore follow with a combined value of $415,764.

Fisheries. Fishery far exceeds all other occupations, and the only manufactures worthy of mention are subsidiary to the fisheries, such as the manufacture of cordage, biscuits, etc. More than 50,000 inhabitants of Newfoundland are engaged in the fisheries, and the fishing fleet in 1900 consisted of 1449 vessels and over 20,000 boats. The fisheries on the Grand Bank (q.v.) have declined, and are no longer important for Newfoundland, whose inhabitants are engaged chiefly along the coast and off the coast of Labrador. Along the west coast of the island, known as the French Shore (see *History* below), the French still enjoy the exclusive right to fish, and the United States enjoy similar rights on the southwestern coast. The cod-fisheries are the most important, the quantity caught annually in the waters of Newfoundland being valued at $9,000,000, about two-thirds of which are caught by Newfoundland fishermen. Next in importance come the seal, lobster, herring, and salmon fisheries. Seal fishing is conducted from steamers which enter the solid drift ice upon which the young seal are suckled by their mothers. The number of seal has lately declined, and the season for hunting has been restricted by law to one month, from March 16th to April 16th. The values of the fishery products exported from Newfoundland in 1900 were as follows: Dried cod, $5,446,067; cod oil, $301,091; seal skins, $162,005; seal oil, $433,011; canned lobster, $441,593; pickled herring, $146,611.

Commerce and Communications. Trade is chiefly with Great Britain, Canada, and the United States. In 1901 the total imports were valued at $7,287,200, and the exports at $8,125,920. The chief imports are flour and other food products, textiles, and hardware. Communication between the coast settlements is still effected chiefly by water, there being few roads, and practically none in the interior except the transinsular railroad. The transinsular railroad was completed in 1897, and with its branch lines had, in 1899, a length of 638 miles. There were also in that year 1314 miles of telegraph lines.

Population. The total population of the colony in 1901 was 220,249, of whom 3634 resided in Labrador. In 1891 the total population was 202,040, of whom 4106 were in Labrador. There is practically no immigration, 97 per cent. of the population being native born, chiefly of English, Irish, and Scotch descent. The population is almost wholly concentrated on the southeast coast, the interior being practically uninhabited, and the west coast barred by the French treaty rights. The capital and largest town is Saint John's, with a population of 29,594, and only four other towns, Harbor Grace, Carbonear, Bonavista, and Twillingate, have populations exceeding 3000.

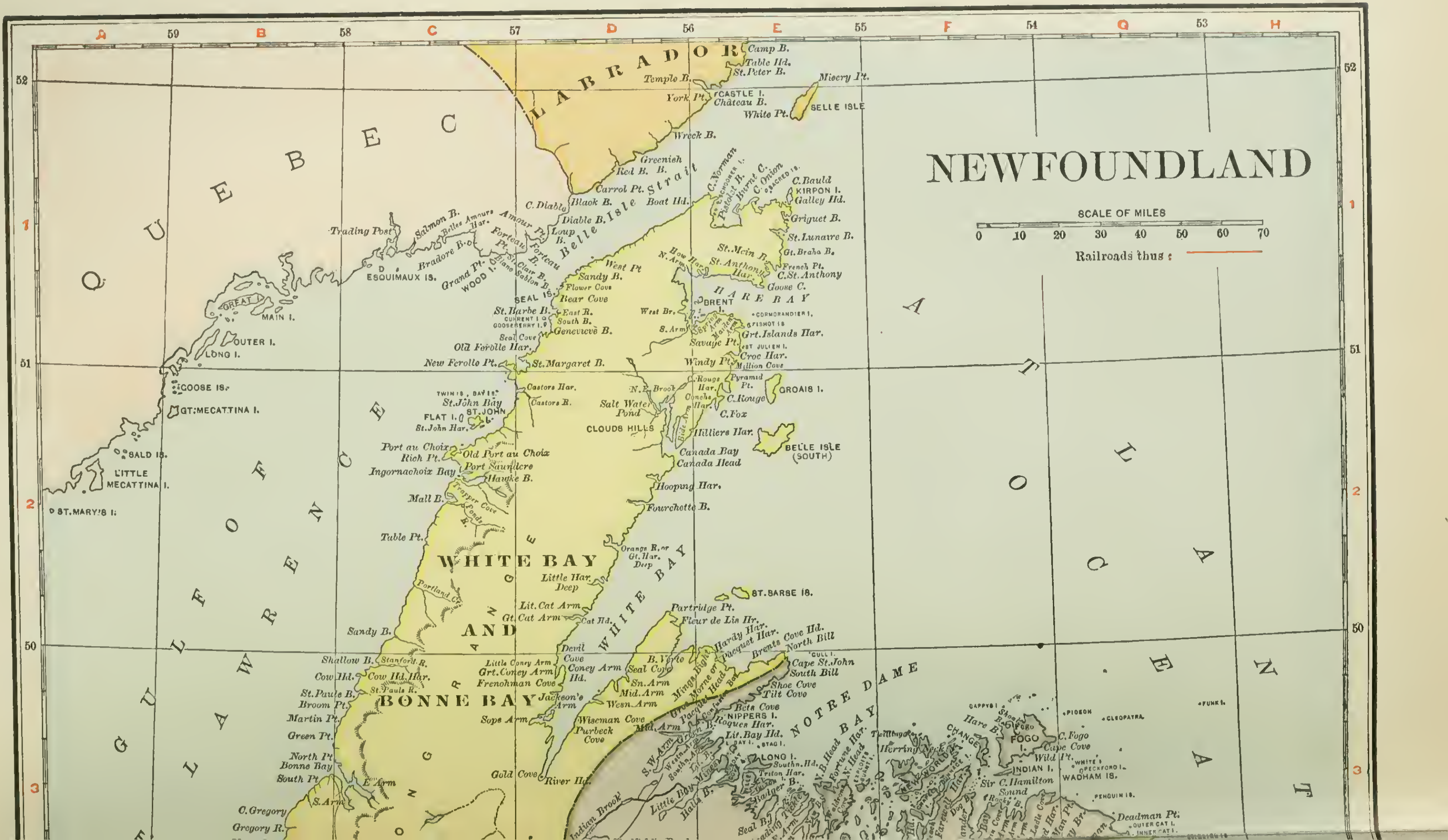
Education and Religion. In 1900 34 per cent. of the population were Roman Catholics, 33 per cent. belonged to the Church of England, and 27 per cent. were Methodists. The schools are wholly denominational. The school funds are proportioned according to the number of pupils of each denomination, and there are three superintendents of public instruction—one for each denomination. Education is not compulsory, but the public schools are well attended; there are very few private schools. Higher education is given through four colleges which prepare students for the examinations of the London University.

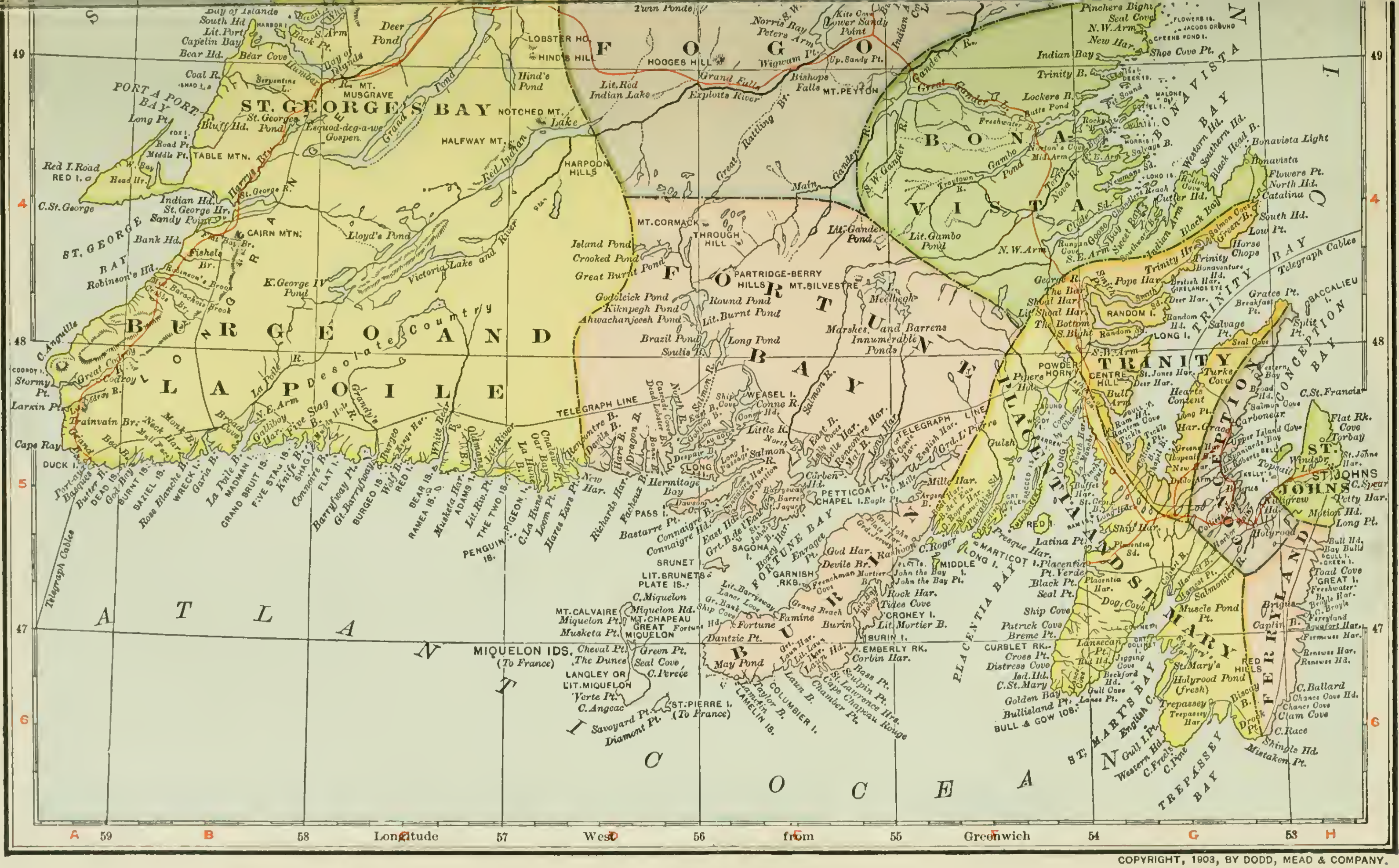
Government. The executive power is vested in a Governor appointed by the Crown and a Ministry or executive council of nine members, responsible to the majority of the Lower House of the Legislature. The latter consists of a council of not more than fifteen members, and an Assembly whose members are elected by manhood franchise. The public revenues in 1901 were $1,953,720, and the expenditures $1,952,748. The public debt was $16,891,902. The colony, like Canada, has adopted the dollar as the unit of currency.

History. Newfoundland was discovered by John Cabot in 1497, but the English did not take advantage of the discovery for nearly a century. In the meantime the cod-fisheries attracted numerous Portuguese, Spanish, and French fishermen. In 1583 Sir Humphrey Gilbert took formal possession of the island for the British Crown, but various attempts at settlement were defeated by the French. English fishermen, however, frequented the shores in increasing numbers. By the Treaty of Utrecht in 1713, France conceded the absolute sovereignty of England over the whole territory of the island. She retained, however, the neighboring islets of Miquelon and Saint Pierre as stations for her fishing fleets, and reserved the exclusive right to the cod-fisheries on the western coast, including the right to build such temporary structures on land as were necessary for curing the fish. Even after the English acquisition, however, the prosperity of the island was delayed for a century by the repressive measures adopted by the home Government, influenced by the mercantile and fishing interests, which desired the island simply as a place for drying fish during the season, to be left barren and uninhabited when the fishing season was over. Settlements were practically forbidden, no titles to land were granted until 1813, and until 1820 no house could be built without a license, while the government of the island was practically left in the hands of the fishing captains. In 1832 Newfoundland finally received a representative government giving the control of its affairs to its inhabitants. In recent years the question of the French treaty rights on the west coast has reached an acute stage. The French interpretation of the treaty, acquiesced in by the British home Government, prevented the settlement and exploitation of the west coast by inhabitants of Newfoundland. Two attempts to arrange a convention between the French and the British governments were vetoed by the Newfoundland Government, which furthermore passed an act cutting off the local supply of bait from the French fishermen. The French Government retaliated by ordering the confiscation of all fishing implements belonging to foreigners found fishing on the west coast, and it later claimed the right to confiscate the Newfoundland lobster factories which had been established there, although the treaty referred only to cod-fishing. In 1890 a temporary settlement was arranged by the *Modus Vivendi* Act, by which the French and Newfoundland establishments then existing on the shore should be left undisturbed, but no more Newfoundland lobster factories could be built until a final settlement could be reached.

Bibliography. Pedley, *History of Newfoundland* (London, 1863); Tocque, *Newfoundland as It Was and Is* (ib., 1878); Shea, *Newfoundland: Its Fisheries and General Resources* (ib., 1883); Hatton and Harvey, *Newfoundland: Its History and Present Condition* (ib., 1883); Kennedy, *Sport and Adventure in Newfoundland and West Indies* (ib., 1885); Prowse, *History of Newfoundland* (2d ed., ib., 1897); Harvey, *Newfoundland, England's Oldest Colony* (ib., 1897); Smith, *The Story of Newfoundland* (ib., 1901); "The Newfoundland Question," in *Quarterly Review*, vol. cxciv. (ib., 1901); Willson, *The Truth About Newfoundland, the Tenth Island* (2d ed., ib., 1901).

NEWFOUNDLAND DOG. This, one of the largest, handsomest, and most intelligent of dogs, named from the island whence he was first introduced to European notice, offers, in his present characteristics, something of a puzzle as to his origin. He is not an aboriginal Newfoundlander. The dog of the native Beothuks was that of the adjacent mainland (Labrador), used mostly for hauling sleds, and it had a double coat of the warmest and thickest hair, the


NEWFOUNDLAND
SCALE OF MILES
0 10 20 30 40 50 60 70
Railroads thus :
A B C D E F G H
1 2 3
59 58 57 56 55 54 53
52 51 50
QUEBEC
LABRADOR
GULF OF ST. LAWRENCE
ATLANTIC OCEAN
Strait of Belle Isle
HARE BAY
WHITE BAY
BONNE BAY
NOTRE DAME BAY
Camp B.
Table Hd.
St.Peter B.
Temple B.
York Pt.
CASTLE I.
Château B.
White Pt.
Misery Pt.
BELLE ISLE
Wreck B.
Greenish B.
Red B.
Carrol Pt.
Black B.
C. Diablo
Diable B.
Loup B.
Boat Hd.
Forteau B.
Forteau Pt.
Amour Pt.
Belles Amours Har.
Salmon B.
Trading Post
Bradore B.
ESQUIMAUX IS.
Grand Pt.
WOOD I.
Blanc Sablon B.
Clair B.
GREAT
MAIN I.
OUTER I.
LONG I.
COOSE IS.
GT.MECATTINA I.
SALD IS.
LITTLE MECATTINA I.
ST. MARY'S I.
C. Norman
Pistolet B.
Burnt C.
C. Onion
SACRED IS.
C. Bauld
KIRPON I.
Galley Hd.
Griquet B.
St. Lunaire B.
Gt. Braha B.
St. Mein B.
St. Anthony Har.
French Pt.
C. St. Anthony
Goose C.
How Har.
N. Arm
West Pt.
Sandy B.
Flower Cove
Bear Cove
SEAL IS.
St. Barbe B.
East R.
South B.
CURRENT I.
GOOSEBERRY I.
Genevieve B.
Seal Cove
Old Ferolle Har.
New Ferolle Pt.
St. Margaret B.
BRENT
West Br.
S. Arm
CORMORANDIER I.
FISHOT IS.
Grt. Islands Har.
Savage Pt.
ST. JULIEN I.
Croc Har.
Windy Pt.
Million Cove
Castors Har.
Castors B.
TWIN IS., BAY IS.
St. John Bay
FLAT I.
ST. JOHN I.
St. John Har.
N.E. Brook
Salt Water Pond
CLOUDS HILLS
C. Rouge Har.
Pyramid Pt.
Conche Har.
C. Rouge
GROAIS I.
C. Fox
Hilliers Har.
Canada Bay
Canada Head
BELLE ISLE (SOUTH)
Port au Choix
Rich Pt.
Old Port au Choix
Port Saunders
Ingornachoix Bay
Hawke B.
Mall B.
Trapper Cove
Ponds
Hooping Har.
Fourchette B.
Table Pt.
Orange B. or Gt. Har. Deep
Little Har. Deep
Portland Cr.
Lit. Cat Arm
Gt. Cat Arm
Cat Hd.
ST. BARBE IS.
Partridge Pt.
Fleur de Lis Hr.
Hardy Har.
Pacquet Har.
Brents Cove Hd.
North Bill
GULL I.
Cape St. John
South Bill
Sandy B.
Devil Cove
Coney Arm Hd.
Shallow B.
Stanford R.
Little Coney Arm
Grt. Coney Arm
Frenchman Cove
B. Verte
Seal Cove
Sn. Arm
Mid. Arm
Wesn. Arm
Cow Hd.
Cow Hd. Har.
St. Pauls B.
St. Pauls R.
Broom Pt.
Jackson's Arm
Sops Arm
Wiseman Cove
Purbeck Cove
Mings Bight
Grt. Morne or Pacquet Head
Shoe Cove
Tilt Cove
Bete Cove
NIPPERS I.
Roques Har.
Lit. Bay Hd.
Martin Pt.
Green Pt.
North Pt.
Bonne Bay
South Pt.
C. Gregory
Gregory R.
S. Arm
E. Arm
Gold Cove
River Hd.
Indian Brook
Little Bay
Halls B.
LONG I.
Triton Har.
Southn. Hd.
N.B. Head
Fortune Har.
Herring Neck
NEW WORLD I.
CHANGE IS.
Hare B.
FOGO
FOGO I.
C. Fogo
Cape Cove
Wild Pt.
INDIAN I.
Sir C. Hamilton Sound
PIGEON
CLEOPATRA
FUNK I.
WADHAM IS.
PENGUIN IS.
Deadman Pt.
OUTER CAT I.
INNER CAT I.



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hairs protruding through an undercoat of short and fluffy fur, or 'wool.' From early in the sixteenth century French, Spanish, Portuguese, and English fishermen frequented the shores of Newfoundland in ever-increasing numbers. The presence of so relatively great a foreign population, all arriving in short periods, overtaxed the capability of the native dogs to meet the demand, and, exactly as happened later in Alaska, the first settlers took into the island 'outside dogs,' among which were undoubtedly some of the big dogs of Spain, where the mastiff, the bloodhound, and a ferocious variety of pointer were then common. These crossed miscellaneously with the Indian dogs, but the pointer especially seems to have introduced into the double-coated native his color, size, intelligence, and keen scent, all qualities well marked in the Newfoundland dog as he came into European knowledge at the end of the eighteenth century. So highly was he then esteemed for his wonderful retrieving powers, that he was almost entirely exported, and his breed in the land of his home almost eliminated. Inquiries made in 1890 showed that, except in one or two outlying islands, none remained in Newfoundland. Fortunately, the breed has been maintained in Great Britain and in America, from the original stock.

The Newfoundland is a massive dog, 27 inches high at the shoulder, and often weighing 100 pounds. In color he is almost always black and white, or all black, although when first imported many were brown and white; and he has a dense coat of coarse texture and oily nature, able to resist water, for which this breed has a passion. If the coat be brushed the wrong way it should fall back into its place naturally. His head is broad and massive; his fore legs perfectly straight, his hind legs very strong with great freedom of action; his feet large and well shaped; his ears small, set well back and lying close to the head. His eye is small and deeply set, but does not show any haw. Consult authorities cited under Dog.

NEW′GATE. A famous London prison, established at the 'new gate' of the city, probably near the beginning of the twelfth century. The earliest authentic mention of it dates from 1218, when it was repaired by order of the King. It was repaired and enlarged in 1638, and wholly rebuilt after the great fire of 1666, which had partially destroyed the old building. In 1770 work was begun on the reconstruction of the prison. The work was hardly finished when the prison was sacked during the 'Lord George Gordon riots.' In 1857-59 the internal structure of Newgate was changed, so as to provide separate cells for prisoners, who had formerly been permitted to mingle with each other. In 1902 the building was demolished.

In the early centuries of its existence Newgate was used for almost every class of prisoners—prisoners of State, Jews charged with child murder, regrators and forestallers, debtors, as well as for ordinary criminals. The prisoners endured a most wretched existence. If they possessed property, they were subjected to the limitless rapacity of their jailers; if without property, they had to rely upon alms for food. Frequently they were detained for years before securing a hearing on the charges upon which they had been committed to prison. These conditions remained practically unchanged in the sixteenth and seventeenth centuries, when the prison began to be crowded with a new class of inmates, those who adhered to proscribed religious creeds. Henry VIII. and Mary, and in later years of her reign, Elizabeth, made use of Newgate as a place of detention for those who were to be tried for heresy or popery, as the case might be. It was in Newgate that such prisoners were tortured in the hope of their recantation, or to force them to implicate others. John Rogers and Hooper were among the more famous of the prisoners of this class.

With the cessation of religious persecution, Newgate was again occupied chiefly by felons awaiting execution, of persons awaiting trial on criminal charges, and of debtors. The condition of its inmates was evil both from a moral and a sanitary point of view. Those who were guilty of mere misdemeanors were permitted to associate with the most hardened criminals, with the result that many not originally inclined toward professional crime became involved in the plots of the professional criminals. This evil was aggravated after 1780, when Newgate became the regular place of detention of felons condemned to transportation. After 1815 debtors were no longer confined in Newgate. Sanitary conditions were even worse. From the Middle Ages Newgate had been noted for its epidemic diseases—the 'jail distemper,' probably a form of typhus fever, being a frequent malady. In 1414 sixty-four prisoners had died of this disease; and its ravages were common down to the end of the eighteenth century. In 1752 an attempt was made to check the evil by the employment of mechanical ventilation, but with small success. In the early part of the nineteenth century philanthropists began to interest themselves in the moral and sanitary conditions of Newgate. Effective reform did not take place, however, until after 1840. After 1849 convicted prisoners were removed to a new prison in Holloway, and Newgate remained, until its demolition, almost exclusively a place of detention for prisoners awaiting trial. Consult Griffiths, *Chronicles of Newgate* (London, 1884).

NEW GLASGOW, glăs′kō. A manufacturing town of Pictou County, Nova Scotia, Canada, on the East River and on the Nova Scotia Railway, 8 miles southeast of Pictou Landing on Northumberland Strait, with which it is connected by a branch line. It is the centre of an important coal and iron mining district with their supplemental industries; there are also ship-building yards, glass factories, tanneries, etc. Population, in 1891, 3776; in 1901, 4447.

NEW GRANADA, grȧ-nä′dȧ. The old name for the Republic of Colombia (q.v.).

NEW GUINEA, gĭn′ē, or Papua. A large island north of Australia, from which it is separated by Torres Strait. It is surpassed in size only by Greenland. Borneo is a little smaller, and Madagascar about three-fourths as large. Its area is estimated at 313,183 square miles, or almost exactly that of Texas and Louisiana together. It lies on the extreme western side of the Pacific Ocean between latitude 0° 19′ and 10° 43′ S. and longitude 131° 12′ and 150° 48′ E. Its length is nearly 1500 miles, its greatest width over 400 miles, and its longer axis extends from northwest to southeast. The larger portion of the island west of longitude 141° has been claimed by the Dutch since 1828; the eastern portion is divided between the British on the south and the Germans on the north, their territories having been defined respectively in 1884 and 1886.

Topography. The waters on the south of the island are so shallow that if the sea floor were elevated 300 feet New Guinea would form a part of Australia and the Louisiade Archipelago in the southeast would be a part of the mainland. Oceanic depths encircle the island on the other sides. Around it are scattered a considerable number of islands, some of which were undoubtedly torn away from the greater land mass. In many places the coast is fringed with coral reefs and islands, most of them covered with vegetation. The vastness of the island, together with the marshy coastlands and dense forests and jungle, hindered exploration and white enterprises till the last decades of the nineteenth century. The interior has not been adequately explored, and most of the western half of the island, under the Dutch flag, is still unknown except along the coasts. There are a sufficient number of indentations on the coasts to provide excellent harbors as the country develops. Port Moresby, with a population of 1000 natives and 50 Europeans, has wharves for shipping, and is the seat of government and the chief port of Southeastern New Guinea (British New Guinea); Samarai and Daru, islands near the mainland, provide the other ports for this colony. Friedrich Wilhelmshafen is the most important port of the northeast of the island, or Kaiser Wilhelmsland (German New Guinea), and vessels trade at a few points in Western New Guinea, the half of the island which is possessed by the Netherlands.

A large part of the coasts are fronted by low and marshy plains suitable for rice-growing; but the interior is very rugged and so densely covered with tropical vegetation that progress is extremely difficult, excepting along a few rivers. Nearly everywhere paths have to be cleared with hatchets, and a mile of advance is often a hard day's work; under such circumstances exploration has been very slow; but the sum total of the work of many explorers has given a fair idea of the interior, excepting in Dutch New Guinea.

Through the eastern half of the island stretches range after range of mountains extending from northwest to southeast, the eastern ranges culminating in the Owen Stanley Mountains, whose highest peaks, Mount Victoria (13,200 feet) and Mount Albert Edward (13,000), are supposed to be the loftiest elevations of British New Guinea. The eastern mountains are of igneous origin, the central masses schistose, and the western ranges chiefly sandstone. The parallel chains of the Kaiser Wilhelmsland ranges are also stupendous and may be seen far out at sea long before the coast lands come into view. The two lofty peaks of the Bismarck range are supposed to be from 15,000 to 20,000 feet high, probably the highest summits in New Guinea. It is thought that the German mountains may be the eastern prolongation of great ranges in Dutch New Guinea still unexplored. The geological structure of the German mountains has not yet been studied. Lofty mountains, some of them 10,000 feet high, fringe long stretches of the north coast of Dutch New Guinea; and farther south the long range of the Charles Louis Mountains extends far east with elevations of 12,000 to 16,000 feet, some of them said to be covered with snow, though this statement is not authoritatively reported. The Dutch coast mountains appear to be of tertiary limestone excepting the Cyclops, which are of volcanic origin; the great mountains of the interior are chiefly composed of slates and sandstones. Everywhere between the mountains extend wide or narrow plains filled with high grass or dense jungle and scrub.

Hydrography. The central mountain ranges form the water parting between rivers flowing to the south and the north. Navigation may be developed more extensively than on most of the great islands of the world. The largest river is the Fly, which, rising on the British-German border, has a course of 620 miles to the Papua Gulf and may be ascended by steam launches for 500 miles. The Purari, farther east, is navigable by steamboats for 120 miles. The Kaiserin Augusta River in Kaiser Wilhelmsland has been ascended by a sea-going steamer for 180 miles. The Ottilia is navigable, and it is believed the Marga will be useful as a means of transportation. Little but the mouths of the Dutch rivers can yet be laid down on the maps, but the depth and breadth of some of the outlets indicate important streams.

Climate. As the island lies just south of the equator, the climate is hot in the lower altitudes, with a small annual range and an average temperature of about 79° F. The climate is usually agreeable at elevations of 3500 feet and water freezes during the night at 10,000 feet. Rain falls nearly every week in the year, but the quantity is subject to large variation, the precipitation at Port Moresby, for example, averaging 37 inches a year, while that of Samarai, farther east, is 126 inches, and at Daru, farther west, 82 inches. Malarial fever of a mild type is common on the lower grounds, but the climate away from the swamps is not inimical to the health of white men. The dense vegetation found everywhere shows the great natural fertility of the soil.

Flora. The rich flora is transitional between that of the Malay Archipelago and that of Australia. It varies with altitude and climate. Many varieties of grass and flowers are found even on the tops of the high mountains. The great forests of the south are chiefly cypress, cedar, and ebony. In Kaiser Wilhelmsland there is a great variety of cabinet timber, banyan trees, tangled vines, and the rarest of orchids. The gutta-percha tree has recently been discovered, and the Germans intend to cultivate this valuable commodity. The cultivated plants are rice, sugar, maize, yams, bananas, breadfruit, and other tropical products. The massoi tree supplies spices, medicines, and dyes, and the prospects of the rubber industry are promising. The natives make cloth from the bark of the paper mulberry and other trees, and obtain fibre from the banana, cocoanut, and the aërial roots of the pandanus. Some of the aborigines live exclusively on sago, others on yams and taro, and bananas or sweet potatoes are the staple food of other tribes. There is no agriculture in our sense of the word, except that the Germans have introduced tobacco and cotton farming with some success. It is expected that coffee, tea, and vanilla will ultimately be valuable crops.

Fauna. Wild swine are common, but there are no dangerous carnivora. The crocodiles in the rivers cause some loss of life, and there are many poisonous snakes. On the whole, the fauna is poor in quadrupeds, which include the phalanger, echidna, and rodents, and among the marsupials the wallaby and tree kangaroo. The bird of paradise is preëminent among the birds, including fourteen of the eighteen known varieties, and all those of the most magnificent plumage. Other birds include the cassowary, pigeon, emeu, hornbill, cockatoo, geese, ducks, quail, snipe, and woodcock. The capture of the trepang or bêche-de-mer, in about twenty varieties, affords an important industry off the coasts. There is considerable trade in turtle-shell, pearls, and pearl-shell.

Geology. Although the geological structure of the island has not yet been adequately investigated, important discoveries of gold have been made in British New Guinea—alluvial gold on the eastern islands and along the Mambare and other streams, and auriferous reefs on Mount Scratchley and in other places. Prospecting has scarcely more than begun, but the gold-bearing region seems to be extensive, and mining is almost the only industry of the white men in British New Guinea, the number of miners varying from 100 to 1000 men, who are meeting with some success and some disappointment. Gold has also been found in the Bismarck range of Kaiser Wilhelmsland.

Commerce. The trade of the island is still very small. The incoming of miners into British New Guinea has increased the commerce of that colony, which now amounts to over $500,000 a year, about equally divided between imports (chiefly foodstuffs, tobacco, cloth, and hardware) and exports (copra, pearl shell, gold, pearls, and sandal wood). Nearly the entire trade of this possession is with Queensland and New South Wales, about 400 small vessels a year entering and clearing the ports. The colony is treated as a postal district of Queensland, the postal movement being about 20,000 letters and 13,000 newspapers a year. The German New Guinea Company has a concession placing in its hands the development of Kaiser Wilhelmsland with stations along the coast at Friedrich Wilhelmshafen, Konstantinhafen, Finschhafen, and Stephansort. The few plantations yield export tobacco and cotton, and the natives barter copra, trepang, and mother-of-pearl. Several steam and sailing vessels owned by the company connect the ports with Bremen. Dutch New Guinea has very little trade except along the coast, an occasional Dutch war vessel supplying the needs of the trading and missionary posts.

Government. British New Guinea (estimated area, 90,540 square miles; population, 358,000) is a Crown colony with an administrator and a legislative council. The expenses of administration, about $75,000 a year, are guaranteed by the Commonwealth of Australia, which practically monopolizes the trade. The revenues are from $50,000 to $60,000 a year, chiefly from customs duties. A company called the British New Guinea Syndicate has a concession of 250,000 acres of land, best suited for cultivation, and has begun to develop systematic planting. Land is offered to settlers at 2s. 6d. an acre. Native labor is in ample supply, and the natives are improving under the British policy of gradually making them more useful to themselves and foreigners without depriving them of their inherited rights and social usages.

The German New Guinea Company maintains a court of law in each section of the colony of Kaiser Wilhelmsland (estimated area, 70,843 square miles; population, 110,000). The revenues are still very small, the expenditures being about three times as great; the deficit is covered by a Government subvention. Dutch New Guinea (estimated area, 151,800 square miles; population, 238,000) belongs to the Residency of Ternate, Molucca Islands, and is one of the outposts. A Dutch official (*Controleur*) has charge of the Government interests, but very little is done for the country excepting to protect the few white stations and prevent intertribal wars along the coast.

Population. The total population, estimated at 706,000, is very thinly spread over the island. The dense forests have had the effect to keep the small tribes apart and to make them suspicious of one another. Near the British settlements many of them are beginning to speak English, and it is found that they are best controlled by native policemen in the pay of the Government. While they often make war upon one another, they have offered no important opposition to the ingress of the whites. Many of them are cannibals, and a few white men have been killed by members of tribes addicted to eating human flesh.

Ethnology. The term 'Papuan,' which is of Malay origin (*papúwah*, 'frizzled'), is applied by modern ethnologists to the type of man found in its greatest purity in certain parts of New Guinea (often called 'Papua') and some small islands to the east and west of it. Some writers use 'Papuan' and 'Melanesian' as equivalent terms, but most authorities divide the negro-like race in question into a Papuan proper and a Melanesian section. It would seem best to restrict the term Papuan to the assumed autochthones of the great island of New Guinea and the peoples closest akin to these. Physically, the Papuans are of rather short stature, dolichocephalic, frizzly-haired, dark-skinned. This general type is not, however, without variations due to Malay, Melanesian, Negrito, and Polynesian influences. The Papuans are, as a rule, sedentary, with pile-dwellings about the coast, and may be said to be in the 'Stone Age.' Tree-dwellings, especially for purposes of refuge, are common. The Papuans generally are good fishermen, boat-users, and boat-builders, but not farers into the open sea like the Malays and Polynesians. Their characteristic vessel is the one-trunk canoe. In matters of government they seem to be less communistic than the Australians, for private property in a number of things (land, fields, houses, besides ornaments and weapons) exists, while the general tone is quite democratic, subjection to chiefs being rather a matter of popular recognition than of individual imposition. Shamanism is, however, a powerful factor. The position of woman varies in diverse parts of the Papuan domain, but is generally not low. In disposition and temperament the Papuans vary from the less energetic and very hospitable peoples of German New Guinea like the Yaropu, to the savage and warlike tribes of some regions of the British territory and the cannibals of various sections. The Papuans are an imaginative people, and possess numerous myths and an abundant folk-lore; they possess a remarkable form-sense, and are skillful in ornamental work. Their art has been treated by Prof. A. C. Haddon, in his *Evolution in Art* (London, 1895). The religion of the Papuans includes ancestor-worship, shamanism, 'temple-cults,' and spiritism. Among their customs are head-hunting, vendettas, secret societies, and the *duk-duk* of New Britain. In intellectual ability the Papuans are ranked above the Australians and below the African negroes. The chief Papuan tribes of New Guinea are the peoples about Geelvink Bay and its islands; the Arfaks of the extreme western interior—the Karons of the Arfak Hills are by some said to be Negritos; the Onimes of Maclure Inlet, and farther south, the Kovai; the Talandjang of Humboldt Bay; in German New Guinea the peoples of Astrolabe Bay, Finschhafen, the Bismarck Archipelago; in British New Guinea the tribes in the region of the Fly River (Daudai, Kiwai, etc.), and the Gulf of Papua (Orokolo, Toaripi), the tribes of the southeastern interior (Koitapu, Kupele), the Moresby region and the terminal peninsula (Kerepunu, Loyalupu, Aroma, Massim), the peoples of the Entrecasteaux and Louisiade archipelagoes (Samarai, etc.). Papuans are also to be found on the Aru group and the islands of Salawatti, Waigu, etc., to the northwest of New Guinea, and there are probably Papuan elements in the population of the Ke and Tenimber islands, and some slight traces elsewhere in Malaysia.

History. The name Guinea, derived from the name of a large negro kingdom, Ganuya, was applied by the Portuguese in the fifteenth century to the territory of the Senegal in West Africa. The Spanish explorer Iñigo Ortiz de Rez in 1545 gave the name New Guinea to the large island north of Australia on account of the physical resemblance of its inhabitants, in his opinion, to the natives of West Africa. The island was seen and reported by Dabreu in 1511, but the first European to land was Menezes in 1526, when he named it Papua after the local designation of the natives. During succeeding centuries it was visited by most of the Polynesian explorers despite the efforts of the Dutch to bar the passage to lands beyond their Molucca Islands. From 1815 to 1873 several Dutch and English hydrographic expeditions surveyed the coast, and Dutch and English missions were established respectively at Geelvink Bay and the Gulf of Papua. The inhabitants were divided into a number of petty independent tribes, over whom feudatory rights were claimed by the Moslem chiefs of small neighboring islands. The presumed rights of one of these, the Sultan of Tidore, were acquired by the Dutch and led to their expedition of annexation in 1828. In 1883 the Ministry of Queensland, Australia, proclaimed the annexation to that colony of the eastern half of New Guinea; the British Government promptly disavowed the act, but in 1884 established a protectorate over the south coast. A short time after the British occupation of the south coast, the German Government took possession of the northeast, together with the Bismarck Archipelago.

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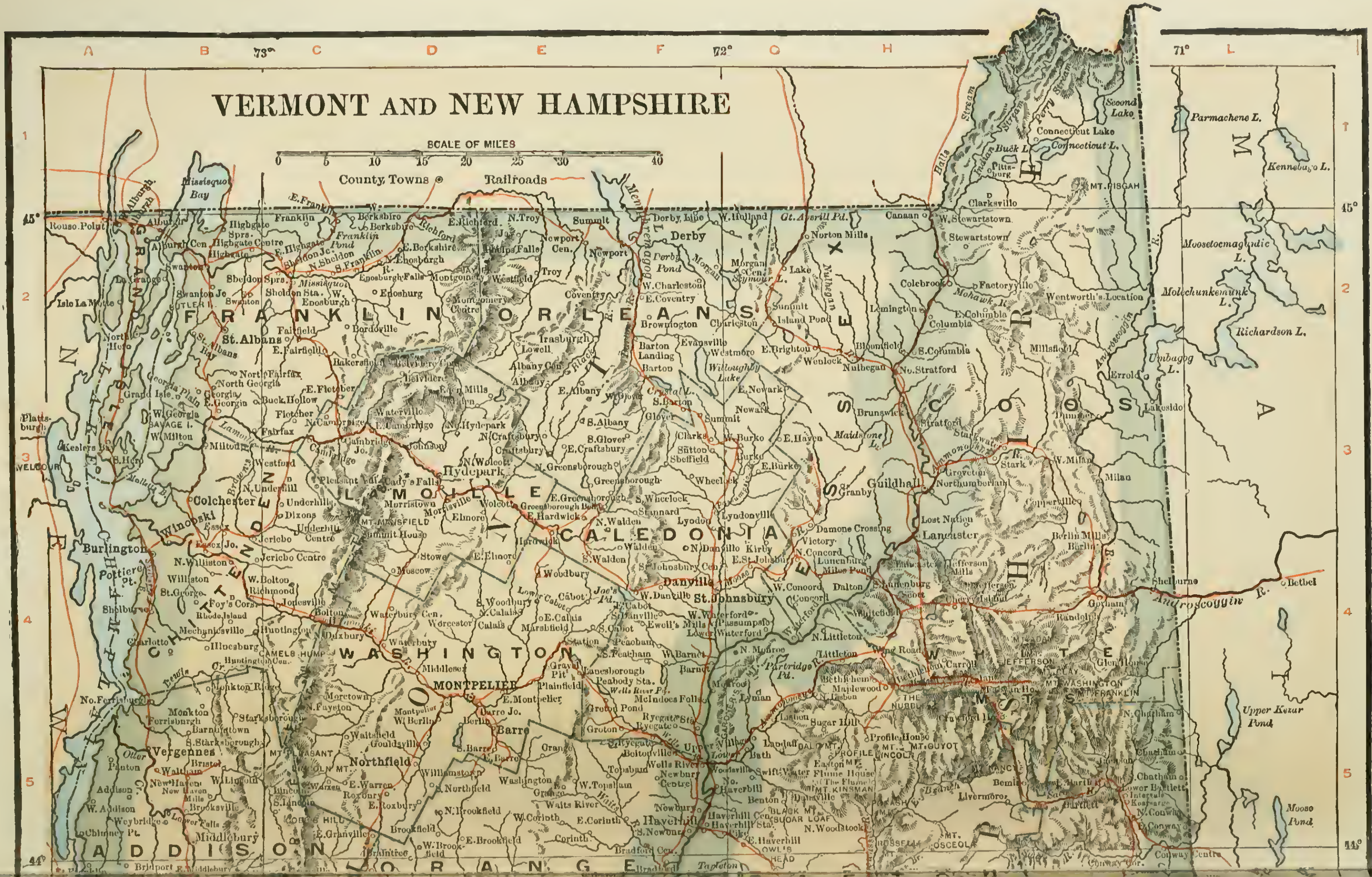
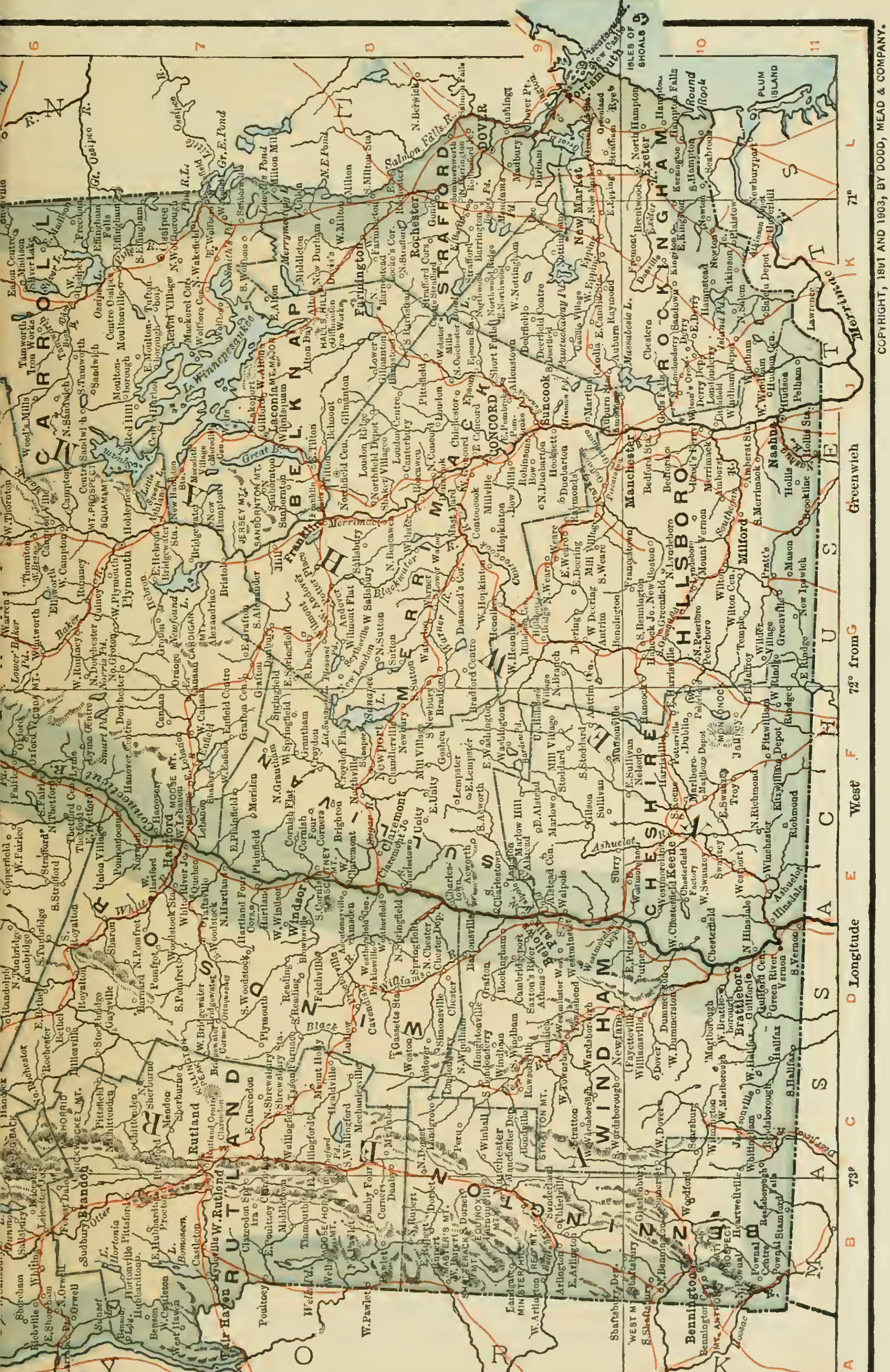
NEWHALL, nū'hạl, Charles Stedman (1842—). An American naturalist and author of juvenile books. He was born in Boston; studied at Amherst (1869) and at the Union Theological Seminary; soon left the ministry for educational work; and then became United States assistant special forest agent and superintendent of the forest reserves of northern and central California. Newhall wrote: *A History of Fall River, Mass.* (1862); various juveniles, including: *Harry's Trip to the Orient* (1885) and *Ruthie's Story* (1888); and the following works on botany: *Trees of Northeastern America* (1892); *Shrubs of Northeastern America* (1893); *Leaf Collector's Handbook and Herbarium* (1892); and *Vines of Northeastern America* (1897).

NEW HAMP'SHIRE (popularly called the 'Granite State'). A North Atlantic State of the United States, belonging to the New England group. It lies between latitudes 42° 40′ and 45° 18′ N., and between longitudes 70° 37′ and 72° 37′ W. It is bounded on the north by the Cana-

AREA AND POPULATION OF VERMONT BY COUNTIES.

County.	Map Index.	County Seat.	Area in square miles.	Population.	
				1890.	1900.
Addison	A 5	Middlebury	722	22.277	21.912
Bennington	B 10	Bennington	658	20.448	21.705
Caledonia	F 3	St. Johnsbury	652	23.436	24,381
Chittenden	B 4	Burlington	515	35 389	39,600
Essex	G 3	Guildhall	692	9.511	8,056
Franklin	B 2	Saint Albans	645	29,755	30 198
Grand Isle	A 2	North Hero	83	3,843	4,462
Lamoille	C 3	Hydepark	436	12,831	12,289
Orange	D 6	Chelsea	686	19.575	19,313
Orleans	E 2	Newport	729	22.101	22.024
Rutland	B 7	Rutland	911	45,397	44,209
Washington	D 4	Montpelier	688	29.606	36,607
Windham	D 9	Newfane	788	26.547	26 660
Windsor	E 8	Woodstock	930	31.706	32,225


VERMONT AND NEW HAMPSHIRE
SCALE OF MILES
0 5 10 15 20 25 30 40
County Towns
Railroads
FRANKLIN
ORLEANS
ESSEX
GRAND ISLE
LAMOILLE
CALEDONIA
CHITTENDEN
WASHINGTON
ADDISON
ORANGE
COOS
LAKE CHAMPLAIN
MAINE
NEW YORK
NEW HAMPSHIRE
WHITE MTS.
MONTPELIER
St. Albans
Burlington
St. Johnsbury
Lancaster
Guildhall
Hydepark
Haverhill
Middlebury
Colchester
Derby
Lake Memphremagog
Androscoggin R.
Connecticut Lake
Umbagog L.
MT. WASHINGTON
MT. MANSFIELD
CAMELS HUMP
73°
72°
71°
45°
44°
A B C D E F G H L
1 2 3 4 5



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AREA AND POPULATION OF NEW HAMPSHIRE BY COUNTIES.

County.	Map Index.	County Seat.	Area in square miles.	Population.	
				1890.	1900.
Belknap	H 7	Laconia	410	20.321	19.526
Carroll	J 6	Ossipee	939	18,124	16,895
Cheshire	F 10	Keene	734	29,579	31,321
Coos	J 3	Lancaster	1,812	23.211	29,468
Grafton	G 6	Woodsville	1,691	37,217	40,844
Hillsboro	G 10	Nashua	873	93.247	112,640
Merrimack	G 8	Concord	921	49.435	52,430
Rockingham	K 10	Exeter	693	49.650	51,118
Stafford	H 8	Dober	394	38.442	39.337
Sullivan	F 9	Newport	538	17,304	18.009

dian Province of Quebec, on the east by the State of Maine and for a distance of 18 miles by the Atlantic Ocean, on the south by Massachusetts, and on the west by Vermont, from which it is separated by the Connecticut River. Its general shape is that of a right triangle with the right angle at the southeastern corner and the acuter apex pointing north. Its extreme length is 178 miles, its extreme width 88 miles, and its area 9305 square miles, of which 9005 square miles, or 5,763,200 acres are land surface. It ranks fortieth in size among the United States.

TOPOGRAPHY. New Hampshire is relatively more rough and mountainous than the average State on the Atlantic slope. The easternmost extension of the Appalachian system traverses the State lengthwise, running first as a ridge along the western boundary on the east bank of the Connecticut River, and culminating in the rugged mass of monadnocks known as the White Mountains. These cover about 1300 square miles in the north-central part of the State, and constitute a region of romantic scenery. Among the peaks, whose naked, rocky summits reach above the timber-line, the highest is Mount Washington, with an altitude of 6293 feet. Several isolated monadnocks, outlying members of the group, are scattered over the southwestern quarter of the State, the most prominent being Mount Kearsarge, 2943 feet high, and Mount Monadnock, with an altitude of 3186 feet. North of the White Mountains, in Coos County, another elevation rises to a height of over 2000 feet, and extends indefinitely into Maine and Canada. The southeastern part of the State is generally low, being relieved by numerous 'drumlins'—rounded hills of glacial drift generally covered with boulders. Every part of the State is well drained by numerous streams, the narrow western portion by the Connecticut River, the remainder by rivers flowing to the Atlantic Ocean. The northern part of the State is drained by the Androscoggin River, which issues from Lake Umbagog, and after making an irregular detour to the west flows into Maine. The Saco also enters that State after draining the eastern group of the White Mountains. The principal river of the State after the Connecticut is the Merrimac, whose main fork, the Pemigewasset, rises in the Franconia or western group of the White Mountains. It flows southward in a series of falls and rapids, furnishing enormous water power. It has been said that the Merrimac turns more spindles than any other river in the world. The lower course of this river is in Massachusetts. Finally, the southeastern corner of the State is drained by the streams flowing into the Piscataqua estuary, this being the only harbor on the coast. Like all glaciated areas, New Hampshire abounds in lakes—irregular, beautiful sheets of water studded with wooded islets. The largest is Lake Winnipiseogee, 16 miles long and 6 miles wide. Other notable lakes are Umbago, in the north on the Maine boundary; Squam, northwest of Winnipiseogee; and Sunapee and New Found Lake, in the west.

CLIMATE. The climate is strongly affected by the elevation of the land. It is colder, on the average, than that of Maine, and the winters are severe, the ground being usually snow-covered and the rivers frozen from autumn to spring. The lower Merrimac Valley is the warmest part of the State. It is of slight elevation and but little affected by ocean breezes. Here the mean temperature for January is 21°, and for July 70°, the corresponding figures for the northern portion being 16° and 67°, and for Mount Washington 5° and 47°. The climate is quite humid, and the precipitation sufficient all over the State. It is especially abundant on the mountain summits, where it reaches 55 inches, and on the eastern slope of the mountains, where it ranges from 40 to 46 inches. It is least near the seashore and on the western slope, where there is a fall respectively of only 35 and 30 inches. The whole State is, as a rule, very healthful.

For flora and fauna, see paragraphs under UNITED STATES.

GEOLOGY. New Hampshire consists almost exclusively of ancient crystalline rocks, a fact which has earned for it the title of "Granite State." The main formations run lengthwise through the State parallel with the coast and the Connecticut River. The eastern or New Hampshire bank of the latter and a broad band along the coast are composed of rocks mainly of the Huronian series. Between these, through the centre of the State, the predominant formation consists of Montalban and other gneisses together with calciferous mica-schists in the north. The structure is, however, complicated by extensive outcrops of still older rocks. A line of granites and diorites appears near the coast west of the Piscataqua, and through the centre of the State, running west of the Merrimac Valley toward the White Mountains, there are extensive outcrops of porphyritic gneiss. The heart of the White Mountains themselves is composed mainly of granite. Few regions exhibit more well-marked evidences of glacial action than New Hampshire. The rocks are everywhere striated, and boulders of all sizes are scattered all over the State, even on the mountain summits. Moraines are also well marked; but, though there are deposits of glacial drift, and of fertile modified drift along the river valleys, the soils of the State are in general not encouraging to agriculture.

MINERAL RESOURCES. The most valuable mineral output of the State is derived from its nonmetallic rocks. Up to 1900 New Hampshire ranked first in the production of mica, the output in that year being 191,118 tons. In 1901 it fell to 65,800 tons, and was exceeded by that of North Carolina. The production of granite in 1901 was valued at $935,494. The celebrated Indian Pond and White Mountain scythestones are quarried in great quantities. Copper is mined to some extent, and ores of lead, zinc, tin, arsenic, iron, and some gold and silver are found.

FISHERIES. In the fishing industry New Hampshire is the least important of the New England coast States. Its commercial fisheries are confined to Rockingham County, on the Atlantic. The industry showed a considerable decline from 1889 to 1898. The value of the catch (1898) was $48,987, as compared with $88,511 nine years before. The most important catches in 1898 were haddock, cod, and lobsters. The 11 hatcheries of the State distributed in 1900 about 3,256,000 fry, mainly salmon, salmon trout, brook trout, and lake trout.

FORESTS AND FOREST PRODUCTS. The manufacture of lumber products is the oldest of the State's industries. It is claimed that the first sawmill in New England was established near Portsmouth in 1635. In 1900 the woodland was estimated at 5200 square miles. Much of this is cut-over land, the primeval forests of white pine having almost disappeared. But there is an extensive area of second-growth white pine, some of which is merchantable. It is estimated that since 1850 1,764,609 acres (nearly one-third) of the farm land has reverted to unimproved land, most of which is growing up in white pine. The highest mountain slopes are still covered with primeval forests of spruce, the variety of wood most largely used in the manufacture of wood-pulp. The town of Berlin, in the Androscoggin Valley, claims to be the largest pulp-manufacturing centre in the country. The manufacture of this product increased 462 per cent. in the decade 1890-1900. The value of the lumber and timber products increased ninefold from 1850 to 1900, and nearly doubled in the last decade of that period. See table below.

Agriculture. A large portion of the surface of the State lies too broken for agriculture. Only along the coast and in the river valleys is the soil rich and well adapted for farming. Latterly it has been cheaper to import cereals than to grow them in New Hampshire. The number of farms and their total acreage were but slightly greater in 1900 than in 1850, but the area of the improved acreage decreased over one-half during the half-century, amounting in 1900 to only 29.8 per cent. of the farm acreage. The most marked decline in the improved area was from 1890 to 1900. The average size of farms—123.1 acres—was about the same in 1900 as in 1860. Only 7.5 per cent. of the farms are rented. The cash system of lease is rapidly supplanting the share system. In the table below will be noticed the decided decrease in cereals from 1890 to 1900. Wheat and rye, both formerly of considerable prominence, have practically ceased to be cultivated. A considerable area of corn grown for forage or ensilage is not included in the table figures. As the cereals have decreased in importance much more attention has been given to vegetables, garden products, and fruits. In 1899 the potato crop was, after hay and forage, the most valuable farm crop. Apples are the chief orchard fruit, the number of trees in 1900 being 2.034.398. Many of the abandoned farms in New Hampshire are being acquired for summer homes by residents of cities.

Stock-Raising. With the changes in the system of agriculture dairying has become an important industry, and the number of dairy cows increased decidedly from 1880 to 1900. The value of dairy products for 1899 was $5.591,272, of which 80.5 per cent. was realized from sales. The number of other cattle, by contrast, decreased after 1850, and the number of sheep in 1900 was only about one-sixth as many as in the former year. The accompanying census figures are self-explaining.

	1900	1890
Corn	25,694	23,746
Oats	12,589	26,618
Barley	1,596	4,934
Buckwheat	1,835	3,117
Hay and forage	615,042	652,722
Potatoes	19,422	22,085

	1900	1890
Dairy cows	115,036	109,423
Other cattle	111,756	113,465
Horses	54,866	52,458
Sheep	65,318	131,611
Swine	51,211	58,585

Manufactures. Manufacturing is the leading industry. The percentage of wage-earners engaged therein gradually increased during the last half of the nineteenth century, being 17.1 in 1900, or twice that of 1850. Of the 70,419 thus employed, 21,921 were women. The decade 1890-1900 witnessed the largest absolute gain in the value of products—$118,669,308 in 1900. The southern part of the State possesses the advantage of being close to the business centre of New England, has a convenient harbor at Portsmouth, and shares with Massachusetts the excellent water power afforded by the Merrimac. The manufacturing interests accordingly are confined largely to this section of the State. The manufacture of cotton goods headed all industries until 1900. From its establishment in 1804 its growth has been steady. The water power of the Merrimac was largely the cause of the success of this industry, and determined the location of the two main cotton manufacturing centres—Manchester and Nashua. With the development of this industry in the Southern States latterly, the relative importance of New Hampshire is diminishing. The woolen industry was established in the first year of the nineteenth century. In 1900 the product was valued at a little less than half that of the cotton products. The woolen output decreased slightly during 1890-1900. Hosiery and knit goods are manufactured at Laconia, but in less quantities than formerly. The boot and shoe industry almost doubled the value of its product during 1890-1900, and acquired first rank among the industries of the State. The closely related tanning industry owes its development to the former abundance of the local supply of tanning bark. This branch reached its maximum in 1880, since when it has declined. The manufacture of flouring and grist-mill products is a long established industry, but the factory production of butter, cheese, and condensed milk is of recent though rapid growth. The table following shows the relative importance and condition of the ten leading industries.

Transportation. The first railroad charter was granted in 1835. In 1850 the mileage amounted to 467 miles. This was increased to 1142 in 1890, and 1193 in 1900. The numerous small lines have been consolidated until in 1900 the lines were operated by three companies—the Boston and Maine, the Grand Trunk, and the Maine Central. The railroad built up Mount Washington in 1868 is a remarkable piece of engineering. In its steepest part it ascends 1980 feet to the mile. Portsmouth is a port of entry, but its foreign trade is insignificant.

Banks. The first bank was the New Hampshire Bank, of Portsmouth, chartered in 1792 and until 1800 the only bank in the State. In the beginning of the nineteenth century several banks were established, which called forth special legislation, and as early as 1814 the State passed a law requiring annual reports from them. By 1835 there were twenty-five banks in the State, but in the financial panic of 1837 many suspended payment. In 1845 there were only seventeen banks, with a small aggregate capital, and a circulation of less than $1,000,000.

INDUSTRIES	Year	Number of establishments	Average number wage-earners	Value of products, including custom work and repairing
Total for selected industries given below, for State	1900	1,040	49,828	$85,488,450
	1890	1,001	45,271	63,855,641
Increase, 1890 to 1900	......	39	4,557	21,632,809
Per cent. of increase	......	3.9	10.1	33.9
Per cent. of total of all industries in State	1900	22.3	70.8	72.0
	1890	31.0	75.3	74.4
Cotton goods	1900	23	20,454	$22,998,249
	1890	27	19,383	21,958,002
Wool manufactures	1900	45	5,461	10,381,056
	1890	50	6,038	10,769,240
Hosiery and knit goods	1900	22	2,492	2,592,829
	1890	37	3,121	3,481,922
Boots and shoes, factory product	1900	67	12,007	23,405,558
	1890	64	7,912	11,986,003
Leather—tanned, curried, and finished	1900	12	552	2,664,942
	1890	18	668	2,988,209
Flouring and grist-mill products	1900	149	185	2,505,936
	1890	121	174	2,358,616
Cheese, butter, and condensed milk—factory product	1900	53	119	1,467,503
	1890	23	51	494,466
Foundry and machine-shop products	1900	87	1,979	3,049,334
	1890	76	2,034	2,895,716
Lumber and timber products	1900	553	4,188	9,218,310
	1890	570	5,370	5,641,445
Paper and wood pulp	1900	29	2,391	7,204,733
	1890	15	520	1,282,022

In the next decade the banks recovered, and by 1863, when the national banking system was introduced, there were fifty-two State banks in operation, with a capital of almost $5,000,000. By 1870 all but three banks had become national. State banks have remained unimportant since then. Private banks have been prohibited since 1799.

Trust companies appeared in 1885 and tried to do the business of both discount banks and savings banks. Six of them are in existence. Savings banks have always been numerous and popular. The two savings banks chartered in 1823 were among the first in the country. The savings banks deposits grew with special rapidity after the Civil War. About one-fourth of all the savings banks went into liquidation in the panic of 1893, and a bill was passed for their regulation in 1895, strictly limiting their investments. The act was further amended in 1901. In 1902 there were 147,928 depositors (one for about every 28 of the population), with an average deposit of $407.29. The condition of the banks in the State in 1902 is shown in the following table:

	National banks	State banks	Savings banks
Number of banks	56	10	53
Capital	$5,355,000	$610,000	No capital
Surplus	1,500,000	131,000	$3,348,000
Cash, etc	1,146,000	80,000	138,000
Loans	13,410,000	1,100,000	29,061,000
Deposits	13,449,000	1,418,000	60,249,000

Finances. Up to the beginning of the Civil War the debt of the State was insignificant, amounting to $60,000 in 1860. The war expenditures made loans necessary, and their aggregate sum rose from less than $1,000,000 in 1862 to $4,236,000 in 1865. The total expenditures of the State treasury for war purposes were $6,852,678, only $897,122 of which were repaid by the Federal Government. The State debt was gradually reduced, and by 1872 amounted only to $2.205,695. In that year, however, the commonwealth assumed the Civil War debt of the towns and cities, which increased the State debt to $4.138,124. The financial condition has been sound since then, and the debt is being reduced at the rate of from $100,000 to $200,000 a year. In 1878 a law was passed by the Legislature for taxation of railroads. In 1902 the total liabilities were $1,669,071, out of which the State owed $813,574 to trust funds, and $839,200 formed the funded debt. The cash in the treasury on June 1, 1902, was $575,612. The receipts for the fiscal year 1901-02 were $1,389,332, derived as follows: 30 per cent. from a general State tax; 25 per cent. from a tax on savings banks deposits; 27 per cent. from tax on railroads; and the rest from miscellaneous sources. The disbursements were $1,261,614, of which $570,136 was returned to towns as their share of the railroad and savings banks tax.

Government. The present Constitution was adopted in 1877. The question of revising the Constitution is submitted to the people every seven years, and if approved by a majority of those voting, a convention for revision must be called. The right of suffrage is given to male citizens twenty-one years of age who have resided in one town six months. Paupers and persons excused from paying taxes are excepted.

Legislative. Every town or place entitled to town privileges, and wards of cities having 600 inhabitants may elect one representative to the Lower House, and one additional representative for every additional 1200 inhabitants. Whenever the unit of representation contains less than 600 inhabitants, it is entitled to a representative such proportionate part of the time as the number of its inhabitants shall bear to 600. The State is divided into twenty-four districts, paying approximately equal portions of direct taxes. Each of these districts is entitled to one Senator. Representatives and Senators are elected biennially in November in open town meetings. The Legislature convenes on the first Wednesday of January. Money bills must originate in the

Lower House. Members 'seasonably attending' are paid $200, exclusive of mileage.

Executive. The Governor and the five members of the Governor's Council are chosen biennially in the month of November. The resolutions and advice of the Governor's Council are recorded, and may be called for at any time by either House of the Legislature. A two-thirds vote of each House overcomes the Governor's veto. The president of the Senate and the Speaker of the House are in the line of succession to the Governorship in case of vacancy. The pardoning power rests with the Governor, with the advice of the Council. The Secretary, Treasurer, and Commissary-General are chosen by joint ballot of the Senators and Representatives.

Judiciary. The Legislature erects and constitutes judicatures, courts of record, and other courts. All the judicial officers, such as the Attorney-General, solicitor, sheriffs, coroners, and registers of probate, are appointed by the Governor. Judicial officers serve during good behavior, except justices of the peace, whose terms expire in five years.

Local Government. The laws of the State provide for the election in each county of a treasurer, register of probate, solicitor, sheriff, and register of deeds.

Militia. The population of militia age in 1900 was 88,149. The militia in 1901 numbered 1342.

Population. The growth of the population is shown by the following figures: 1790, 141,885; 1820, 244,022; 1850, 317,976; 1860, 326,073; 1870, 318,300; 1880, 346,991; 1890, 376,530; 1900, 411,588. New Hampshire ranked 10th among the States of the Union in 1790, 22d in 1850, and 36th in 1900. The largest gain was made in the first census decade, and the population actually decreased in the decade 1860-70. The gain between 1890 and 1900 amounted to 9.3 per cent., as compared with 20.7 for the United States. Throughout the century the State contributed largely to the tide of Western migration, but this outflow has been offset in recent years by the increase in the immigration of foreigners, particularly French-Canadians, who constitute over half of the 88,107 foreign born returned by the census of 1900. The 15 towns exceeding each 4000 inhabitants collectively contain 46.7 per cent. of the total population. The density of population in 1900 was 45.7 per square mile. The State sends two members to the National House of Representatives.

Cities. The population of the largest towns in 1900 was: Manchester, 56,987; Nashua, 23,898; Concord, 19,632; Dover, 13,207; Portsmouth, 10,637. The capital is Concord.

Religion. The Roman Catholic element amounts to about 10 per cent. of the total population of the State. The principal Protestant denominations are the Congregational, with about 20 per cent. of all the church members; the Baptist, with over 17 per cent.; and the Methodist, with about 12 per cent.

Education. A number of town schools were established in accordance with the law of 1647. Grants of land for educational purposes were made before the War of Independence. In 1769, 44,000 acres were granted for the establishment of a college, and in 1821 a law was passed appropriating for a literary fund the taxes from banking corporations. The illiterate population amounted in 1900 to 6.2 per cent. of the total population of ten years and over. Of the whole school population of 71,544 in 1900, there were enrolled 65,688. The average attendance amounted to 47,276, or about 72 per cent. of the total enrollment. The total number of schools fell off from 2644 in 1882 to 2198 in 1900, but the number of graded schools increased from 481 to 773 during the same period. The length of the school term was nearly 148 days in 1900, as compared with about 118 days in 1890. The school revenue for 1900 amounted to $1,120,219, of which only $15,707 was derived from the permanent school fund. From the State came $55,519, and from local taxes, $997,667. New Hampshire has only one State normal school (at Plymouth). Representing secondary education there were, in 1900, 57 public high schools, with a total attendance of 3700, and 33 private high schools and academies, with a total attendance of 2600. The institutions of higher education are Dartmouth College, at Hanover, and Saint Anselm's College (R.C.), at Manchester.

Charitable and Penal Institutions. The State Board of Charity and Correction consists of five members appointed by the Governor and Council, and of the secretary of the State Board of Health. This board inspects all State and county charitable or correctional institutions, except the State prison and the asylum for the insane (both of which are located at Concord). The changes recommended by it must be made by the responsible officers. In 1902 there were 1203 children wholly or partially supported by public charity, 979 of them being in orphan asylums. There are 15 private orphan homes—7 Protestant and 8 Catholic—but in all but one of these, county or city children are boarded at public charge. There is a State industrial school for boys and girls, located at Manchester. In 1901 the State Legislature made appropriations for the erection of a State school for feeble-minded. During the year ending September 30, 1902, were accommodated in the almshouses of the State 1630 persons, of whom 687 were confined because of insanity, feeble-mindedness, or epilepsy. Drunkards and petty criminals are sometimes committed to the pauper institution, where they mingle freely with the other inmates. At the State prison the convicts are worked under the contract system, a fixed sum being paid per day per convict. The State has general control of the convicts.

History. The first explorer of this region was probably Martin Pring, who anchored in Piscataqua Harbor in 1603. It was included in the grant to the Council for New England in 1620, and this body on August 10, 1622, granted to John Mason and Sir Ferdinando Gorges all the land lying between the Merrimac and Kennebec for sixty miles inland, under the title 'Province of Maine.' The next year David Thomson settled at Little Harbor. In 1627 Edward Hilton settled at Dover Neck, and secured a patent later in 1629 or 1630. The province was divided November 7, 1629, and that part lying between the Merrimac and the Piscataqua fell to Mason. In November, 1631, Mason and Gorges, together with a number of merchants, received from the Council territory lying on both sides of the Piscataqua within the territory already granted to them. Several trading stations were founded, the most important of which was Strawberry Bank (Portsmouth). Many settlers came out, but the proprietors derived little profit from the colony. When the Council dissolved in 1635, Mason was confirmed in all his grants and received 100,000 acres more west of the Kennebec. The settlement of Exeter was founded by Rev. John Wheelwright in 1638 after his expulsion from Massachusetts Bay. All these settlements were practically independent and with little form of organized government. Mason was a busy man who paid little attention to this province, which was named for his native Hampshire in England. Massachusetts Bay looked with disfavor upon the settlements of Royalists and Churchmen, and laid claim to the territory. In 1641 all the settlements except Exeter were joined to Massachusetts, and Exeter followed in 1643. Mason's grandson, Robert Tufton Mason, applied to the King for restitution of the territory granted to his ancestor. A decision that Massachusetts had usurped possession was secured in 1677, and in 1679 a decree declaring New Hampshire a royal province was issued, but Mason received little satisfaction. It remained a royal province until the Revolution, but its existence was dependent entirely upon the King's will, as no charter was issued. The Governor of Massachusetts was often commissioned the Governor of New Hampshire as well. After the expulsion of Andros in 1689 New Hampshire asked to be incorporated with Massachusetts, but was refused. The colony suffered greatly in the Indian wars of the eighteenth century, but nevertheless gradually extended its settlements north and west. Boundary disputes were frequent. The dispute over the southern and eastern boundaries was settled in 1740, but the question of the possession of Vermont was not settled until 1764. During the Revolution New Hampshire bore a conspicuous part. The Continental Congress, from which counsel was asked, advised the formation of a temporary State. A convention at Exeter, December-January, 1775-76, adopted a brief constitution. In 1779 a constitution was submitted to the people, but was rejected. A convention, June 12, 1781-October 31, 1783, framed a new constitution, which was ratified and went into effect June 2, 1784. Another convention. September 7, 1791-September 5, 1792, drafted a third constitution, which was ratified during the session of the convention. This provided that the question of the expediency of revision must be submitted to the people every seven years. Accordingly, modifications were made in 1852, 1877, 1889.

The State was the ninth to ratify the Federal Constitution, June 21, 1788, thus making certain the establishment of the United States. The capital of the Province of New Hampshire was Portsmouth. Until 1805 it was migratory, but at that date Concord was chosen. New Hampshire was Federalist in national politics till 1816, with the exception of 1804, when it voted for Jefferson. From 1816 to 1852 it was consistently Democratic. Since 1856 it has been stanchly Republican. The following is a list of the Governors of the Colony and State of New Hampshire:

As a Royal Province

PRESIDENTS

John Cutts	1679-80
Richard Waldron	1681

GOVERNORS

Edward Cranfield	1682-85
Walter Barefoote	1686
Joseph Dudley	1686
Edmond Andros	1686-89
Simon Bradstreet	1690-92
Samuel Allen	1692-98
Richard Coote, Earl of Bellomont	1699-1701
Joseph Dudley	1702-14
Samuel Shute	1716-24
William Burnet	1728-29
Jonathan Belcher	1730-40
Benning Wentworth	1740-67
John Wentworth	1767-75

As a State

Matthew Thornton, President Provincial Convention	1775
Meschech Weare, President of the State	1776-84

PRESIDENTS UNDER THE CONSTITUTION OF 1784

Meschech Weare	1784
John Langdon	1784-85
John Sullivan	1786-87
John Langdon	1788
John Sullivan	1789
Josiah Bartlett	1790-92

GOVERNORS OF THE STATE

Josiah Bartlett	Federalist	1792-94
John T. Gilman	“	1794-1805
John Langdon	Democrat-Republican	1805-09
Jeremiah Smith	Federalist	1809-10
John Langdon	Democrat-Republican	1810-12
William Plumer	“ “	1812-13
John T. Gilman	Federalist	1813-16
William Plumer	Democrat-Republican	1816-19
Samuel Bell	“ “	1819-23
Levi Woodbury	“ “	1823-24
David L. Morrill	“ “	1824-27
Benjamin Pierce	“ “	1827-29
John Bell	Democrat	1829-30
Matthew Harvey	“	1830-31
Joseph M. Harper (acting)	“	1831
Samuel Dinsmoor	“	1831-34
William Badger	“	1834-36
Isaac Hill	“	1836-39
John Page	“	1839-42
Henry Hubbard	“	1842-44
John H. Steele	“	1844-46
Anthony Colby	“	1846-47
Jared W. Williams	“	1847-49
Samuel Dinsmoor	“	1849-52
Noah Martin	“	1852-54
Nathaniel B. Baker	“	1854-55
Ralph Metcalf	American	1855-57
William Haile	Democrat	1857-59
Ichabod Goodwin	Republican	1859-61
Nathaniel S. Berry	“	1861-63
Joseph A. Gilmore	“	1863-65
Frederic Smyth	“	1865-67
Walter Harriman	“	1867-69
Onslow Stearns	“	1869-71
James A. Weston	“	1871-72
Ezekiel Straw	Democrat	1872-74
James A. Weston	Republican	1874-75
Person C. Cheny	Democrat	1875-77
Benjamin F. Prescott	Republican	1877-79
Nathaniel Head	“	1879-81
Charles H. Bell	“	1881-83
Samuel W. Hale	“	1883-85
Moody Currier	“	1885-87
Charles H. Sawyer	“	1887-89
David H. Goodell	“	1889-91
Hiram A. Tuttle	“	1891-93
John B. Smith	“	1893-95
Charles A. Busiel	“	1895-97
George A. Ramsdell	“	1897-99
Frank W. Rollins	“	1899-1901
Chester B. Jordan	“	1901-03
N. J. Bachelder	“	1903 —

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NEW HANOVER. The northernmost large island of the Bismarck Archipelago (q.v.).

NEW HARMONY. A town in Posey County, Ind., 15 miles north of Mount Vernon, the county-seat, on the Wabash River and on a branch of the Illinois Central Railroad (Map: Indiana, A 5). It has the free library of the Workingmen's Institute with some 15,000 volumes, founded in 1838. There are flouring and planing mills, brick works, and minor industries. Population, in 1890, 1197; in 1900, 1341.

New Harmony was settled in 1805 by a community of Harmonists (q.v.), who, in 1824, sold out to Robert Owen and moved to Economy, Pa. In 1825 Owen organized a 'Preliminary Society,' and invited here 'the industrious and well disposed of all nations.' There was to be a community of goods according to age, religious worship was to be replaced by a series of 'moral lectures,' and children, when two years of age, were to be taken from their parents and educated by trained teachers. Within a few months the village became a 'scene of idleness and revelry,' but in 1826 Owen returned, and for a time the settlement prospered. Later in the year, disagreements arising, the original community separated to form three communities—New Harmony, Macluria, and Feiba Pevla—and in a short time the whole experiment was abandoned. William Maclure, one of the original leaders, then bought part of the land and founded a 'school of industry,' which after a short time was discontinued. Consult Lockwood, *The New Harmony Communities* (Marion, Ind., 1902).

NEWHA'VEN. A seaport town in Sussex, England, on the English Channel at the mouth of the Ouse, 8½ miles east of Brighton (Map: England, G 6). Its importance is to be measured by its shipping trade and not by its population. It is a bonding port with a well-equipped harbor, a large coasting trade, and bi-diurnal communication with Dieppe, France, 64 miles to the southeast. The average annual value of its imports and exports is $70,000,000. The principal articles of export are woolen, cotton, silk, and hat manufactures, leather, silver plate, pictures, paper, machinery and mill work, cycles, hardware and cutlery, chemical products, etc.; the imports include agricultural produce and provisions of all kinds, cotton, woolen, silk, and linen manufactures, gloves, india-rubber goods, glassware, spirits, sugar, tobacco, and timber. It is a terminus of the London, Brighton and South Coast Railway, a coast guard station, and is protected by a large modern fort. Its twelfth-century Norman church is archæologically interesting. Population, in 1891, 4995; in 1901, 6772.

NEW HAVEN. The county-seat of New Haven County, Conn., and the largest city of the State, situated at the head of New Haven Bay, four miles from Long Island Sound, and on the main line and several leased lines of the New York, New Haven and Hartford Railroad, 73 miles east by north of New York and 36 miles distant from Hartford, the State capital (Map: Connecticut, D 4).

New Haven is widely known as the 'City of Elms'—these famous trees bordering many of the streets and surrounding 'The Green,' a public square in the heart of the town as originally laid out. The city occupies about 22¼ square miles on a level plain, bounded east and west by the Quinnipiac and West rivers, and inclosed by hills, two spurs of which, East Rock and West Rock, rise to a height of 360 and 400 feet, respectively, and command fine views. East Rock is the picturesque point in an attractive park, its summit crowned by a Soldiers' and Sailors' Monument, while on the slope of West Rock is Judge's Cave, where the two regicides, Goffe and Whalley, lay in concealment for a time. There are parks overlooking the harbor and other smaller inclosures, the entire public park system comprising 1100 acres. The city has some 200 miles of streets, about 70 miles of which are paved, a large proportion with macadam, and drained by 95 miles of sewers. New Haven is the seat of Yale University (q.v.), which, with its buildings and its historical and educational prominence, is the chief attraction. There are other noteworthy educational institutions, namely, Hopkins Grammar School (founded in 1660), Hillhouse High School, Boardman Manual Training School, and a State normal school. The more important charitable institutions include the New Haven and Grace hospitals, and Saint Francis (Roman Catholic) and New Haven orphan asylums. The Public Library contains more than 52,000 volumes, and there are also valuable collections belonging to the American Oriental Society, New Haven Colony Historical Society, New Haven Orphan Asylum, State Board of Health, and the Young men's Institute. Among other features are several churches built in the early years of the nineteenth century, and the old burying-ground in Grove Street, in which are the graves of Noah Webster, Timothy Dwight, B. Silliman, Eli Whitney, Samuel F. B. Morse, Theodore Winthrop, Presidents Day, Woolsey, and Porter, James D. Dana, and W. D. Whitney.

The commercial interests of the city lie in a distributing and coastwise trade, the latter being facilitated by an excellent natural harbor, which has been greatly improved, and which was once the scene of extensive shipbuilding. New Haven ranks first among the industrial centres of the State. Its manufactures, representing, according to the census of 1900, an invested capital of $30,463,000, and having an annual production valued at $40,762,000, include carriages, clocks, firearms and ammunition, rubber goods, corsets, hardware, foundry and machine-shop products, slaughtering and meat-packing products, boxes, etc. There are also large railroad repair shops.

New Haven is the name borne by three distinct administrative corporations—the city, town, and school district of New Haven—the town being coextensive with the limits of the city; thus New Haven maintains a town and a city government. The city government is vested in a mayor, elected every two years, a bicameral council, and in administrative officers, the majority of whom are appointed by the executive, but with the following exceptions: assistant city clerk, elected by the council; and city clerk, controller, sheriff, treasurer, and collector of taxes, chosen by popular vote. New Haven spends annually, in maintenance and operation, about $1,415,000; the principal items of expense being $380,000 for schools, $190,000 for the police department, $150,000 for interest on debt, $140,000 for the fire department, $90,000 for street cleaning and sprinkling, $80,000 for municipal lighting, and $75,000 for charitable institutions. The assessed valuation of property, real and personal, is more than $115,000,000, including exemptions, and the bonded debt is over $3,750,000.

Population, in 1800, 4049; in 1850, 20,345; in 1870, 50,840; in 1880, 62,882; in 1890, 81,298; in

1900, 108,027, including 30,800 persons of foreign birth and 2900 of negro descent.

In 1637 a small company of Puritans under John Davenport, their pastor, and Theophilus Eaton, a wealthy London merchant, arrived in Boston, and in the following year settled at New Haven, then called by the Indians Quinnipiac. Adrian Block had previously visited the place and named it Roodenberg, probably from the reddish color of the soil. In November the new settlers bought from an Indian chief, Momanguin, a large tract of land, for which they paid "twelve coats, twelve alchymy spoons, twelve hatchets, twelve hoes, two dozen of knives, twelve porringers, and four cases of French knives and scissors." Momanguin agreed that the Indians should not "terrify, disturb, or injure" the whites, who, in return, promised to protect the Indians and extend hunting privileges in part of the ceded territory. In December another tract thirteen miles long and ten miles wide was bought from another Indian chief, Montowese, for thirteen English coats. Immediately after landing the settlers had entered into a 'plantation covenant,' but a regular government was not established until the 'Fundamental and Written Constitution' was adopted in June, 1639. The privileges of voting and holding office were limited to church members, and the Scriptures were solemnly proclaimed as the supreme and only law in both civil and ecclesiastical affairs. Eaton was chosen as first Governor, and by successive elections was retained in this office until his death in 1658. In 1640 the settlement received its present name (from Newhaven, England), and three years later it formed with Milford, Guilford, and Stamford (Southhold, L. I., and Branford, Conn., being admitted later) a confederation known as the 'New Haven Colony,' which, in the same year, entered the New England Union. From 1660-64 the regicides Goffe and Whalley found shelter in and near New Haven (see above), and from 1670 to his death in 1688, another regicide, Dixwell, lived here under the name of 'James Davids.' In 1665, after a long and bitter struggle, the New Haven Colony was united to Connecticut under the Connecticut charter of 1662. In 1701 New Haven was made a joint capital with Hartford, and as such remained until 1873. In 1717 Yale College was moved here from Saybrook. On July 5, 1779, a British force under Generals Tryon and Garth captured the town after fighting sharp skirmishes with the inhabitants, and remained here until the 7th, having lost about 70 killed, while of the Americans 29 were killed and 17 wounded. In 1784 part of New Haven was incorporated as a city. Until its shipping trade was crippled by the Embargo and the War of 1812, New Haven was an important commercial port, but since then its energies have been devoted mainly to manufacturing. Steamboat communication with New York was opened in 1815, and the first railroad was completed in 1848. In 1856 a company left New Haven to help found Wabaunsee, Kan. Fair Haven was annexed in 1870. Consult: Lambert, *History of the Colony of New Haven* (New Haven, 1838); Kingsley, *A Historical Discourse* (ib., 1838); Barber and Punderson, *History and Antiquities of New Haven* (ib., 1870); Levermore, *Republic of New Haven* (Baltimore, 1886); Atwater, *History of the City of New Haven* (ib., 1887); id., *History of the Colony of New Haven*, new ed. (ib., 1902); Bartlett, *Historical Sketches of New Haven* (ib., 1897); and a brief article in Powell, *Historic Towns of the New England States* (New York, 1898); Blake, *Chronicles of New Haven Green* (New Haven, 1898); Baldwin, *Stories of Old New Haven* (ib., 1902); *Papers of the New Haven Colony Historical Society* (6 vols., ib., 1865-1900).

NEW HEBRIDES, hĕb′rĭ-dēz. A group of islands in the Pacific Ocean, northeast of New Caledonia, extending from latitude 13° to 20° S., and from longitude 165° to 170° E. (Map: Australasia, J 4). Its total area is estimated at over 5000 square miles. The chief islands are Espiritu Santo, Mallicolo, Pentecost, Maewo, Sandwich, and High Islands. Some of the islands are composed of coral; others are of volcanic origin with several active volcanoes. The soil is fertile. Considerable quantities of sandalwood are exported. The chief agricultural products are the breadfruit, sago palm, banana, yam, pineapple, orange, etc. The climate is unhealthful. Even the natives are not immune from fever, and dysentery makes great ravages among them. The population is steadily decreasing; in 1901 it was estimated at 50,000. The people of this group of islands are Melanesians. They are chiefly dolichocephalic (cranial index, 70.4, but examples as high as 85 are found), very dark in complexion, below the medium in stature (64 inches), and have abundance of woolly hair. They are still in savagery, though under the teachings of Christian missionaries they have abandoned to a large extent head-hunting and cannibalism. Under discipline they become industrious and are a factor in the trade of the Pacific. The languages of New Hebrides belong to the sub-Papuan family everywhere except in Fotuna and Aniwa, and at Mel and Fel in Efat, which are Maori colonies from New Zealand still speaking Maori dialects. The best-known sub-Papuan languages are Epi, Pama, Amboym, Vunmarama, and Sesaki. On the southernmost island, Aneityum, the inhabitants are Christianized, can all read and write, and have over forty schools. The group forms a protectorate administered by a mixed commission of French and English officers.

NEW HOLLAND. The former name for Australia (q.v.).

NEW IBE′RIA. A town and the parish seat of Iberia Parish, La., 125 miles west of New Orleans, at the head of navigation on the Bayou Teche, and on the Southern Pacific Railroad (Map: Louisiana, D 3). This section has many natural features of interest, and is the scene of Longfellow's *Evangeline*. Avery's Island is famous for its deposits of rock salt. A Federal Government post-office is (1903) in course of construction, and the city has a public high school library, a fine city hall, and a public market. New Iberia is the centre of a productive agricultural section devoted to the cultivation of sugar-cane, cotton, rice, corn, potatoes, small fruits, and vegetables. It is also of considerable importance as an industrial centre, its establishments including ship-yards, foundries and machine shops, a knitting mill, and manufactories of cypress lumber, shingles, sash, doors, and blinds, cypress cisterns and tanks, cotton-seed products, soap, tabasco sauce, pressed and common brick, wagons, and carts. The water-works and electric light plant are owned and operated by the municipality. Population, in 1890, 3447; in 1900, 6815.

NEW INN HALL. See OXFORD.

NEW IRELAND. An island of the Bismarck Archipelago. See NEW MECKLENBURG.

NEW JER'SEY. A middle Atlantic State of the United States. It lies between latitudes 38° 56′ and 41° 21′ N., and between longitudes 73° 54′ and 75° 33′ W. It is bounded on the north by the State of New York, which also bounds it for some distance on the east, being separated from it by the Hudson River, New York Bay, and Staten Island Sound. The remainder of the eastern boundary is formed by the Atlantic Ocean. On the south the State is bounded by Delaware Bay. The whole western boundary is formed by the Delaware River, which runs eastward in a sharp angle nearly to the middle of the State, and separates it from Pennsylvania. New Jersey is one of the smallest States of the Union, only three others, Rhode Island, Delaware, and Connecticut, having a smaller area. Its extreme length is 167 miles, and its average width 50 miles. Its area is 7815 square miles, of which 7525 square miles, or 4,816,000 acres, are land surface.

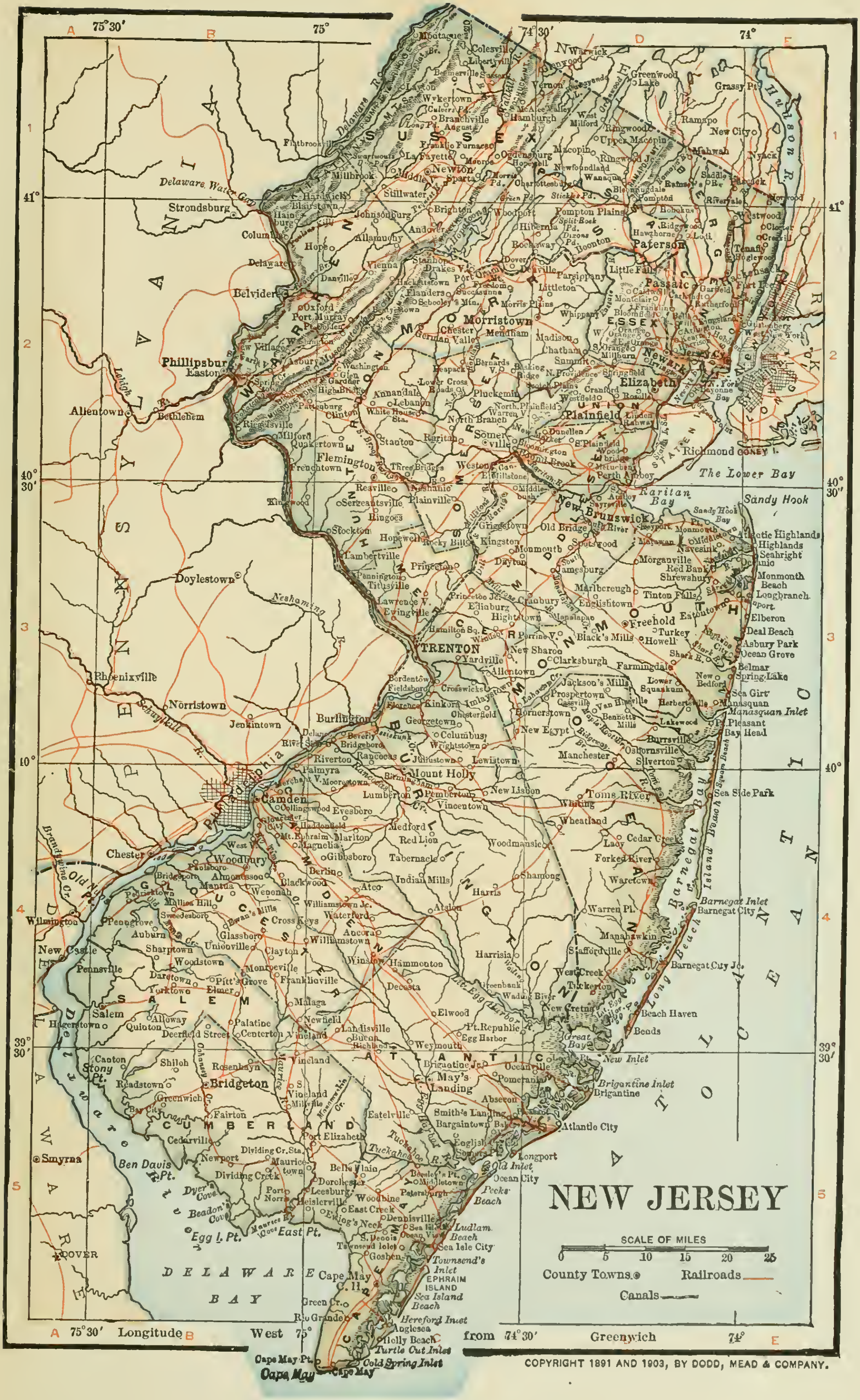
TOPOGRAPHY. The northern and southern divisions of the Atlantic slope meet in New Jersey on a line running west from Newark Bay. The former division is characterized practically by the absence of the coastal plain and by the less definite demarcation of the Piedmont plain (q.v.). The latter division is characterized by the well-defined presence of both. Though the State lies wholly within the Atlantic slope, it is crossed in the northwest by several ranges of the Appalachian system. There are four distinctly marked topographical regions running in parallel bands across the State from southwest to northeast, coterminous with and closely dependent on the outcropping bands of geological formations. (See paragraph *Geology*.) The first, beginning at the northwest, is the Kittatinny range and upland valley. This range is an extension of the Blue Mountains of Pennsylvania, and runs in a continuous ridge into New York, reaching in High Knob, near the boundary, a height of 1799 feet. The second region includes the Highlands, an outlying Appalachian range consisting of semi-isolated, plateau-like masses, rising to a height of 1200 to 1400 feet. The third band is the Piedmont plain, nearly as wide as the first two combined. It is, for the most part, an undulating plain ranging in elevation from the sea level in the marshes of the Hackensack Valley in the east to over 500 feet in the west. It is, however, diversified by bold trap-rock ridges extending in a northeast and southwest direction, such as the Palisades along the Hudson and the First and Second Mountains. The fourth region constitutes the coastal plain and includes the entire southern half of the State south of a line running from Trenton to Newark Bay. It is a gently undulating plain, sloping south and eastward. It is nowhere more than 400 feet, and in large part is less than 100 feet above sea level. It is trenched by river-valleys, and here and there diversified by isolated hills such as the Navesink Highlands. It is bordered on the coasts by salt marshes fringed along the Atlantic by shallow coast-lagoons inclosed by outlying sand beaches.

The western slope of the State is drained by short tributaries into the Delaware River, but by far the greater portion drains directly into the Atlantic Ocean or its inlets. The principal rivers are the Passaic and Hackensack, flowing into Newark Bay; the Raritan, flowing through Raritan Bay into Lower New York Bay; the Mullica and Great Egg, emptying into the Atlantic lagoons; and the Maurice, into Delaware Bay. Lakes are confined chiefly to the northern section. There are several beautiful mountain lakes in the Highlands, the largest being Lake Hopatcong and Greenwood Lake, the latter lying partly in New York State. The most noted natural features are the Falls of the Passaic River at Paterson, the Palisades of the Hudson, and the Delaware Water Gap.

CLIMATE. The particular element affecting the climate of New Jersey is the ocean. Since the extreme northern portion is also the most elevated and the extreme southern portion is low and surrounded by water, the slight range in temperature due to difference in latitude is accentuated, so that there is a variation of 8 degrees between the mean annual temperature of the north and the south. The former is 46° and the latter 54°. The mean winter temperature is 35° in the south and 25° in the north, and the mean summer temperatures, respectively, 75° and 67°. The mean annual rainfall is, in general, between 44 and 50 inches in the greater part of the State. In the extreme eastern portion it is over 50 inches, and in the south along Delaware Bay it is less than 42 inches. As a whole, the State is quite healthful, and the sandstone belt is considered particularly favorable to persons inclined to lung diseases. There are numerous summer and winter health resorts. Lakewood (q.v.), in the heart of the pine woods, is one of the most popular winter resorts in the Northern States. Atlantic City, Asbury Park, and Cape May, although essentially summer resorts, are also popular winter resorts for invalids. Other well-known summer seaside places are Long Branch, Elberon, and Ocean Grove.

For flora and fauna, see paragraph under UNITED STATES.

GEOLOGY. The geology of New Jersey is very intimately connected with its topography. The outcrops of the rock formations cross the State from the southwest to northeast in bands closely coincident with the topographical regions described above. Beginning at the northwestern corner, we find the Kittatinny Mountain and valley, consisting of Paleozoic slate, limestone, and sandstone, and these formations also extend into some of the western valleys of the Highlands. The Highlands themselves, however, consist of the still older Archæan gneiss, granite, and mica-schist. The Piedmont plain is also called the Red Sandstone Plain, as it consists mainly of the Triassic red sandstone, with scattered intrusions of trap-rock. In the coastal plain the surface deposits consist wholly of unindurated materials. In the north there is a band running from Staten Island Sound southwest to Camden, composed of Cretaceous marls, sands, and clay, while the entire remaining portion is covered with Tertiary clays and sand finally fringed by the modern sand bars along the



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AREA AND POPULATION OF NEW JERSEY BY COUNTIES.

County.	Map Index.	County Seat.	Area in square miles.	Population.	
				1890.	1900.
Atlantic	C 5	Mays Landing	567	28,836	46,402
Bergen	D 1	Hackensack	236	47,226	78,441
Burlington	C 4	Mount Holly	869	58.528	58.241
Camden	B 4	Camden	222	87,687	107,643
Cape May	C 5	Cape May C. H	256	11,268	13,201
Cumberland	B 5	Bridgeton	511	45.438	51,193
Essex	D 2	Newark	127	256,098	359.053
Gloucester	B 4	Woodbury	326	28.649	31,905
Hudson	D 2	Jersey City	43	275,126	386.048
Hunterdon	C 3	Flemington	437	35,355	34,507
Mercer	C 3	Trenton	226	79.978	95.365
Middlesex	D 3	New Brunswick	312	61,754	79,762
Monmouth	D 3	Freehold	479	69.128	82,057
Morris	C 2	Morristown	475	54,101	65.156
Ocean	D 3	Toms River	583	15,974	19,747
Passaic	D 1	Paterson	198	105,046	155,202
Salem	B 4	Salem	359	25,151	25,530
Somerset	J 2	Somerville	305	28,311	32,948
Sussex	C 1	Newton	529	22.259	24,134
Union	D 2	Elizabeth	103	72.467	99,353
Warren	B 2	Belvidere	362	36,553	37,781

coast. Each of the main geological eras is represented except the Carboniferous.

Mining. The most extensively utilized of the State's diversified geological resources are its clays. New Jersey ranks second in the production of pottery and third in the total output of clay products. Brick clay is found in most parts of the State. The value of the pottery products and of the combined output of brick and tile, respectively, ranges between $5,000,000 and $9,000,000 annually. (See *Manufactures* below.) Morris County furnishes infusorial earths used in the manufacture of dynamite and giant powder, and for polishing purposes. Deposits of marl found in the State are utilized for fertilizers. A variety of stone is quarried in the northwestern counties, and constitutes another important source of wealth. The production of granite has increased rapidly since 1896. The output for 1900 was appraised at $1,170,555, or five times the value of the product in the former year. The value of the sandstone quarried in 1900 was $198,234, but the annual yield is usually worth much more. New Jersey ranks second in the production of Portland cement. Iron was mined in Warren County early in the history of the State, and has been mined continuously in the northwestern part until the present time. The entire product in 1900 was of the magnetite variety, estimated at 344,247 long tons. The iron is mined with greater difficulty than in the larger iron-producing regions, but the saving of the cost of transportation makes it profitable. The New Jersey ores have a larger per ton value ($3.18 in 1899) than those obtained in any other State.

Fisheries. New Jersey, with its long and well indented coast line, and bounded by the Hudson and the Delaware, is well adapted for the development of an extensive fishery industry, in which seventeen out of the twenty-one counties of the State participate directly. There were 12,270 persons so engaged in 1898, as against 16,539 in 1891. The value of the product for 1898 was $3,563,766, only about $44,000 more than the product of 1891. The catch of oysters in the same year was valued at $1,670,000. Next to oysters, the principal species with respect to value are clams, shad, squeteague, bluefish, and cod. The value of caviar in 1898 was $79,693. The menhaden industry in that year was represented by six factories, and yielded a product of $57,995.

Agriculture. Only 59 per cent. of the total land area is included in farms. The area of improved land increased until 1880, since when it has remained practically stationary. In 1900 the percentage of farm land improved was 69.6. The number of farms increased during the half century nearly 45 per cent., while the average acreage decreased from 115.2 in 1850 to 82 in 1900. There is a gain in the per cent. of rented farms, especially cash-tenant farms, which increased 53.6 per cent. during the decade 1890-1900, so that these farms represented in 1900 15.3 per cent. of the total number of farms, as against 14.6 per cent. for the share tenants. The soil is generally a red sandy loam, easily tilled. The river valleys are very fertile, but in most parts of the State fertilizers are advantageously used. The cost of fertilizers per farm in 1900 was $62. Between 1880 and 1890 the area devoted to cereals decreased considerably, but the falling off was checked in the next decade, when the loss was confined to oats and rye, the other crops showing gains. Accordingly the decrease in the cereals is not so marked as in some other Eastern States. Corn, the principal cereal, is raised throughout the State; wheat, next in rank, is grown in the western counties; rye, oats, and buckwheat are confined almost entirely to the northwestern counties. The acreage of hay and forage crops exceeds that of corn and wheat combined, and considerable areas of the poorer lands are being turned into permanent pasture lands. As above suggested, the proximity of large cities—notably New York and Philadelphia—has led to a large gardening and fruit-raising industry. Of the $8,400,000 of vegetable produce grown in the census year 1900, 26 per cent. and 14.4 per cent. respectively represented the value of the Irish and the sweet potatoes. New Jersey ranks next to Maryland in the production of tomatoes; the acreage devoted to their cultivation exceeded that of sweet potatoes. Sweet corn, melons, and cabbages were the most important of the other vegetables. The raising of early vegetables under glass for the New York and Philadelphia markets is a large industry.

Orchard fruits receive much attention, the peach-growing industry being very extensive in the northwestern counties. From 1890 to 1900 the number of peach trees decreased about 38 per cent. There was an equal percentage of increase in the number of apple trees. In 1900 32.1 per cent. of all fruit trees in the State were apple trees, and 48.6 were peach trees. A great variety of small fruits are raised, strawberries and cranberries being most important. Cranberry culture is confined largely to the marshy lands of Burlington and Ocean counties. New Jersey is surpassed by few States in the extent of its floriculture. The value of the product grown for the market in 1900 was nearly $2,000,000.

The following table of acreage is self-explanatory:

CROPS	1900	1890
Corn	295,258	267.648
Wheat	132,571	121,570
Oats	75,959	121,327
Rye	68,967	77.245
Buckwheat	15,762	13,520
Hay	441,610	458,267
Potatoes	52,896	46,711
Potatoes (sweet)	20,588	20,157

Stock-Raising. From 1890 to 1900 there was a marked increase in the number of neat cattle, a decrease in sheep and swine, and a noticeable increase in horses. The decrease in dairy cows, as shown below, is more apparent than real, owing to the change in the method of enumeration. Over one-half of the total income of all animal products was derived from the dairy industry. Of the $7,170,000 realized from dairy produce sold, $6,318,000 represented milk. The value of the poultry products is also quite large.

The following table shows the leading livestock holdings:

	1900	1890
Dairy cows	157,407	161,576
Other cattle	82,577	50.486
Horses	94,024	86,925
Mules and asses	4,931	8,227
Sheep	26,363	55,409
Swine	175,387	224.388

Manufactures. Manufacturing affords employment to a larger number of wage-earners than any other industry in the State. The number in 1900 was 241,582, or 12.8 per cent. of the population. The percentage of people thus engaged has increased faster than the population itself, there being in 1850 only 7.7 per cent. connected with manufactures. The increase in the value of the product has been twice as rapid. From 1890 to 1900 but few States exceeded New Jersey either in the absolute or the percentage (72.5) of gain attained in the value of manufactured products. In the latter year this value was estimated at $611,748,000, placing the State sixth in rank. Prominent among the factors contributing to the development of manufactures are first, New Jersey's proximity to the large markets of New York and Philadelphia; secondly, its admirable transportation facilities; and lastly, its iron and clay resources and its proximity to the coal and other mineral fields of Pennsylvania.

The manufacture of textiles constitutes the most important group of industries. New Jersey ranks first in the production of silk and silk goods; and Paterson, the chief centre, is the largest silk manufacturing city in the United States. The industry was first established here in 1840, but it was not until the decade ending with 1870 that its great growth began. From 1890 to 1900 the value of the product increased nearly 30 per cent. Cottons, woolens, and worsteds are also produced, but in less quantities. The output of woolens suffered a decline from 1890 to 1900, while the output of worsteds increased more than threefold. The dyeing and finishing of textiles has assumed large proportions.

Another important group includes the manufacture of iron and steel and their products. The iron and steel industry began in Warren County at an early period, the supply of iron ore being secured in that locality. The value of products more than doubled during the decade 1890-1900. Of yet greater value are the products of the closely related foundry and machine-shop industry. During 1890-1900 the advantages of cheaper land and more efficient railway service brought hither a number of New York establishments. Newark, Paterson, and Elizabeth are the largest centres. The value of the electrical apparatus produced in 1900 was nearly eightfold greater than in 1890. The sewing-machine output increased in value 59 per cent. in the same period. In 1900 the State ranked fourth in the manufacture of jewelry, Newark being the chief centre.

The State's valuable beds of clay and sand have each given rise to an important industry. Brick clays are found in every section, but nearly all the rich clays are in Middlesex County, and fortunately close to the navigable coast waters or the Raritan River. Architectural clay products, sewer pipe, etc., are produced in this section in great abundance. Trenton has become famous for its pottery. The industry was begun here in 1852, but it was not until the Centennial Exhibition in 1876 that the superior quality of the product became known, and a wide market was opened for it. From 1890 to 1900 the value of the total clay product increased 73.1 per cent. The sand deposits in the southern part of the State are of a quality that makes them valuable in the manufacture of glass, and glass has been produced in that section since pre-Revolutionary times. The leather industry is centred largely in Newark. Elizabeth has one of the largest sewing-machine factories in the United States. Chemicals, liquors, and tobacco goods are all extensively produced and have each made large gains. The first two are most important in Newark, the last in Jersey City. Extensive oil-refining works are located at Bayonne, where the surrounding water of New York Bay is of sufficient depth to enable ocean-going vessels to load from the docks. The table following explains itself.

Forests and Forest Products. The primeval forests, consisting mainly of hard woods, have been almost wholly removed, but there is considerable merchantable second-growth timber. In 1900 the woodland was estimated at 3234 square miles, or 43 per cent. of the State's area. The value of the timber cut did not show any marked tendencies to increase or decrease in the last half of the nineteenth century, the maximum value, $2,745,317, being attained in 1870. The value of the planing mill products, etc., will be seen in the above table.

Transportation and Commerce. New Jersey is well provided with transportation facilities. Railroads which approach New York City from the west or Philadelphia from the east necessarily traverse its territory. New Jersey, therefore, has a greater railroad mileage in proportion to its area than any other State. The mileage increased from 560 in 1860 to 2109 miles in 1890, and 2242 miles in 1900. The terminals of the lines centring in New York City are on the New Jersey side of the Hudson River.

The canals of New Jersey were once its principal commercial channels. The Morris Canal, 101 miles long, from Jersey City to the Delaware River at Phillipsburg, has always transported vast quantities of coal from Pennsylvania to New York, and now belongs to the Lehigh Valley Railroad. It cost originally $14,000,000. The Delaware and Raritan Canal, from New Brunswick to Bordentown, 43 miles long, with a feeder to Trenton, 22 miles, was built in the early part of the nineteenth century at a cost of $3,935,287. It is under lease to the Pennsylvania Railroad.

Banks. In 1804 two banking companies were chartered by the Legislature, one to do business in Newark and the other in Trenton. A general banking law was passed in 1812 for the protection of depositors. This law remained in force till 1850. Reports were made obligatory, the total indebtedness and the rate of discount were limited. But the provisions of the law were avoided, and a number of speculating banks flooded the State with worthless paper. This condition of affairs and the suspension of specie payment in 1837 led to a reform in 1850. Another general banking law was passed. Under this statute the bank circulation had to be guaranteed by deposits of collateral security—bonds of States, etc. The limits of loans on real estate were strictly set and investigations of the banks made possible. In 1860 there were eight banks of issue. Besides these, there were a number of specially incorporated banks of discount and deposit. In 1859 the number was 36, but most of them availed themselves of the national banking law, and there were only five left in 1870. State banks became somewhat more popular toward the end of the century. They numbered 18 in 1902.

COMPARATIVE SUMMARY OF FIFTEEN LEADING INDUSTRIES

INDUSTRIES	Year	Number of establishments	Average number wage-earners	Value of products, including custom work and repairing
Total for selected industries for State	1900	1,780	117,008	$258,421,105
	1890	1,367	77,974	156,491,146
Increase, 1890 to 1900	......	413	39,034	$101,929,959
Per cent. of increase	......	30.2	50.1	65.1
Per cent. of total of all industries in State	1900	11.5	48.4	42.2
	1890	14.8	44.9	44.1
Textiles, total	1900	321	46,932	$72,921,528
	1890	242	33,860	52,855,496
Cotton goods, including cotton small wares	1900	25	5,681	6,930,766
	1890	17	5,632	5,902,615
Dyeing and finishing textiles	1900	59	7,074	10,488,963
	1890	41	3,735	6,183,397
Silk and silk goods	1900	180	24,157	39,966,662
	1890	132	17,445	30,760,371
Woolen goods	1900	13	2,942	4,755,393
	1890	21	4,165	5,652,166
Worsted goods	1900	11	3,910	6,823,721
	1890	6	937	2,058,662
Iron and steel	1900	25	8,288	24,381,699
	1890	28	5,150	11,018,575
Foundry and machine-shop products	1900	353	17,918	32,621,229
	1890	249	12,793	21,666,955
Electrical apparatus and supplies	1900	35	2,793	6,447,154
	1890	3	425	744,274
Sewing machines and attachments	1900	4	4,701	6,643,348
	1890	3	3,931	4,177,330
Jewelry	1900	100	2,779	7,379,777
	1890	74	1,757	4,724,500
Pottery, terra cotta, and fire-clay products	1900	81	8,117	8,940,723
	1890	60	4,425	5,165,537
Glass	1900	26	5,383	5,093,822
	1890	34	5,688	5,218,152
Rubber and elastic goods	1900	37	2,609	8,458,274
	1890	12	926	2,135,705
Leather—tanned, curried, and finished	1900	77	4,178	13,747,155
	1890	31	706	2,780,016
Liquors, malt	1900	45	1,723	14,386,456
	1890	34	1,174	10,018,393
Tobacco—chewing, smoking, and snuff	1900	12	1,955	7,788,379
	1890	4	131	348,814
Cigars and cigarettes	1900	486	1,640	2,647,595
	1890	444	1,051	1,909,406
Chemicals	1900	61	3,048	12,207,289
	1890	44	1,712	8,146,795
Petroleum, refining	1900	4	2,951	29,649,460
	1890	4	2,610	20,711,826
Lumber, planing mill products, including sash, doors, and blinds	1900	113	1,993	5,107,217
	1890	101	1,635	4,869,372

In 1868 there were 55 national banks, and in 1900, 115. A Department of Banks and Insurance was established in 1891. The banking law was revised in 1899. Trust companies have rapidly multiplied in the State since 1880, under the influence of the organization of gigantic corporations, which have made the State conspicuous. In ten years the number of these increased from 11 to 23, and the deposits increased eightfold. Savings banks were established early (1828). A law for regulating them was passed in 1876. It remains almost unchanged. The condition of the various banks in 1902 is shown in the following table:

	National banks	State banks	Trust companies	Savings banks
Number of banks	124	18	47	28
Capital	$17,164,000	$1,593,000	$9,321,000	....
Surplus	11,375,000	979,000	6,890,000	$6,060,000
Cash, etc	5,965,000	493,000	1,823,000	423,000
Deposits	87,949,000	8,950,000	67,642,900	69,866,000
Loans	80,248,000	8,053,000	56,105,000	28,812,000

FINANCES. The beginning of the Civil War found the State in a satisfactory financial condition. It became involved in heavy war expenses, and a loan of $2.000.000 and a State tax of $100,000 for war purposes were authorized in 1861. In 1866 the total war debt amounted to $3,305,200. Besides, the minor civil divisions of the State (counties and towns) spent more than $23,000,000 for war purposes. This debt was totally extinguished by the redemption of the last $71,000 on January 1, 1902.

In the matter of taxation New Jersey is in advance of many States, having long ago solved the problem of conflict between State and local taxation by entirely dividing these two fields. Even between 1840 and 1850 the income of the State was largely derived from taxes on the gross receipts of railroads ('transit duties' was their official designation), taxes on capital stock of railroads, etc. A State tax upon general property was only introduced in 1861 for war purposes, and though it existed for twenty years, it was exceedingly small. In 1880 75 per cent. of the income was derived from corporation taxes. New laws for taxation of railroads, as well as other corporations, were passed in 1884 and 1885, and were declared constitutional after a hard struggle. Since then the only State tax on general property is collected for the purposes of the school fund. The whole sum collected is returned to the towns. This is therefore a State tax in form only.

The income of the State Government is derived from taxes on railroads (70 to 75 per cent.) and other corporations (15 per cent.), and fees, licenses, etc. Since 1890 taxes on new corporations, of which so many have been formed in New Jersey, have constituted a large share of the receipts. In 1902 the total receipts of the general State fund were $4,317.846. of which $2,-866.363 came from corporation taxes. The expenditures reached $3.924,811, leaving a balance of $393.035. But of the general fund, $883.978 was distributed among the counties for school purposes. Besides, the State collected and redistributed among the counties $1.486,806 as school tax, and $400.784 as a local railroad tax. The school fund amounts to $3.839.692. Though there was no debt, the sinking fund contained $172,550.

Government. The present Constitution was ratified by the people in 1844, and amended at a special election in 1875. Proposed amendments must receive the approval of a majority of the members elected to both Houses at two consecutively chosen Legislatures, and afterwards the approval of a majority of the qualified electors. But amendments cannot be submitted to the people oftener than once in five years. Voters must be citizens who have resided in the State one year, and in the county five months. An elector is not deprived of his vote by reason of being in the actual military service of the army or navy of the State or United States. The registration of voters is required by law. The capital is Trenton.

Legislative. The Legislature, meeting annually, and unlimited as to session, is composed of 21 Senators, one from each county, elected for three years, and of Representatives, not to exceed 60, elected for one year, from the counties on the basis of population, every county being at all times entitled to one member. The salary of a Representative is $500. State elections are held annually on the Tuesday after the first Monday in November. Revenue bills originate in the Lower House.

Executive. The Governor is elected for three years, and cannot be reëlected until three years shall have elapsed. He can convene extra sessions of the Legislature or of the Senate alone. The Governor's veto of bills or items of appropriation bills is overridden by a majority vote of the whole number elected to each House. In conjunction with the six judges of errors and appeals and the Chancellor, the Governor grants pardons, etc. The president of the Senate and the Speaker of the House respectively succeed to the Governorship in case of a vacancy. The State Treasurer and Controller are appointed for three years by the Senate and General Assembly in joint meeting. The Attorney-General, prosecutors of the pleas, clerk of Supreme Court, clerk of the Court of Chancery, Secretary of State, and keeper of the State prison are appointed for five years—by the Governor and Senate.

Judiciary. The distinction between courts of law and courts of equity is still maintained in New Jersey. The judges are appointed by the Governor, the judges of the Supreme Court and Chancellor for seven years, others for five years —all subject to confirmation by the Senate. The first or lower courts are the county courts of common pleas and oyer and terminer, presided over by a single judge; an orphan's court; and court of general quarter sessions of the peace. Next above is the Supreme Court, which makes the circuit of the State, and is composed of a Chief Justice and eight associates. A prerogative court is presided over by the Chancellor alone. The Court of Errors and Appeals in the last resort is composed of the Chancellor, the justices of the Supreme Court, and six judges specially appointed. The Senate acts as a court for the trial of cases of impeachment.

Laws, etc. A wife holds property acquired before marriage free from control of her husband or liability for his debts. If living with her husband, she cannot convey her real property without his consent. The legal and only rate of interest is 6 per cent. A State Board of Agriculture was established in 1886, and there are a board of health and bureau of vital statistics. Each city and township is required to have local boards of health.

Local Government. County sheriffs and coroners are elected by the people for terms of three years, but cannot be their own immediate successors. The counties also elect clerks and surrogates for terms of five years. The townships elect justices of the peace for terms of five years. The affairs of towns and counties are regulated according to general laws, and special laws cannot be passed relating to them.

The State has ten Representatives in the Lower House of the National Legislature.

Militia. The number of men of militia age in the State in 1900 was 422,758. The number of militia in 1901 was 4038.

Population. The growth of the population is shown by the following figures: 1790, 184.139; 1820, 277,426; 1850, 489.555; 1860, 672,035; 1870, 906,096; 1880, 1,131,116; 1890, 1,444,933; 1900, 1, 883.669. From the 9th position in 1790 New Jersey fell to 21st in 1860, but rose again to 16th in 1900. Both the absolute and the proportionate increase have been much greater since 1840 than prior to that year. The absolute increase was greatest from 1890 to 1900, the percentage of increase being 30.4, as compared with 20.7 for the United States, and was exceeded only in one State east of the Mississippi River. The recent rapid growth is due largely to the heavy immigration of foreigners. Of the 431.884 foreign-born, according to the census of 1900, about one-half were German or Irish, the most prominent among the remainder being the English and Italians. In the same year the negroes numbered 69.844. The density of the population—250.3 to the square mile—is exceeded in only two States. The increase from 1890 to 1900 has been almost wholly on the part of the urban population. In 1900 the 49 cities containing over 4000 inhabitants each, together contained 67.5 per cent. of the total population, only three States having as high a per cent. of urban population.

Cities. In the State of New Jersey in 1900 the population of the ten largest cities was as follows: Newark, 246.070; Jersey City, 206.433; Paterson, 105.171; Camden, 75.935; Trenton, 73,-307; Hoboken, 59.364; Elizabeth, 52,130; Bayonne, 32.722; Atlantic City, 27.838; Passaic, 27,777.

Religion. The Roman Catholics form about 16 per cent. of the total population of the State.

The principal Protestant denominations are the Methodist, with about 19 per cent. of the total number of church members; the Presbyterian, 12 per cent.; the Baptist, 8 per cent.; and the Protestant Episcopal and the Reformed, with about 6 per cent. each.

Education. The question of education received attention at a very early date. Bergen had a school as early as 1661, and the charter of Woodridge (1669) provided for the granting of 100 acres of land for school purposes. The arrival of the Quakers gave an additional impetus. Even before the foundation of Princeton University, a number of classical schools were in existence. The finances for schools were not infrequently obtained by means of lotteries. After the Revolutionary War the matter of education, which had been almost entirely neglected during the struggle for freedom, again came to the fore. In 1816 the State Legislature laid the foundation of a permanent school fund by a grant of $16,000; and in 1824 a provision was made for the addition of one-tenth of all the annual State taxes. In 1871 a free public school system was established.

The educational affairs of the State are under the supervision of a State superintendent, appointed by the Governor and the Senate for three years, and of a board of education, whose 16 members are also appointed by the Governor and Senate. The State has a compulsory education law, and provides free text books and school supplies. The illiterate population in 1900 amounted to 5.9 per cent. of the total population of ten years and over. The proportion of illiteracy among the native whites is 1.7 per cent.; foreign whites, 14.1 per cent.; colored, 17.5 per cent. The 1893 public schools of the State employed, in 1901, 7561 teachers, of whom only 998 were males. The average monthly salaries received were $91.87 for male and $52.88 for female teachers. The length of the school term in 1901 was 183 days. The revenue for educational purposes amounted in 1901 to $6,718,189, of which $200,000 was derived from the permanent school fund and the rent of school lands, $2,399,724 from State taxes, and $4,079,945 from local taxes. The expenditures for the same year amounted to $7,189,712, or $32.49 per pupil in average attendance. The evening schools maintained in the larger cities of the State had an average attendance of 5397 in 1900.

For the preparation and training of teachers there are the State Normal School at Trenton and its auxiliaries and the Model and Farnum Preparatory schools. New Jersey had, in 1900, 170 public and private high schools and academies, with a total of 15,158 students. Technical education is provided by Stevens Institute (q.v.) at Hoboken and the Newark Technical School. The principal institutions for higher education are Princeton University, at Princeton; Stevens Institute of Technology, at Hoboken; Saint Peter's College (R. C.), at Jersey City; Saint Benedict's College (R. C.), at Newark; Rutgers College (Reformed), at New Brunswick; Seton Hall College (R. C.), at South Orange; and Bordentown Female College, at Bordentown.

Charitable and Penal Institutions. There is a State board of charities. Care and instruction of the deaf and dumb were provided in New York City and Buffalo until 1883, when a State institution was completed at Trenton. The blind are taken care of in New York and Pennsylvania institutions. There are a State training school for feeble-minded children and a State institution for feeble-minded women, both at Vineland. The home for disabled soldiers is at Kearney. An industrial school for girls at Trenton is maintained by the State. A State reform school for juvenile delinquents is located at Jamesburg in Middlesex County. The city of Newark also maintains a reformatory home at Verona. The old State lunatic asylum is at Trenton. This institution derives a revenue from the care of private patients. The asylum for the insane near Morristown is one of the finest structures for the purpose in the country, having cost about $2,500,000. It can accommodate upward of 1000 patients. The total expense for the insane and the poor in the fiscal year 1899-1900 was $1,812,962. The State prison is at Trenton. In 1884 the Legislature passed a bill abolishing contract convict labor in the prison. The inmates must now be employed upon goods used in institutions under State control, on the public-account system, or on the piece-price plan. A system of releasing certain inmates of the State prison on parole has been in operation since 1891.

History. The territory included within the limits of the present State was claimed by the Dutch without any definite boundaries as a part of New Netherland, and between 1614 and 1621 settlements were made in what is now Bergen County. Swedes and Danes also settled on the Delaware River, but were brought under the jurisdiction of the Dutch by Governor Stuyvesant. In 1664 this whole region was granted to James, Duke of York, by Charles II., but before James took possession he conveyed to John, Lord Berkeley, and Sir George Carteret the land between the Delaware and Hudson rivers, bounded on the north by a line drawn from 41° 21′ on the Delaware River to 41° on the Hudson, the present boundaries. In 1664-65 Berkeley and Carteret granted a form of government and settlement, the 'Concessions,' which allowed a popular assembly, and under which the colony was governed until the Revolution. Philip Carteret was sent over as Governor in 1665, and made Elizabeth-Town his capital. On March 18, 1674, Berkeley sold his interest to John Fenwick, in trust for Edward Byllinge, both Quakers, for £1000, and in 1676 the province was divided by a line drawn from Little Egg Harbor to the northwest corner. The Quakers took the western half, known as 'West New Jersey,' while Carteret retained 'East New Jersey.' Soon Byllinge surrendered his title to William Penn and others as trustees for his creditors, and West Jersey was divided into one hundred shares, of which Fenwick retained ten. Each of these shares carried with it the same rights of sovereignty which had been granted to the Duke of York. When the question was raised as to whether the Duke of York, not being a sovereign, could transfer the rights of government, Sir Edmund Andros, then Governor of New York, arrested Philip Carteret and Fenwick, and attempted to assume control. He was forced to give way in 1681, however, and the colonies continued to be governed by the proprietors. In 1682 Carteret's heirs sold East Jersey to William Penn and his associates. The proprietors of both colonies in 1702 ceded their right of government to the Crown, and the colonies were united and placed under the Governor of New York, though New Jersey retained its separate assembly. In 1738 the province was given a separate Governor. Manufacturing began very early. A paper mill was established at Elizabeth in 1728, and in 1769 forty of these were in operation. A glass factory was begun in 1748. In 1791 the Society for the Encouragement of Useful Manufactures was chartered, with the exclusive right of utilizing the falls of the Passaic, and the town of Paterson was founded. The first Provincial Congress met at New Brunswick, July 21, 1774. In 1776 the Royal Governor, William Franklin, was deposed, and on July 2, 1776, the Provincial Congress adopted a 'Constitution' for the 'Colony of New Jersey' without submitting it to the people. Under this instrument the Governor was to be chosen annually, and was to be executive, president of the council, and chancellor, thus combining executive, legislative, and judicial functions. On July 18th the Provincial Congress ratified the national Declaration of Independence, and changed the title of the colony to the 'State of New Jersey.' During the Revolution the State did its full duty, and was the scene of many of the battles of the war. (For military operations during the War of the Revolution, see UNITED STATES.) The State hesitated to enter a Federal union out of fear of the larger States. In the constitutional convention of 1787 William Paterson (q.v.), one of her delegates, proposed the famous 'New Jersey Plan,' which provided for a single legislative House, in which each State should have one vote. The State ratified the Constitution, December 18, 1787. The capital was fixed at Trenton in 1790, and the history of New Jersey for many years after that was one of increasing prosperity. In 1844 a new constitution was adopted, providing for a term of three years for the Governor, and taking away his judicial duties. In 1875 the Constitution was thoroughly revised. The word 'white' was struck from the suffrage clause, though, of course, it had been a dead letter since the adoption of the Fifteenth Amendment to the United States Constitution. Politically, the State has generally inclined toward the Democratic Party. In 1796, 1800, and 1812, it supported the Federalist candidates; from 1836 to 1848 it was Whig; in 1860 it gave four votes to Lincoln and three to Douglas; in 1872 it cast its vote for Grant: and in 1896 and 1900 it went Republican on the money question. The following is a list of the colonial and State Governors of New Jersey:

GOVERNORS OF EAST AND WEST JERSEY AFTER THE UNION

Edward, Lord Cornbury *	1702–08
John, Lord Lovelace *	1708–09
Robert Hunter *	1710–19
William Burnet *	1720–28
John Montgomerie *	1728–31
Lewis Morris (pres. Council)	1731–32
William Cosby *	1732–36
John Anderson (pres. Council)	1736
John Hamilton (pres. Council)	1736–38

* Also Governors of New York.

GOVERNORS OF NEW JERSEY ONLY

Lewis Morris	1738–46
John Hamilton (pres. Council)	1746
John Reading (pres. Council)	1746–47
Jonathan Belcher	1747–57
John Reading (pres. Council)	1757–58
Francis Bernard	1758–60
Thomas Boone	1760–61
Josiah Hardy	1761–62
William Franklin	1762–76

GOVERNORS OF THE STATE

William Livingston	Federalist	1776–90
William Paterson	“	1790–93
Richard Howell	“	1793–1801
Joseph Bloomfield	Democratic-Republican	1801–02
John Lambert (acting).	“ “	1802–03
Joseph Bloomfield	“ “	1803–12
Aaron Ogden	Federalist	1812–13
William S. Pennington	Democratic-Republican	1813–15
Mahlon Dickerson	“ “	1815–17
Isaac H. Williamson	“ “	1817–29
Garret D. Wall (declined).	Democrat	1829
Peter D. Vroom	“	1829–32
Samuel L. Southard	Whig	1832–33
Elias P. Seeley	Democrat	1833
Peter D. Vroom	“	1833-36
Philemon Dickerson	“	1836–37
William Pennington	Whig	1837–43
Daniel Haines	Democrat	1843–44
Charles C. Stratton	Whig	1845–48
Daniel Haines	Democrat	1848–51
George F. Fort	“	1851–54
Rodman M. Price	“	1854–57
Wm. A. Newell	American	1857–60
Charles S. Olden	“	1860–63
Joel Parker	Democrat	1863–66
Marcus L. Ward	Republican	1866–69
Theodore F. Randolph	Democrat	1869–72
Joel Parker	“	1872–75
Joseph D. Bedle	“	1875–78
George B. McClellan	“	1878–81
George C. Ludlow	“	1881–84
Leon Abbett	“	1884–87
Robert S. Green	“	1887–90
Leon Abbett	“	1890–93
George T. Werts	“	1893–96
John W. Griggs	Republican	1896–98
David O. Watkins (acting)	“	1898
Foster M. Voorhees	“	1898–1902
Franklin Murphy	“	1902 —

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NEW JERSEY, COLLEGE OF. See PRINCETON UNIVERSITY.

NEW JERSEY TEA. An American shrub. See CEANOTHUS; and illustration on Plate of MINT, ETC.

NEW JERUSALEM CHURCH. See SWEDENBORGIANS.

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